

SPECIFICATION 02615 - HIGH DENSITY POLYETHELENE PIPE SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Contractor shall furnish all labor, materials, tools and equipment necessary for the complete and satisfactory installation of the sanitary force main piping, valves, fittings and appurtenances at the locations shown on the drawings and in accordance with the contract Documents and approved installation details. The Contractor shall be permitted to either open cut or directionally drill the HDPE pipe as a method of installation unless a preferred method is indicated on the particular project's plans or specifications.

1.02 INSPECTIONS AND FIELD TESTS

- A. The Owner may inspect all materials before and after installation for compliance with the contract requirements. When specific material tests are called for in the referenced standards and specification, the Owner shall have the option of requiring that any or all of these tests be preformed for materials furnished at the place of manufacture by the manufacturer at no cost.
- B. The Contractor shall schedule all field tests with the Owner at least 48 hours in advance, and shall conduct all testing in the presence of the Owner.
- C. All pipe shall be hydrostatically pressure tested once installed by the contractor. The pipeline under test shall be filled with water to eliminate all air from the system pressurized at the highest point under test. The pipe shall be tested to the pressure rating of the pipe. Details for the pressure test are as provided in Section 3.04 of this Specification.
- D. All equipment used in testing shall be provided by the Contractor and shall be subject to the approval of the Owner. Where devices such as meters, timers, gauges, recorders, charts, plugs, caps, blind flanges, corporation stops or bulkheads are required to develop, maintain and measure test pressures the devices shall be furnished and installed by the contractor at no cost to the Owner.
- E. All piping shall be adequately braced and supported during all testing so that no movement, displacement or damage will result from the application of the test pressure. Relief devices in the various systems shall be capped or plugged during the tests.
- F. Should test show any visible leakage, displacement or damage, regardless of the results of the test, the Contractor shall repair the leakage, displacement or

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damage and retest the system as required to the satisfaction of the Engineer and Owner, at no additional cost.

- G. Repairs to the various systems shall be made with new materials. When it is necessary to replace any piece of pipe, fitting, valve, etc., the replacement shall be of the same material and thickness as the defective piece.
- H. At the option of the Owner, the pipe may be tested for deflection after each 400± feet of pipe has been installed. Testing shall be performed by the Contractor by passing a 10% undersized from the inner diameter Go/No-Go mandrel through the pipeline. Maximum allowable deflection shall be 5%. Contractor shall conduct deflection testing in the presence of the Owner. Any section not passing the deflection test shall be pulled or excavated and replaced.

1.03 SUBMITTALS

- A. Shop drawings shall be submitted for, but not limited to, the following materials, and shall include the following information:
 - 1. All Pipe fittings: Product information and dimensions; SDR, pressure class and operating pressure rating; storage, handling and installation recommendations, manufacturer's recommended testing procedures, and jointing methods and procedures.
 - 2. Pipe couplings and appurtenances, including stiffener rings and MJ adaptors for connecting the different pipe materials shown on the drawings; for connecting pipes with different outside diameters; or for connecting pipes, fittings or valves with different end conditions.
 - 3. Other items to be used in the work that are not specifically identified above shall be subject to shop drawing review at the option of the Owner.

1.04 MANUFACTURER'S CERTIFICATES

- A. Certificates of Compliance shall be submitted for all pipe and fittings stating the item supplied is in accordance with the requirements specified herein.
- B. Certified test results shall be submitted for the following materials at the Owner's request: High density polyethylene (HDPE) pressure pipe and fittings.

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1.05 PIPING

- A. The entire piping system shall be constructed using high density polyethylene pipe and fittings unless otherwise shown on the drawings or where it is necessary to transition to another material.
- B. Miscellaneous piping systems which may not be described specifically by any section of this specifications shall be of the type of pipe and fittings as shown on the drawings and shall be in accordance with the Owner's Standards.
- C. The Contractor shall verify all dimensions, so that all of the pipe work performed will fit together properly and will conform to the arrangement as shown on the drawings. In selecting laying lengths of fittings, the Contractor shall be guided by the dimensions shown. Flanges shall be at right angles to the axis of the opening, and openings shall be at the exact angle specified.

1.06 FITTINGS

- A. All fittings shall be of the type indicated on the drawings or specified. They shall be of the same material and meet or exceed the pressure rating of the pipe.

1.07 REFERENCES AND STANDARDS

- A. ANSI/AWWA C906-90 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 Inches Through 63 Inches, for Water Distribution.
- B. ASTM D 1248-84 Specification for Polyethylene Plastics Molding and Extrusion Materials.
- C. ASTM D3035-93 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
- D. ASTM D3350-93 Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
- E. ASTM F714-94 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

PART 2 PRODUCTS

2.01 GENERAL

- A. All pipe and fittings shall be new, of the nominal pipe sizes and materials indicated on the drawings or specified.

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- B. If the Contractor wishes to use a pipe material that is specified but not shown on the drawings, it shall be his responsibility to design and submit shop drawings for approval, indicating all pipe details. The Contractor shall not be entitled to any extra compensation for such design, shop drawings and their approval, or revisions to the arrangements and details shown on drawing necessary to accommodate the use of pipe materials not shown. All such designs prepared by the Contractor shall be as required and approved by the Owner. Fittings provided for connection to existing piping shall be compatible with the existing piping and with the new piping.
- C. The Contractor shall demonstrate to the full satisfaction of the Owner that his personnel are adequately skilled in making joints specified, prior to installation of any piping.
- D. Some materials or products are specified on the drawings. In case of conflict between drawings and the specifications regarding the product or materials specified, the Owner shall determine which shall govern.

2.02 HDPE PRESSURE PIPE AND FITTINGS

- A. Polyethylene plastic pipe and fittings for sizes 4-inches and larger shall be supplied on accordance with AWWA C-906-90. All pipe shall conform to IPS, O.D. dimensions.
- B. Polyethylene plastic pipe shall be PE3408, Type 2 (high density), Class C (black), Category 4 (extra high molecular weight), Grade P34, polyethylene as specified by ASTM 1248-84 and shall have a cell classification of PE 345434C as specified by ASTM D3350-84. Minimum dimensions and workmanship shall be as specified by ASTM D714-90.
- C. Polyethylene plastic pipe shall be PE 3408, as manufactured by Plexco, Driscopipe 1000, as manufactures by Phillips Driscopipe, Inc., or approved equal.
- D. Pipe Schedule: HDPE pipe shall be SDR 11 with a minimum pressure rating of 160 psi unless directed otherwise by the particular project's plans or specifications
- E. Pipe Fittings and Joints:
 - a. The pipe, fittings and specials shall be from the same manufacturer. All fittings and specials shall have the same pressure rating as the pipe.

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- b. Joints for the pipe fittings and specials shall be by butt fusion joining. Joints shall be made in accordance with the pipe manufacturer's recommendations.
- c. All pipe and fitting joints shall be fully restrained from movement due to thermal expansion/contraction forces.
- d. The Contractor shall be permitted to arc the pipe in lieu of utilizing fittings for bends. The minimum bending radius and other pipe installation requirements shall be as specified in Part 3, EXECUTION, of this specification.

2.03 COUPLINGS/MECHANICAL JOINT ADAPTER

- A. Couplings between HDPE and different pipe materials or between HDPE with different outside diameters shall be provided by Contractor.
- B. Unless otherwise shown or called for on the drawings, couplings shall be the restraining type and shall consist of an epoxy coated and lined steel or ductile iron sleeve ring, ductile iron end rings and a rubber gasketed seal. Couplings shall be capable of restraining the HDPE pipe from pull out due to thermal effects. All hardware shall be stainless steel. All steel components shall be factory coated with a fusion bonded epoxy coating and lined in accordance with AWWA C213-85.
- C. Couplings shall be designed for buried service and shall be rated for the same working pressure as the pipe. Couplings shall be Maxigrip and manufactured by Coupling Systems, Inc., or approved equal.
- D. Couplings shall include ring stiffeners as specified herein.
- E. HDPE mechanical joint adapters for making connections to mechanical joint fittings and valves shall be acceptable. The adapter shall provide for a restrained joint. Adapter shall be suitable for connecting to any ANSI/AWWA C153 ductile iron fitting or value and comply with AWWA C901, 906.

2.04 RING STIFFENERS

- A. Steel stiffener rings sized for the inside diameter of the pipe shall be furnished for all HDPE at all compression type couplings and non-fused joints. Ring stiffeners shall be steel, fusion bonded with an epoxy coating in accordance with AEEA C213. Ring stiffeners shall be as manufactured by Coupling Systems, Inc. or equal. Rings shall be of sufficient length to extend beyond coupling gasket and follower gland.

2.05 DETECTION TAPE AND WIRE

Detection tape used for pipe installed by open-cut methods shall be installed directly above the force main as specified in Specification 02221 - Trenching – Section 2.05.

PART 3 EXECUTION

3.01 HDPE PIPING AND FITTINGS

- A. HDPE pipe may be installed either by trench methods or by directionally drilling, unless otherwise called for on the drawings.
- B. All directional drilling of pipelines shall be in accordance with Specification, DIRECTIONAL DRILLING.
- C. All pipelines installed using the trench method shall be installed in accordance with the typical trench section in the Appendix of this specification for HDPE pipe installation.
- D. Allowable minimum bend radii for the 8" HDPE pipe shall be 25' unless in conflict with the pipe manufacturers recommendation in which case the larger radius shall govern. Bends in PE pipe shall not be permitted to occur closer than 10 diameters from any fitting or valve. Bending of coiled pipe against the coil shall not go beyond straight. Polyethylene pipe that becomes kinked during handling or installation shall not be used, and care should be taken to ensure that kinking does not develop after installation.
- F. Profiles for the piping system are not shown. The pipe shall generally be laid to follow the contour of the existing ground surface or to the inverts shown on the drawings. Minimum depth of cover of all mains shall be 3.5 feet. Where conflicts occur existing utilities, the top of the proposed pipe shall be laid at least 1 foot below the bottom or above the crown of the existing utility as required.
- G. Contractor shall maintain a drill log to show actual in place depths at intervals of 50-feet which are to be turned over to the County at the end of the job.
- H. Field cutting and fusion bonding of HDPE pipe and fittings shall be done on accordance with the manufacturers recommended procedures.
 - a. Joints shall be made either pipe end to pipe end, pipe end to fitting, or between a saddle fitting and pipe by heat-fusion methods. These methods involve preparation of surfaces, heating of surfaces to proper

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fusion temperatures, and bringing the surfaces together in a prescribed manner to effect the fusion bond as described in ASTM D2657 and in accordance with the pipe manufacturer's recommendations.

- b. Special tools to provide proper heat and alignment shall be used for heat-fusion connections. Detailed written procedures and visual aides provided by the pipe manufacturer shall be supplied to the inspector prior to heat fusing any pipe. The information shall include specific recommendations for time, temperature, and pressure required to make joint as well as criteria used to evaluate the quality of a fusion bonded joint.
- c. Upon request by the Owner, the manufacturer shall provide fusion training services to the Contractor. When requested, both installers and inspectors shall be trained by the manufacturer or his authorized representatives.
- d. Mechanical connections of polyethylene pipe to pipe or fittings of other materials, or pipe or fittings of different dimensions shall be by means of restrained mechanical couplings designed for joining polyethylene pipe to other piping material unless otherwise shown on the drawings. The Contractor shall submit drawings of mechanical connections during the shop drawing phase for review and approval.
- e. All piping shall be fully restrained. No unrestrained mechanical or compression joints are allowed unless proper thermal expansion/contraction restraint anchors are provided. The design of these anchors shall be the responsibility of the Contractor and subject to the review and approval of the Owner.
- f. Polyethylene pipe, tubing, and fittings shall be stored in a way that prevents damage due to crushing or piercing, excessive heat, harmful chemicals, or exposure to sunlight for prolonged periods. The manufacturer's recommendations regarding storage shall be followed.
- g. Handling of HDPE pipe during installation shall be performed with care to prevent scratches, nicks, and gouges in the conduit.
- h. Practices such as dragging coils of pipe or tubing over rough ground and installing by pulling through auger or bore holes containing sharp-edged material is prohibited. Uncoiling and other handling shall be done without kinking. If pipe is cut or kinked beyond the manufacturer's recommendation, the damaged portion shall be removed, discarded, and replaced.

3.02 CONCRETE THRUST BLOCKS

- A. The Contractor shall provide concrete thrust blocks on all non-fused (or otherwise unrestrained) bends, tees, plugs and caps in accordance with the drawings and Standard Details.
- B. Contractor shall provide concrete anchors at all locations where HDPE segments of pipe terminate at non-flanged, non-threaded or non-fusion bonded valves, fittings or couplings to resist thermal expansion and constriction.

3.03 EXISTING UTILITIES

- A. When crossing and/or working in the vicinity of existing utilities, it will be the Contractor's responsibility to properly support and maintain the operations of the utilities. Extreme care must be exercised in excavation and refill operations. The Contractor shall refer to Specification 01010 and 02200 if this specification for information on how to address existing utilities.

3.04 TESTING

- A. Pressure and leakage tests shall be conducted in accordance with the pipe manufacturer's recommended procedures.
- B. The pipe shall be tested hydrostatically. The length of the pipe under test shall be filled with water, with care being taken to eliminate all air from the pipeline to. Air testing shall not be used. The test pressure shall be 100 psi. For the next period of time, which is called expansion test time, pipeline shall be left alone with no water added during this time. Expansion time shall continue not less than 2 hours. This will allow for the pipeline to expand under first pressurization. After expansion time, the pressure in the pipeline should be again raised to the test pressure by adding water for the leakage test. This pressure test shall continue for at least 3 hours with no leakage allowable.
- C. All visible leaks shall be immediately repaired and the line retested. Any section of the line in which the leakage occurs shall be repaired by the Contractor at his expense to the complete satisfaction of the Engineer, whether or not the trench has been refilled. Any pipe, fitting, Valve, etc. which gives evidence under test of being defective, shall be replaced by the Contractor at his own expense. If the line shows an excessive number of leaks in any phase of the test, the Contractor shall re-test the line after initial correction until all leaks have been remedied.
- D. Leaks and defects shall be repaired or otherwise remedied by the Contractor at no expense to the Owner, and to the complete satisfaction of the Engineer

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whatever time they become apparent prior to the final acceptance of the work under this contract.

3.05 DEFECTS TO BE MADE GOOD

- A. If, at any time, before the completion of the contract, any broken pipes, or any defects are found in the buried piping or in any of their appurtenances, the Contractor shall cause the same to be removed and replaced by proper material and workmanship, without extra compensation for the labor and materials required, even though such injury or damage may not have been due to any act, default, or negligence on the part of the Contractor; provided however, that should such defective work result from inherent flaws in the material furnished by the Owner, materials to replace same will be furnished by the Owner. All materials shall be carefully examined by the Contractor for defects just before placing any found defective shall not be placed in the line.

3.06 PIPE INSTALLATION – GENERAL

- A. Contractor shall adhere to the manufacturer's recommended installation procedures.
- B. All pipe, fittings, valves and accessories shall be carefully lowered into the trench using suitable equipment in such manner as to prevent damage to pipe and fittings. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. HDPE pipe installed by open trench methods shall be in accordance with the detail shown on the drawings.
- C. The pipe and accessories shall be inspected for defects prior to installation. Any defective, damaged, or unsound material shall be repaired or replaced as directed by the Owner.
- D. All foreign matter or dirt shall be removed from the interior of the pipe before installation. Pipe shall be kept clean by means approved by the Owner during and after installation.
- E. When pipe laying is not in progress, the open ends of the installed pipe shall be closed to prevent entrance of debris into the line. If water enters the trench, the Contractor shall prevent pipe from floating. Any pipe that has floated shall be removed from the trench and the bedding restored. No pipe shall be laid when the trench conditions or the weather are unsuitable for proper installation as determined by the Owner.
- F. The pipe shall be cut in accordance with the manufacturer's recommended procedures. Cuts shall be made in a neat and workmanlike manner without damage to the pipes as to have a smooth end at right angles to the axis of the pipe.

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- G. HDPE pipe shall be installed in prepared trench bottoms that provide continuous support and are uniform and free from rocks, stones, and debris.

3.07 BACKFILLING PIPE TRENCHES

- A. Trenches shall be backfilled as shown on the drawings and in accordance with Specification 02221.

END OF SPECIFICATION

SPECIFICATION 02620 - VACUUM SEWER MAINS AND CROSSOVERS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this Specification includes, but is not limited to:

Vacuum Sewer Mains and Crossovers
Division Valves
Valve and Controller/Sensor
Valve Pits and Covers

- B. Related work specified elsewhere:

Specification 02221 - Trenching
Specification 02651 - Sewer Testing

- C. Applicable Standard Details:

Water Sewer Conflict Deflection
Division Valve Box
Valve Box and Cover
Access Point
Lift Section
Over the Top Connection
Valve Pit Section (2 details)
Valve Pit Extension

1.02 QUALITY ASSURANCE

- A. Reference Standards:

American Society for Testing and Materials (ASTM):

D1784 Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly
Vinyl Chloride (CPVC) Compounds

D2241 Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)

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D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

1.03 SUBMITTALS

- A. Manufacturer's Instructions: Submit manufacturer's instructions for installation of adapters and maximum recommended deflection per pipe joint.
- B. Certificates: Submit manufacturer's certification attesting that the pipe, pipe fittings, joints, joint gaskets and lubricants meet or exceed specification requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. During loading, transporting and unloading, and storage on site, exercise care to prevent damage to materials.
- B. Do not drop pipe or fittings.

PART 2 - PRODUCTS

2.01 VACUUM SEWER MAINS AND CROSSOVERS

- A. The acceptable type of pipe is Schedule 40/Pressure PVC with all solvent welds. Color of the pipe shall be green if available. No cellular core pipe. SDR 21 PVC pipe with bell joint fitted with double 'reber' gasket suitable for vacuum sewer application may be substituted for the pipe, however all fittings will still need to be solvent weld.
- B. Wyes and Bends for sewers and crossovers shall be pressure rated with solvent weld connections.
- C. All PVC bends, couplings and caps shall be Schedule 40-Pressure.
- D. Tee fittings shall not be used for vacuum service. No vent ells shall be allowed.

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- E. All 90 degree changes of direction shall be accomplished with two 45 degree bends with a twenty-four inch section of pipe between them.
- F. All vacuum crossover connections from the valve pit to the collector main shall be over-the-top connections.
- G. Only wye fittings or combination wye and 45 degree bends shall be used for the over-the-top connections.
- H. All roads, parking, foundations, or any other excavation required to reach a subgrade within the vicinity of sewer lines will be completed prior to the installation of sanitary sewer lines.
- I. Where applicable, stub-outs for the gravity line inlets shall be constructed to facilitate the future connection to the valve pit. The stub-outs shall consist of a right-of-way cleanout assembled from a combination wye and eighth bend with a riser section to grade. The riser section shall be capped off using a PVC threaded cap with a removable threaded PVC plug making sure that the threads are teflon taped. The end of the wye that faces the property shall have a twelve-inch stub of pipe with a solvent welded cap. All gravity sewer cleanouts are to be protected with a traffic bearing frame and cover installed over the PVC cap.
- J. All trenching and backfilling shall be in accordance with the specifications for trenching and backfilling.
- K. Trenches shall not be backfilled prior to an acceptable vacuum test each day unless the modified testing procedure is utilized.

2.02 DIVISION VALVES

- A. Resilient Wedge Valves:
 - 1. Division valves shall be installed as shown on the Drawings.
 - 2. Valves shall be resilient wedge type suitable for service in sewage under both vacuum and/or pressure as manufactured by Mueller Company, or approved equal.

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3. Valves shall be constructed and rated in accordance with ANSI Specifications B16.34-1977 Class 150 where applicable (i.e. flanges, body wall thickness and body pressure rating). Valves shall also be capable of sustaining a vacuum of 24" mercury with no leakage from the valve body.
4. Valves shall be fabricated with a carbon steel body, bronze stems. Kennedy & American Flow Control valve stems shall be provided in bronze which conforms to ASTM D763 Alloy C99500 (NDZS Bronze).
6. Mechanical joint connections with transition to PVC gaskets shall be provided.
7. Diaphragm or sleeve type valves shall not be acceptable for vacuum service.
8. Valves with greater than 5 foot of cover shall have an operating nut extension installed to a depth between 2 and 3 feet from grade. Extensions shall be manufactured, not field cut, with a set screw at the base and a centering o-ring at the top. Extension shall operate freely and shall not bind against the valve box wall.

2.03 VALVE BOXES

- A. 12" valves and smaller: domestic cast iron, two-piece, sliding type.
- B. Valves larger than 12": domestic cast iron, three-piece, sliding type; round base.
- C. Cast iron lid.
- D. Valve boxes shall be cast iron, sliding type, with 5-1/4 inch shaft and extra deep lid having the word "SEWER" cast thereon. All valve boxes shall be adjustable within the limits necessary to provide for the setting depths required and shall be as manufactured by the M&H Valve and Fittings Company, Mueller Company, or approved equal. Valve boxes with more than three sections shall have an exterior PVC sleeve around the full length of the box to maintain alignment.
- E. Valve boxes shall have a concrete collar poured around the valve box top at finish grade. The collar is to have a minimum of 18" diameter (i.e. a 6 inch annular collar), 6 inches thick, with two stands of 10-gauge wire reinforcing, and be tightly bonded to the cast iron box.

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- F. Valve box bottoms shall be fitted with Valve Box Adaptor II rubber centering ring, as manufactured by Adaptor, Inc., or approved equal.

2.04 VALVE AND CONTROLLER/SENSOR GENERAL SPECIFICATION

- A. The vacuum sewage valve, or interface valve, as manufactured by AIRVAC, shall be vacuum operated on opening and be spring assisted on closing. The valves shall be model S valve and will be sump vented.
- B. The valve configuration shall be so arranged that the sewer vacuum ensures positive valve seating. It shall be nominal 3 inch diameter up to 90% of nominal while providing a visual flow through areas of at least 50% of nominal. The plunger and its shaft shall be arranged to be completely out of the flow path when the valve is in its open position. The valve shall be equipped with a vacuum operator of the rolling diaphragm type and of sufficient diameter to overcome all sealing forces and open the valve fully using line vacuum from the downstream side of the valve. The valve shaft shall be provided with an elastomer seal to minimize sewage leakage into the lower housing of the valve vacuum operator. A vacuum drain shall be connected to the lower housing of the valve operator which shall remove any shaft seal leakage and suck it into the vacuum sewer each time the valve cycles. A surge tank, fitted with double check valve units, shall be mounted on the vacuum supply to the valve controller.
- C. All materials of the valve shall be chemically resistant to sewage. The valve shall be equipped with a controller/sensor which shall rely on atmospheric air and vacuum from the downstream side of the valve for its operation, thereby requiring no other power source. The controller/sensor shall be capable of taking vacuum from the downstream side of the valve applying it to the actuator chamber and fully opening the valve. The controller/sensor shall be capable of maintaining the valve fully open for a fixed period of time. This time period shall be adjustable over a range of 3 to 10 seconds. After the time period is elapsed, the controller/sensor shall be capable of admitting atmospheric air to the actuator chamber and permitting spring assisted closing of the valve. The opening of the valve shall be initiated by the controller/sensor which shall sense the head of sewage in the collection sump. Activation of the controller/sensor shall be at the factory head setting of 4-6" water gauge.

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- D. All materials of the controlled/sensor shall be fabricated from a plastic or elastomer that is chemically resistant to sewage and sewage gases.
- E. The valve and controller/sensor shall be capable of operating when submerged in water.

2.05 COLLECTION SUMPS

- A. Collection sumps shall be supplied by AIRVAC and manufactured from fiberglass and have a wall thickness of approximately 3/16". Sumps shall be of an approximately 30 or 60 gallon capacity, as indicated on the plans and designed for H2O traffic loading at 2 feet depth of cover. Elastomer connections shall be provided for the gravity line(s). Holes for 4 and 6 inch connections shall be sealed with grommets as supplied by sump tank manufacturer. Holes for the seals shall be field cut with a circular saw in lieu of a jig saw at the positions indicated on the Valve Pit Detail. Sealing between the valve pit bottom and tank shall be made in the field using an approved O-ring gasket supplied by the manufacturer.

2.06 VALVE PITS AND COVERS

- A. Valve pits shall be manufactured by the filament winding fiberglass process. Pits shall be 3'-0" inside diameter at the bottoms and be conically shaped to allow fitting of a 23-1/2" diameter clear opening cast iron frame and cover. Valve pit depth shall be 3'6". Wall thickness shall be 3/16". Pits shall be suitable for H2O traffic loading. Valve pits to be manufactured by AIRVAC.
- B. A fiberglass reinforced bottom shall be provided for field assembly to the pit by the installation Contractor. Valve pit bottoms shall be 1/4 inch thick at the edges and 5/16 inch at the center. Bottoms shall be molded by the resin inject process. Valve pit bottoms shall be provided with holes factory cut for the 4" sensor/cleanout unit, 3" suction and the sump securing bolt holes.
- C. Valve pits shall be supplied with one 3 inch and one 1-1/2 inch elastomer seals. Seals shall effectively seal all openings to prevent ingress of ground water.
- D. Pits shall be supplied with 6" deep cast iron covers and frames designed for H2O traffic loading. Frame weight shall be not less than 90 pounds and lid not less than 100 pounds. Lids shall have single components locking mechanisms. Frames and covers shall meet or exceed AASHTO M306-89 standards. Frames and covers shall

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be "B & C Utilities Supply, Inc.", design number A 2630, or equal. All equal frames and covers must have covers that are interchangeable with B & C Utilities A 2630. Covers shall be lettered with "Queen Anne's County" in the casting.

- E. A 4-inch by 4-inch salt treated wooden witness post shall be installed adjacent to the vacuum valve pit. The top corners of the post are to be rounded. The post shall be permanently labeled with the valve pit number via engraving or attaching an aluminum imprinted label.
- F. Two tee handle keys shall be provided to the County as manufactured by the cover manufacturer.
- G. Model D valves, which need exterior breathers are to be only used when specifically directed. Breathers for exterior breathing valves (model D) shall consist of 1-1/2" galvanized pipe with 5/8" polyurethane tubing contained within as an air passage from the atmosphere to the controller of the valve. The 1-1/2" galvanized pipe would enter the wall of the valve pit through a 2" by 1-1/2" Fernco donut. The 1-1/2" galvanized pipe shall act as a heavy duty conduit which is to be supported by a five foot length of 4" by 4" salt treated post.

2.07 TRACER WIRE & MARKING TAPE

- A. All vacuum pipe runs shall have a single strand 8-gage un-coated copper wire run along the invert of the pipe and run with the pipe to aid in future locates.
- B. Wire shall be run to grade at all cleanouts, division valves, etc. in order to allow for tracer equipment to connect to the wire. Wire shall provide a continuous loop along the entire length of pipe not to exceed 900 feet without an access point to be able to reach and attach to the wire.
- C. Marking tape, green in color and in accordance with Specification 02221 - Trenching Section 2.05 & 3.11, shall be placed in the trench 18 inches below grade.

2.08 CONNECTORS

- A. Nuts, bolts, washers, tie rods, and any other connectors shall only be 304 stainless steel, or 'Tripac, Inc. 2000 Blue Coated', or approved equal, to resist corrosion.

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PART 3 - EXECUTION

3.01 PREPARATION

- A. Perform trench excavation to the line and grade indicated on the Contract Drawings and as specified in Specification 02221 - Trenching.
- B. Provide pipe bedding as specified in Specification 02221 - Trenching for each type of pipe used. Provide Type III bedding for PVC vacuum sewer mains and vacuum pit crossovers. Place aggregate in a manner to avoid segregation, and compact to the maximum practical density so that the pipe can be laid to the required tolerances.
- C. Provide at least 3'6" of cover from the top of the pipe to the finished grade elevation.

3.02 PIPE INSTALLATION

- A. All pipe, valves, fittings, and buttresses shall be installed as specified in AWWA standards C-600 and C-900, the pipe manufacturer's recommended methods and as stated herein, unless otherwise specified by the County.
- B. All pipe, valves and fittings shall be thoroughly cleaned and shall be entirely free from grease or oil and substantially free from blacking, dirt, sand, rust, slag or fluxing materials.
- C. Pipe and fittings shall be moved to the trench, carefully lowered, and set to line and grade. Pipe shall be laid on the subgrade. No blocking will be permitted. No pipe or fitting shall be installed until sufficient trench has been completely excavated to satisfy the County that no unforeseen obstructions of any kind are likely to be encountered. Where it is necessary to raise or lower the pipes due to obstructions or other causes, the County shall be notified and the change in grade shall be effected in accordance with details which will be furnished by the County. Said field adjustments will need County approval prior to construction. No pipe shall be cut except as necessary to install fittings as shown on the approved plans.
- D. In crimping, joint deflections shall not exceed maximum deflections stated by the manufacturer for the specified joint and pipe sizes. No pipe shall be cut, nor cut pipe installed, except at the specific direction of the County. Pipe shall be cut by the contractor when required. In cutting, the ends shall be cut at right angles to the axis

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and the edges filed to a smooth taper. Special care shall be exercised by the contractor to prevent damage to any pipe.

- E. Before placing in the trench each pipe or fitting shall be carefully cleaned of any foreign substance which may have collected therein and shall be kept clean at all times thereafter. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the County deems there to be a danger of the formation of ice or the penetration of frost at the bottom of the excavation. All requirements regarding the minimum length of open trench and promptness of refilling shall be observed. The open ends of all pipe and fittings in the trench shall be closed to the satisfaction of the County before leaving the work for the night and for all holidays or other times of interruption to the work.
- F. Any excessive settlement of the pipe requiring repairs shall be the sole responsibility of the Contractor (within the limits of the guarantee) and he shall make and do all required work as may be necessary to accomplish the required repairs and return the site to proper condition and appearance, without additional compensation.
- G. Fittings and valves shall be placed along the vacuum sewer mains and crossovers where shown on the drawings or where designated by the County in accordance with the requirements as provided elsewhere in these specifications.
- H. All trenches are to have tracer wire placed in the invert of the trench and have marking tape placed 18 inches below the ground service in the trench as detailed in Section 2.07 of this specification.

3.03 WYE BRANCHES

- A. Install wye branches at locations indicated on the Contract Drawings concurrently with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed.

3.04 DIVISION VALVES AND VALVE BOXES

- A. Install valves in conjunction with pipe laying; set valves plumb. Support valves with a 1 inch by 8 inch by 8 inch cement block laid firmly on compacted base
- B. Provide buried valves with valve boxes installed flush with finished grade.

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- C. Fittings and valves shall be placed along the sewer mains where shown on the drawings or where designated by the County in accordance with the requirements as provided elsewhere in these specifications.
- D. A valve box shall be provided for every valve and shall be carefully placed and set at a right angle to the sewer main. The valve box shall not transmit shock or stress to the valve or pipe and shall be centered and plumb over the operating nut of the valve, with the box cover flush with the surface of the finished pavement or set to the elevation shown on the approved plans.
- E. Valve boxes shall have a concrete collar poured around the valve box top at finish grade. The collar is to have a minimum of 18" diameter (i.e. a 6 inch annular collar), 6 inches thick, with two stands of 10-gauge wire reinforcing, and be tightly bonded to the cast iron box.
- F. In tamping the backfill around the valve, special care shall be taken to keep the box in place and to have it firmly supported so as to avoid settlement. Any box which is found out of place or which is not firmly supported shall be dug up and reset in a satisfactory manner at the Contractor's expense.
- G. For valve boxes not placed in roadway areas, but in graded areas, the top shall be set at the existing finished grade or as directed by the County.
- H. Valve boxes with more than 2 sections shall have a 6 inch schedule 40 PVC sleeve placed over the valve box to maintain the valve box's alignment.
- I. Valve box bottoms shall be fitted with Valve Box Adaptor II rubber centering ring as manufactured by Adaptor, Inc., or approved equal.
- J. Tracer wire is to loop into the valve box and extend to within four inches of the valve box lid. Wire is to be located outside of the bottom section (and middle section, if any) of the valve box, but on the interior of the top of the valve box.

3.05 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of the pipe laying by the County.
- B. Backfill trenches as specified in Specification 02221 - Trenching.

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3.06 INSTALLATION AND TESTING VALVE PIT

- A. The 2" sensor cleanout shall be air tested for leaks prior to installation in the valve pit bottom. Prior to fitting the valve pit bottom, the flanges and mating surfaces shall be clean and dry.
- B. Install elastomer o-ring into ring groove, align match marks on pit bottom and sump. Fit and tighten bolts, nuts and flat washers. Make certain that the nuts are on the topside of the pit bottom for ease of future disassembly.
- C. To test collection sump, first make a 3" test plug using a 3" PVC cap glued onto a 6" length of 3" pipe. Insert test plug into 3" grommet in pit bottom. Make a 4" test plug using a 4" PVC cap glued on to a 6" length of 4" pipe. Tap a 1/8" tubing connection and an air valve fitting into the 4 inch PVC cap. Insert the 4 inch test plug into the 4 inch grommet in the pit bottom. Connect a 0 to 50 inch magnehelic gauge to the 1/8 inch tubing connection. Connect an air supply to the air valve fitting. Stabilize at 40 inches on the gauge and watch for leaks. Leakage must be within 1 inch water in 1 minute for a period of 3 minutes.
- D. Alignment of the 3" pipes after cutout for the interface valve within the top of the valve pit shall not exceed a vertical of 1/4" and a horizontal of 1/8".
- E. All assembly and testing of the complete valve pit installation shall be carried out in accordance with the interface valve manufacturers instruction.
- F. Upon final completion of each valve pit and associated gravity sewer system, the Contractor shall test the gravity sewers in accordance with the requirements for testing the valve pit collection sump.
- G. Contractor shall retest the complete assembly at the systems final completion and repair or replace all units that fail the test.

3.07 VACUUM SEWERAGE INTERFACE VALVES

- A. All vacuum sewerage interface valves and associated assembly components shall be purchased from the manufacturer and turned over to the County in mint condition prior to substantial completion for future installation.

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3.08 INSTALLATION OF VACUUM VALVE PIT BREATHER (Model D Vacuum Valves Only)

- A. Breather assemblies for each valve pit shall be installed as shown on the valve pit detail.
- B. Breather risers shall be located on the private property side of the roadside drainage swales but within the County right-of-way. Breather risers shall extend 6 inches above the crown of the road or 2-1/2 feet above existing grade; whichever is greater in elevation.
- C. The minimum cover of material over the breather pipe shall be 6 inches at the drainage swale invert. Should the Contractor fail to obtain said amount of cover, an asphalt-coated corrugated metal drainage pipe (CMP) shall be installed in order to facilitate a breather line crossing. CMP shall be 5 feet long and of adequate diameter for proper drainage through the swale. CMP and breather line shall be backfilled with suitable material to match existing grade.

END OF SPECIFICATION

SPECIFICATION 02651 - SEWER TESTING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this Specification includes, but is not limited to:

Vacuum sewer testing
Low pressure air testing of gravity sewer pipelines
Hydrostatic testing pressure pipelines
Deflection testing plastic pipelines
CCTV Pipe Inspection

- B. Related work specified elsewhere:

Specification 02610 - Sanitary Sewer Pipe
Specification 02620 - Vacuum Sewer Mains and Crossings

- C. Applicable Standard Details:

General Notes Sewer

1.02 QUALITY ASSURANCE

- A. Test Acceptance:

1. No test will be accepted until the results are below the specified maximum limits.
2. The Contractor shall determine and correct the causes of test failure and retest until successful test results are achieved. The Contractor shall be responsible for the cost of all retesting.

1.03 SUBMITTALS

- A. Submit the following prior to start of testing:

1. Testing procedures
2. List of test equipment

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3. Testing sequence schedule
4. Provisions for disposal of flushing and test water
5. Certification of test gauge calibration
6. Deflection mandrel drawings and calculations

1.04 JOB CONDITIONS

- A. Do not allow personnel in manholes during vacuum or pressure testing.
- B. Provide relief valves to avoid accidentally over pressurizing gravity sewer line and valve pit sump (if applicable) during low pressure air testing.

PART 2 - PRODUCTS

2.01 VACUUM TEST EQUIPMENT

- A. Vacuum pump
- B. Vacuum line
- C. Vacuum tester base with compression band seal and outlet port
- D. Shut-off valve
- E. Stop watch
- F. Plugs
- G. Vacuum chart recorder, calibrated to 0.1" Hg

2.02 EXFILTRATION TEST EQUIPMENT

- A. Plugs
- B. Pump
- C. Measuring device

2.03 AIR TEST EQUIPMENT

- A. Air compressor
- B. Air supply line
- C. Shut-off valves
- D. Pressure regulator
- E. Pressure relief valve
- F. Stop Watch
- G. Plugs
- H. Pressure gauge, calibrated to 0.1 psi.

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2.04 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump
- B. Pressure hose
- C. Water meter
- D. Test connections
- E. Pressure relief valve
- F. Pressure gauge, calibrated to 0.1 psi.

PART 3 - EXECUTION

3.01 PIPELINE PREPARATION

- A. Backfill trenches in accordance with Specification 02221 - Trenching.
- B. Provide pressure pipeline with concrete reaction support blocking.
- C. Flush/jet clean pipeline to remove debris; collect and dispose of flushing water and debris. (Repeat as needed)
- D. Clean pipelines by propelling a snug fitting rubber ball through the pipeline with water from the upstream access to the downstream access.

3.02 DAILY TESTING OF VACUUM SEWER

- A. Standard Two Hour Test:

At the completion of each day's work, all vacuum sewer mains and lateral connections laid or completed that day shall be tested as follows: Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by "no-hub" couplings. Apply a vacuum of 24" mercury to the pipes and allow the vacuum to stabilize for 15 minutes. There shall be no loss of vacuum in excess of 1% per hour for a two hour test period. The vacuum line must pass this test each day before further installation of vacuum pipe. Upon the discretion of the County, if a "perfect test" is in progress, backfilling of the trench may be allowed for the last 45 minutes of the 2 hour test. The "perfect test" being defined as no loss in vacuum after 1 hour and 15 minutes of the 2-hour test.

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B. Two Hour Vacuum Line Test Modification Provision:

1. If the Contractor succeeds in meeting the daily 2-hour test for 7 consecutive working days or two thousand feet of pipe, whichever occurs first, he may modify 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 enjoying this test modification, the Contractor will take whatever action necessary at his cost to pass the test including the re-excavation of the trench, leak detection and line repair, and additional cleanup as may be necessary.
2. After the failure the Contractor must "re-qualify" as above or as the County determines not to exceed above. Note this test modification is optional on the part of the Contractor wishing to utilize it and as such the Contractor assumes all liability in its use.

3.03 FINAL ACCEPTANCE TEST OF VACUUM SEWER

- A. Prior to final acceptance, the complete vacuum sewer system shall be subjected to a vacuum of 24" mercury and allowed to stabilize for 15 minutes. There shall be no loss greater than 1% per hour over a four hour test period. This test must be successfully completed prior to the installation of any AIRVAC vacuum interface valves.
- B. Prior to the four hour test, all pipe, ancillary structures and final road subgrades must be completed as well as all site grading and other utility work which has the potential to damage the tested sewer lines. At the County's option, lines which fail the 4-hour test may be required to undergo an in-line CCTV inspection. A representative of the County must witness the entire test.
- C. Any lines damaged after the final test shall be subjected to another four hour vacuum test and the in-line camera inspection once repaired.
- D. All testing equipment must be supplied by Contractor.

3.04 GRAVITY SEWER LATERAL TESTING

- A. Gravity lines connected to the collection sumps shall be subject to the same test requirements as the collection sump itself. (see 02620-12 part 3.06)

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- B. Gravity lines connecting manholes shall be plugged at the manholes and air tested at a pressure equal to or greater than 5 psi. The test duration shall be 5 minutes with no loss being acceptable.
- C. Prior to acceptance, all lines shall be flushed clean and all debris and material removed. Gravity lines are to be inspected with an in-line camera.
- D. Laterals are also to be TV inspected from the right-of-way cleanout to the main. Videotapes with audio description are to be made and turned over to the County.

3.05 MANHOLE TESTING

- A. Manholes to be vacuum tested shall have 10 inches of Mercury applied to the manhole and the time measured for the vacuum to drop from 10 inches to 9 inches of mercury. The following are minimum allowable test times for manhole acceptance at the specified vacuum drop.

| Depth of Manhole (feet) For less than 8' use 8' table | Time (sec) | | |
|--|---------------------------|------------|------------|
| | Manhole Diameter (inches) | | |
| | <u>48"</u> | <u>60"</u> | <u>72"</u> |
| 8 | 14 | 18 | 23 |
| 10 | 17 | 23 | 28 |
| 12 | 21 | 28 | 34 |
| 14 | 25 | 32 | 40 |

- B. All testing equipment must be supplied by Contractor.

3.06 PRESSURE SEWER TESTING

- A. Pipelines to be tested in whole or in sections in a manner similar to the testing of water lines. If tested in sections, the sections ends are to be valved or bulkheaded to the satisfaction of the County. Testing to be under a hydrostatic pressure equal to 1.5 times the design pressure or as directed by the County. Test shall be made prior to backfilling.
- B. The line shall be slowly filled with water and the test pressure developed by means of a small power pump. A tapped connection for filling the line shall be located at the lowest point of the section being tested. Care should be taken to ensure no air is trapped in the pipe. It may be necessary for the Contractor to install corporation stops in the line to successfully expel all air from the pipes.

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- C. The rate of leakage shall be determined in 15 minute intervals by means of volumetric measurement of the water needed to maintain the test pressure. The test shall not continue until the rate of leakage has stabilized at an allowable constant value, for three consecutive tests. After meeting this criteria, the test pressure shall be maintained for at least another 15 minutes. If the line fails, the Contractor will explore for the cause of the excessive leakage and retest the line once repairs are completed.
- D. Allowable leakage shall be calculated in the same manner as Allowable leakage on water mains. Specification 2753
- E. In addition to the volumetric leakage test, the piping shall be visually examined during the test and any leaks discovered repaired.
- F. All fittings must be properly braced before pressure is applied.

3.07 TRACER WIRE LOOP CONTINUITY TEST

- A. Tracer wire shall be tested once installed to test its continuity. Any gaps in continuity discovered are to be repaired by Contractor

END OF SPECIFICATION

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SECTION 02715 - WATER MAINS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this section includes, but is not limited to:

Water transmission lines and fittings
Water distribution lines and fittings

- B. Related work specified elsewhere:

Section 02150 - Boring, Jacking, and Tunneling
Section 02221 - Trenching, Backfilling & Compacting
Section 02740 - Water Valves and Fire Hydrants
Section 02742 - Water Service Connections
Section 02753 - Testing & Disinfecting Water Mains
Section 03300 - Cast-in-Place Concrete
Section 03310 - Concrete for Utility Construction

- C. Applicable Standard Details:

Buttress for 1/4 Bends
Buttress for Tees
Buttress for Caps and Horizontal Bends
Bedding Detail
Temporary Stone Check Dam Detail
Trench Restoration Detail
Concrete Cradle and Encasement Detail
Water Air Release Valve Detail
Blowoff Detail
Water Main Deflection Detail

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
American Water Works Association (AWWA):

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- ANSI/AWWA C104/A21.4 - Cement Mortar Lining for Ductile Iron and Gray Iron Fittings for Water
- ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
- ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings, 3" through 48", for Water and Other Liquids
- ANSI/AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
- ANSI/AWWA C115/A21.15 - Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges
- ANSI/AWWA C150/A21.50 - Thickness Design of Ductile Iron Pipe
- ANSI/AWWA C151/A21.51 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
- ANSI/AWWA C600 - Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances
- ANSI/AWWA C603 - Installation of Asbestos Cement Pressure Pipe
- ANSI/AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12", for Water Distribution
- ANSI/AWWA C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14" through 36"

B. American Society for Testing and Materials (ASTM):

- ASTM D2241 - Specification for PolyVinyl Chloride (PVC) Pressure Rated Pipe
- ASTM D2855 - Recommended Practice for Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

1.03 SUBMITTALS

- A. Submit manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints for approval of the County; include manufacturers' recommendations for deflection in pipe joints.

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- B. Submit a Statement of Compliance, together with supporting data, from the materials suppliers of each type of pipe, fitting, gasket, lubricant or other joint materials attesting that each of the products provided meets or exceeds specifications requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Do not place materials on private property without written permission from the property Owner.
- B. During loading, transporting and unloading, exercise care to prevent damage to materials.
- C. Do not drop pipe or fitting.
- D. Avoid shock or damage at all times.
- E. Use padded slings, hooks and tongs to prevent damage to the exterior surface or internal lining of the pipe.
- F. Pipe may be strung along alignment where approved by the County.
- G. Do not stack higher than Maximum Stacking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.
- H. Keep interior of pipe and fittings free from dirt or other foreign matter.
- I. Store gaskets for mechanical and push-on joints in cool location out of direct sunlight and not in contact with petroleum products.

PART 2 - PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

- A. Polyvinyl Chloride (PVC) Plastic Pipe:

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1. Pipe:
 - a. Pressure Rated: ASTM D2241, PVC 1220, SDR 18
2. Manufactured from Blue Polyvinyl Chloride 1220.
3. National Sanitation Foundation Seal of Approval required for use with potable water. Factory Mutual and Underwriter's Laboratory certification required.
4. Joints:
 - a. Push-on: ASTM D3139
5. Fittings:
 - a. All fittings for use with PVC water mains shall be Class 350 ductile iron. Ductile iron shall conform to ASTM A536-72, minimum grade 70-50-05. Nominal thicknesses of fittings shall be equal to or exceed Class 53 ductile iron pipe thicknesses. Radii of curvatures shall conform to ANSI A21.10-71 (AWWA C110-71). Fittings shall be cement lined in accordance with ANSI A21.4-74 (AWWA C104-74) and shall have mechanical joints in accordance with ANSI A21.11-72 (AWWA C111-72).
 - b. Fittings shall be coated on outside by a bituminous coating of either coal tar or asphaltic base 1 mil thick.
 - c. Fittings shall be cement mortar lined on inside in accordance with ANSI A21.10-82 (AWWA C110-82).
 - d. Compact fittings conforming to ANSI/AWWA C153/A21.53 are acceptable.
6. Rubber gaskets, Lubricants, Glands, Bolts and Nuts: ANSI A21.11
7. PVC male pipe threads will not be allowed.
8. PVC cell classification shall be 12454B.

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PART 2 - EXECUTION

2.01 EXCAVATION

- A. Excavate trenches as specified in Section 02221 - Trenching, Backfilling and Compacting.
- B. Provide at least 3'6" of cover from the top of the pipe to the finished grade elevation.

2.02 PIPE BEDDING

- A. Provide Type I pipe bedding for all PVC water mains, as specified in Section 02221 - Trenching, Backfilling and Compacting.
- B. Shape recesses for the joints or bell of the pipe by hand.
- C. Assure that the pipe is supported on the lower quadrant for the entire length of the barrel.

2.03 INSTALLATION OF WATER MAINS

- A. All pipe, valves, fittings, hydrants and buttresses shall be installed as specified in AWWA C-900, the pipe manufacturer's recommended methods, and as stated herein, unless otherwise specified by the County.
- B. All pipe, valves and fittings shall be thoroughly cleaned and shall be entirely free from grease or oil and substantially free from blacking, dirt, sand, rust, slag or fluxing materials.
- C. Mechanical joints shall be installed by experienced pipe layers to the satisfaction of the County. Prior to making up joints, the bells, pipe ends and rubber gaskets shall be thoroughly washed with clean, soapy water. The pipe shall then be inserted fully into the bell. The rubber gasket shall be forced into position with the fingers until it is flush with the face of the bell, the gland shall be slid against the face of the rubber gasket and the bolts inserted finger tight. Nuts shall be tightened with a torque wrench as specified by the manufacturer and AWWA. Bolts shall be drawn up evenly on alternate side, beginning at the keeping the gland parallel to the face of the bell at all times. In the event the use of ratchet wrenches is permitted, extreme care

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shall be taken to tighten the nuts to the specified tension without over tightening. Bell hole excavation may be required to allow proper wrench movement.

- D. Push on joints shall be made up in strict conformance with the manufacturer's recommendations and lubricants.

Pipe and fittings shall be moved to the trench, carefully lowered, and set to line and grade. Pipe shall be laid on the subgrade. No blocking will be permitted. No pipe or fitting shall be installed until sufficient trench has been completely excavated to satisfy the County that no unforeseen obstructions of any kind are likely to be encountered. Where it is necessary to raise or lower the pipes due to obstructions or other causes the County shall be notified and the change in grade shall be effected in accordance with details which will be furnished by the County.

- E. In crimping, joint deflections shall not exceed maximum deflections stated by the manufacturer for the specified joint and pipe sizes.

- F. No pipe shall be cut, nor cut pipe installed, except at the specific direction of the County. Pipe shall be cut by the Contractor when required. In cutting, the ends shall be cut at right angles to the axis and the edges filed to a smooth taper.

- G. Special care shall be exercised by the Contractor to prevent damage to any pipe. Before placing in the trench each pipe or fitting shall be carefully cleaned of any foreign substance which may have collected therein and shall be kept clean at all times thereafter.

- H. No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the County deems there to be a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

- I. All requirements regarding the minimum length of open trench and promptness of refilling shall be observed. The open ends of all pipe and fittings in the trench shall be closed to the satisfaction of the County before leaving the work for the night and for all holidays or other times of interruption to the work.

- J. Any excessive settlement of the pipe requiring repairs shall be the sole responsibility of the Contractor (within the limits of the guarantee) and he shall make and do all

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required work as may be necessary to accomplish the required repairs and return the site to proper condition and appearance.

- K. Fittings and valves shall be placed along the water mains where shown on the drawings or where designated by the County in accordance with the requirements as provided elsewhere in these specifications.
- L. All fittings shall be firmly blocked with concrete against undisturbed earth.

2.04 TEES

- A. Install pipe tees at locations indicated on the Contract Drawings concurrently with pipe laying operations.
- B. For taps into an existing pipeline, use mechanical joint ductile iron tees or approved wet tapping sleeve and valve. Saddles will not be permitted.

2.05 CAST-IN-PLACE CONCRETE CONSTRUCTION

- A. Conform to the applicable requirements of Section 03310.

2.06 CRADLES AND ENCASEMENT

- A. Provide concrete cradles and encasement for pipeline as directed by the County, and in accordance with the Concrete Cradle and Encasement Detail.

2.07 THRUST RESTRAINT

- A. Provide concrete thrust blocking or restrained joints for pressure pipeline at all valves, tees, bends, caps, plugs, and changes in direction in accordance with the Buttress Details.
- B. Pour concrete thrust blocks against undisturbed earth.
- C. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair.

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- D. Furnish and install, tie rods, clamps, set screw retainer glands, or restrained joints as indicated.
- E. Protect metal restrained joint components against corrosion by applying a bituminous coating, encasing the entire assembly with an 8-mil thick polyethylene wrap in accordance with AWWA C105, or by concrete mortar encasement of metal area.

2.08 CARRIER PIPE IN CASINGS

- A. Applicable to casing pipe installed in open cut trenches. For installation by boring, jacking, or tunneling consult with the County.
- B. Provisions regarding pipe laying specified above also apply to carrier pipe installed in casings.
- C. Excavate trench to the additional depth and width necessary to accommodate the casing pipe and to maintain the line and grade of the carrier as indicated on the Contract Drawings.
- D. Minimum inside diameter of the casing pipe shall be as shown on the Drawings.
- E. Support pipeline within casing so that no external loads are transmitted to the carrier pipe. Attach pressure treated wooden skids to barrel of carrier pipe; do not rest carrier pipe on pipe joint bells.
- F. Fill annual space between carrier pipe and casing pipe with grout. Close ends of casing.

2.09 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits given by the manufacturer.

2.10 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of the pipe laying by the County.
- B. Backfill trenches as specified in Section 02221.

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2.11 SPECIAL CONDITIONS

A. Connections:

1. Wherever an existing water main is to be cut and closed, or extended or connected to the proposed new lines, construct connections as shown on the Contract Drawings.
2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the County.

B. Highway Crossings:

1. Install water mains crossing highways as shown on Drawings.
2. Comply with Maryland Department of Transportation State Highway Administration, and municipal permits.
3. When casing pipe is indicated, install it as specified in Section 02150 - Boring, Jacking, Tunneling.

3.13 TESTING AND DISINFECTING

- A. Test and disinfect water mains as specified in Section 02753 - Testing and Disinfecting Water Mains.

END OF SECTION

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SPECIFICATION 02740 -WATER VALVES AND FIRE HYDRANTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this Specification includes, but is not limited to:

Water Main and Service Valves
Fire Hydrants
Air Release Valves

- B. Related work specified elsewhere:

Specification 02715 - Water Main
Specification 02742 - Water Service Connections

- C. Applicable Standard Details:

Fire Hydrant Setting
Blow-off Hydrant Setting
Valve Box & Cover
Division Valve Box

1.02 QUALITY ASSURANCE

- A. Reference Standards:

1. American National Standards Institute (ANSI); American Water Works Association (AWWA):
 - a. ANSI/AWWA C500 Gate Valves, 3" through 48" NPSwage Systems
 - b. ANSI/AWWA C502 Dry-Barrel Fire Hydrants
 - c. ANSI/AWWA C504 Rubber-Seated Butterfly Valves

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1.03 SUBMITTALS

- A. Certificates: Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting that valves, hydrants, and accessories provided meet or exceed ANSI/AWWA Standards and specification requirements.
- B. Product Data: Submit manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Prepare valves, hydrants and accessories for shipment according to AWWA Standards and seal valve and hydrant ends to prevent entry of foreign matter into product body.
- B. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.01 GATE VALVES

- A. Valves shall be resilient wedge type as manufactured by Mueller Company, or approved equal, and conform to the following minimum specifications:
 - 1. Valves shall conform to AWWA C509-87, Standard for Resilient Seated gate valves.
 - 2. Wedge shall be constructed of Ductile Iron, fully encapsulated in synthetic rubber except for guide and wedge areas.
 - 3. Wedge rubber shall be molded in place and bonded to the ductile pipe portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
 - 4. Wedge shall seat against seating surfaces arranged symmetrically about the centerline of the operating system, so that seating is effective regardless of direction of pressure unbalance across the wedge.

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5. All seating surfaces in body shall be inclined to the vertical at a minimum angle of 32 degrees (when stem is in a vertical position) to eliminate abrasive wear of rubber sealing surfaces.
6. Stem shall be non-rising (NRS) type. Stem shall be sealed by at least two o-rings; all stem seals shall be replaceable with valve fully open and while subjected to full rated pressure.
7. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.
8. Valve body and bonnet shall be epoxy coated, inside and out, with fusion-bonded epoxy. Coating shall conform to AWWA C550-90, Standard for Protective Interior Coatings for Valves and Hydrants.
9. Valves with greater than 5 foot of cover shall have an operating nut extension installed to a depth between 2 and 3 feet from grade. Extensions shall be manufactured, not field cut, with a set screw at the base and a centering o-ring at the top.
10. Two tee keys, of a design acceptable to the County, shall be provided.
11. Nuts, bolts, washers, tie rods, and any other connectors shall only be 304 stainless steel, or 'Tripac, Inc. 2000 Blue Coated', or approved equal, to resist corrosion.

2.02 VALVE BOXES

- A. 12" valves and smaller: domestic cast iron, two-piece, sliding type.
- B. Valves larger than 12": domestic cast iron, three-piece, sliding type; round base.
- C. Cast iron lid.
- E. Valve boxes shall be cast iron, slide-type, with 5-1/4 inch shaft and extra deep lid having the word "WATER" cast thereon. All valve boxes shall be adjustable within the limits necessary to provide for the setting depths required and shall be as manufactured by the M&H Valve and Fittings Company, Mueller Company, or

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approved equal. Valve boxes with more than three sections shall have an exterior PVC sleeve around the full length of the box to maintain alignment.

- F. Valve boxes shall have a concrete collar poured around the valve box top at finish grade. The collar is to have a minimum of 18" diameter (i.e. a 6 inch annular collar), 6 inches thick, with two stands of 10-gauge wire reinforcing, and be tightly bonded to the cast iron box.
- G. Valve box bottoms shall be fitted with Valve Box Adaptor II rubber centering ring as manufactured by Adaptor, Inc., or approved equal.

2.03 FIRE HYDRANTS

- A. Fire hydrants shall be WB 67 as manufactured by Waterous Company, or approved equal, and conform to the following minimum specifications:
 - 1. Hydrant shall be manufacturer's latest and best design, conforming to latest issue of AWWA Specification C-502, "Standard for Fire Hydrants".
 - a. Hydrant nozzles shall have National Standard Threads (NST) and shall open left.
 - b. Hydrant shall have a single 4 ½ inch pumper nozzle and two 2 ½ inch hose nozzles.
 - 2. Hydrant main valve shall close with the water pressure, and all operating parts, including valve seat, shall remove through barrel, without digging.
 - 3. Drain valve shall be all brass or bronze, and shall be positively operated by main operating rod.
 - 4. Hydrant operating threads shall be oil lubricated, and shall be o-ring sealed from water, moisture, and foreign matter.
 - 5. Hydrant shall be simple and economical to install and maintain and shall incorporate no parts requiring field adjustment.
 - 6. Hydrant barrel shall be centrifugally cast ductile iron.

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7. Hydrant shall be of traffic flange design allowing for quick economical repair of damage resulting from vehicle impact.
8. Design shall permit ease of installation of top extension without shutting off water to hydrant.
9. Hydrant shall have a positive stop for main operating rod travel incorporated into top section.
10. To facilitate painting, and maintenance, exterior surfaces shall be smooth and free of "fluting".
11. Lower threads on operating rod shall be protected by a cap-nut.
12. Design shall permit 360 degree rotation of nozzle.
13. To facilitate installation, hydrant shoe shall have a flat bottom, ribbed back, and strapping lugs shall be provided.
14. Friction loss through hydrant shall not exceed allowable losses per AWWA Specification C-502, and test data shall be included upon request.
15. All hydrant barrels are to be chrome yellow. The nozzle caps should be painted with the following flow capacity-indicating color scheme, of reflective-type paint:

| | |
|---------------|---------------------|
| 1500+ GPM | Class AA-Light blue |
| 1000-1499 GPM | Class A- Green |
| 500- 999 GPM | Class B- Orange |
| <500 GPM | Class C- Red |
16. Nuts, bolts, washers, tie rods, and any other connectors shall only be 304 stainless steel, or 'Tripac, Inc. 2000 Blue Coated', or approved equal, to resist corrosion.
17. Each hydrant installed shall be accompanied by a 4 foot long reflectorized marker of galvanized spring steel.

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2.04 BLOWOFF HYDRANTS

- A. Blowoff hydrants shall be Eclipse No. 2 as manufactured by The Kupferle Foundry Company, or equal, and conform to the same minimum specifications as Fire Hydrants.

2.05 AIR RELEASE VALVES

- A. Cast iron body and cover; stainless steel float, orifice seat, linkage mechanism, mountings and trim. Buna-N orifice valve designed for maximum venting capacity under normal main pressure.
- B. Float operated to automatically release air from system while system is operating.
- C. Body and Cover: Cast iron, ASTM A48, Class 35.
- D. Seat: Viton, renewable.
- E. Internal parts and float: Stainless steel capable of withstanding a 750 psig test pressure
- F. Valve shall be designed for 300 psig test pressure and 150 psig operating pressure.

PART 3 - EXECUTION

3.01 GENERAL

- A. Determine the exact location and size of valves and hydrants from the Contract Drawings; the Standard Details represent typical details only; obtain all necessary clarification and directions from the County prior to the execution of work.
- B. Perform trench excavation, backfilling and compaction in accordance with Specification 02221 - Trenching.
- C. Install pipe and tubing in accordance with Specifications 02715 – Water Mains and 02742 – Water Service Connections and the applicable Standard Details.

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3.02 GATE VALVES AND VALVE BOXES

- A. Install valves in conjunction with pipe laying; set valves plumb.
- B. Provide buried valves with valve boxes installed flush with finished grade.
- C. Fittings and valves shall be placed along the water mains where shown on the drawings or where designated by the County in accordance with the requirements as provided elsewhere in these specifications.
- D. Where valves are placed on the end of a pipe line, the valve and plug shall be secured to the pipe with approved restraining devices with stainless steel hardware. Additionally all joints for 20 foot back shall also be restrained with approved restraining device with stainless steel hardware.
- E. A valve box shall be provided for every valve and shall be carefully placed and set at a right angle to the water main.
- F. The valve box shall not transmit shock or stress to the valve or main and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or set to the elevation shown on the approved plans.
- G. Valve boxes shall have a concrete collar poured around the valve box top at finish grade. The collar is to have a minimum of 18" diameter (i.e. a 6 inch annular collar), 6 inches thick, with two stands of 10-gauge wire reinforcing, and be tightly bonded to the cast iron box.
- H. In tamping the backfill around the valve, special care shall be taken to keep the box in place and to have it firmly supported so as to avoid settlement. Any box which is found out of place or which is not firmly supported shall be dug up and reset in a satisfactory manner at the Contractor's expense.
- I. Valve box bottoms shall be fitted with Valve Box Adaptor II rubber centering ring, as manufactured by Adaptor, Inc., or approved equal.

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3.03 FIRE HYDRANTS

- A. Install fire hydrants as shown on the Fire Hydrant Setting Detail shown on the Drawings; provide support blocking and drainage gravel as shown; do not block drain hole.
- B. Set hydrants plumb, nozzle facing the roadway unless directed by the County otherwise; set hydrants with centerline of pumper nozzle at least 18" above finished grade and the safety flange not more than 6" nor less than 2" above grade.
- C. After hydrostatic testing, flush hydrants and check for proper drainage.
- D. All hydrants and valves shall be mechanically secured to the pipe and the water main with restrained fittings.

3.04 BLOWOFF HYDRANTS

- A. Install a blowoff hydrant on the dead ends of all water mains of less than 6 inches and/or where shown on the Drawings and in accordance with the Hydrant Setting Detail.
- B. Set hydrants plumb, nozzle facing the roadway; set hydrants with centerline of 2 inch nozzle at least 18 inches above finished grade and the safety flange not more than 6 inches nor less than 2 inches above grade.
- C. After hydrostatic testing, flush hydrants and check for proper drainage.

3.05 AIR RELEASE VALVES

- A. Install air release valves in a valve vault at the high points of water mains where shown on the Contract Drawings and in accordance with the Water Air Release Detail given on the Contract Drawings.
- B. Air release valves shall be installed with approved stainless steel full circle saddles and set plumb.
- C. Isolation valves shall be provided between the air release valve and the water main as per detail.

END OF SPECIFICATION

SPECIFICATION 02742 - WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this Specification includes, but is not limited to:

Tapping water mains by installation of corporation stops or other suitable fittings or couplings.

Installation of service pipe and fittings and curb stops and/or meter pits.

- B. Related work specified elsewhere:

Specification 02221 - Trenching, Backfilling & Compacting

Specification 02715 - Water Mains

Specification 02740 - Water Valves and Fire Hydrants

Specification 02753 - Testing and Disinfecting Water Mains

- C. Applicable Standard Details

Water Service Tracer Wire

Radio Read Residential Water Service

1 ½ inch Water Service

1 ½ & 2 inch Water Service

Dual Residential Water Service

1 inch Residential Water Service

Meter Vault 4, 6, 8 inch

1.02 QUALITY ASSURANCE

- A. Referenced Standards:

1. American National Standards Institute (ANSI):

- a. B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800

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- b. B16.3 Malleable-Iron Screwed Fittings, 150 and 300 lb.
2. American Society for Testing and Materials (ASTM):
- a. A120 Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
 - b. A307 Carbon Steel Externally Threaded Standard Fastener
 - c. A536 Ductile Iron Castings
 - d. B43 Specification for Seamless Red Brass Pipe, Standard Sizes
 - e. B62 Specification for composition Bronze or Ounce Metal Castings
 - f. B88 Specification for Seamless Copper Water Tube
 - g. D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
 - h. D2737 Specification for Polyethylene (PE) Plastic Tubing
3. American National Standards Institute (ANSI)/American Water Works Association (AWWA):
- a. ANSI/AWWA C500 Gate Valves, 3 through 48 inch NPS, for Water and Sewage Systems
 - b. ANSI/AWWA C800 Underground Service Line Valves and Fittings

1.03 SUBMITTALS

- A. **Manufacturer's Literature:** Submit manufacturer's literature for each size and type of Corporation Stop, Water Meter Pit Assembly, and pipe, fitting or coupling.
- B. **Shop Drawings and Samples:** Submit shop drawings, and samples as directed, of all products to be assembled by the Contractor at site for prior approval of the County.
- C. **Certificates:** Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting that products and materials provided meet or exceeds specification requirements.
- D. **Job Mockup:** Prepare one sample complete service connection of each type at a location designated by the County.

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1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Product Delivery: During loading, transporting and unloading of all materials and products, exercise care to prevent any damage.
- B. Storage: Store all products and materials off the ground and under protective coverings and custody, away from walls and in a manner to keep these clean and in good condition until used.

1.05 JOB CONDITIONS

- A. The Contractor will provide and install the water meter pit assemblies with meters as per plans.

PART 2 - PRODUCTS

2.01 PIPE OR TUBING AND FITTINGS

- A. Polyethylene (PE) Plastic Tubing:
 - 1. Tubing: ASTM D2239, SDR 7 minimum, 160 psi pressure rating.
 - 2. National Sanitation Foundation Seal of Approval for use with potable water required.
 - 3. Fittings:
 - a. Suitable for use with pipe or tubing supplied.
 - b. Manufactured from ASTM D3350 materials.
 - c. Stainless steel inserts required at all couplings.

2.02 CORPORATION STOP ASSEMBLY

- A. Corporation Stops:
 - 1. Brass or Red Brass alloy body conforming to ASTM B62.
 - 2. Inlet end threaded for tapping according to ANSI/AWWA C800.
 - 3. Outlet end suitable for service pipe specified.
 - 4. Mueller H-15009 or equal

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B. Service Saddles:

1. Shall be full circle, all stainless steel band and body, with rubber o-ring seal with one full width or two tightening bolts designed to be secured to PVC pipe and to hold pressure in excess of the working pressure. Must meet applicable parts of ANSI/AWWA C800 such as Ford FS-303, Powerseal or equal.
2. All saddles shall be rated for 200 psi working pressure and outlets shall be tapped with AWWA taper (C.C.) Threads.

2.03 WATER METER PIT ASSEMBLY

A. Meter Pit:

1. Plastic Construction
2. Angle ball inlet valve
3. Dual check outlet valve
4. Ford Model PSBHH288-20-36 or equal.

B. Frame and Cover:

1. Cover labeled "Water Meter".
2. Ford Model A53-T, or equal (non-traffic bearing), with 15 inch clear opening.
3. Ford Model A53-HT, or equal (traffic bearing).
4. All covers to have a 1 ¾ inch diameter hole to accommodate a meter 'touch read' component.

C. Inlet Connector:

1. Packed coupling
2. Ford model C-16-33 1 x 1

D. Water meters are to be purchased from Sanitary District directly.

2.04 BACKFLOW PREVENTERS

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PART 3 - EXECUTION

3.01 PREPARATION

- A. Establish location of meter pit assembly's boxes for each service connection.
- B. Excavate trench to the line and grade shown on the Contract Drawings and as specified; jack or bore service lines underneath paved highways where approved by the County.
- C. Prepare sample service mock-up for the inspection and approval of the County.

3.02 CONNECTIONS

- A. General: Provide pipe joints and coupling materials suitable in size, design and material of pipe and service fittings with which it is used in accordance with the standard detail.
- B. Screwed Joints: No screwed joints are to be utilized in underground applications. If used, use sharp cut threads of standard gauge and length; after threading, ream all pipe ends to the size of bore and clean out all chips; sufficient quantity of select pipe dope of graphite and oil shall be used for lubrication of assembly.

3.03 TAPPING WATER MAINS

- A. Each connection for different kind of water mains shall be tapped using suitable materials, equipment and methods approved by the County.
- B. Provide service clamps for all mains other than those of cast or ductile iron.
- C. Screw Corporation Stops directly into a tapped and threaded iron main at 10 and 2 o'clock positions on the main's circumference; locate corporation stops at least 12" apart longitudinally and staggered.
- D. In case of plastic pipe water mains, provide full support for the service clamp all around the circumference of the pipe, with minimum 2" width of bearing area;

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exercise care against crushing or any other damage to the water mains at the time of tapping or installing the service clamp or Corporation Stop. Service saddles shall be installed in accordance with the manufacturer's recommendation including the proper torque requirements using a properly functioning torque wrench.

- E. Use proper seals or other devices to ensure that no leaks are left in the water mains at the points of tapping; do not backfill and cover the service connection until approved by the County.

3.04 SERVICE LINE AND FITTINGS

- A. Use bends to connect the service pipe or tubing to the tapping fitting or corporation stops to provide flexibility to counteract the effects of settlement or expansion/contraction in the line.
- B. Lay each section of the service line in a manner to form a tight joint with the adjoining section; avoid offsets, kinks or awkward bends to ensure a smooth flow line.
- C. Clean and inspect each pipe and part of the fitting before installing and assemble to provide a flexible joint; use joints or lubricants recommended by the manufacturers and as specified by the County.
- D. Install service fittings and appurtenances on suitable brick or concrete supports as shown on the Drawings and Standard Details; do not use earth, rocks, wood or other organic materials as supports.
- E. Prevent displacement of pipes and fittings at the time of placing concrete for thrust blocks or for any structures and until initial setting of concrete is assured.
- F. Operate each corporation stop before and after installation.
- G. When the work is not in progress and at the end of each work day, securely plug the ends of pipe and fittings to prevent any dirt or foreign substances from entering the lines.
- H. Provide concrete thrust blocking or restrained joints at all bends, tees and changes in direction.

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- I. Provide all pipes passing through concrete or masonry construction with wall sleeves of the type and size indicated.
- J. Test and disinfect mains and service lines as specified in Specification 02753.

3.05 RESIDENTIAL AND SMALL COMMERCIAL WATER METER SETTINGS

- A. Residential and small commercial meters are defined as meters less than two inches typically serving single family residences and small businesses.
- B. Meter pit assembly shall be installed at a point near the property line. The exact location of the setting shall be designated by the County.
- C. In paved areas such as parking lots where there is not a lawn space to install the meter pit, use a traffic bearing meter vault and meter vault lid cover per detail. Any meter pits within 3 foot of driveways or other traffic areas must be of the traffic bearing design. Traffic bearing meter pits are to be discouraged and will only be accepted in there is no other option.
- D. Water meters installed in crawl-spaces are to be within 10 feet of the crawl-space entrance and equipped with a remote readout.
- E. Yard meters which are to be used solely for irrigation will be installed after the house meter and meet all requirements of the house meter.
- F. Valves are required on both the inlet and outlet side of the water meter yoke per Maryland Plumbing Law 09.20.11.H
- G. The remote readout is to be located next to the main utility location. (Electrical meter, telephone box, etc.). Water meter, check valve, yokes, couplings and remote readout (touch-pads) are supplied by the Sanitary District.
- H. While to be discouraged, when any meter must be installed inside a building or crawl space, the remote readout wire shall be installed in a raceway. This is to facilitate the replacement of the wire should it become defective.
- I. When a meter must be installed within a building, all water meter yoke couplings and backflow preventers provided for in home installation will work only with ASTM

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B88 type "k" copper tubing or ASTM D-2737 PE 2306, 3306, CTS O.D. PE Plastic tubing.

- J. A water meter fee will be assigned to the property owner and must be paid for when submitting an application. (Price subject to change).
- K. Water meter pits have compression couplings for SDR7 IPS pipe provided for connection by the homeowner's plumber. Stainless steel inserts are required for all plastic tubing connections.
- L. All water service laterals installed on private property shall be a minimum 160 PSI plastic such as PVC or Polyethylene. No galvanized pipe shall be permitted and copper tubing is not recommended due to lead and copper regulations.
- M. Water lines must be flushed before installing meter.
- N. When making water service connections, galvanized nipples will not be allowed because of dissimilar metal corrosion. Brass compression couplings and adapters such as the McDonald #4754-33-33 shall be used with stainless steel inserts.
- O. Wells to be abandoned require that a licensed well driller perform the work in accordance with State Environmental Health Department.
- P. Wells left in service require a complete separation from domestic household service. (Queen Anne's County Health Department, or their designated inspector to inspect).
- Q. A minimum of 24 hour notice will be required before starting work.
- R. All water and sewer laterals on private property shall maintain a minimum of one foot separation per Maryland Plumbing Law. The sewer lateral shall be below the water lateral.
- S. Minimum cover requirement for water service pipe is 36" unless otherwise specified.
- T. Contractor will provide for all water laterals, a detailed as built drawing showing location of piping with dimensions to all fittings. Drawing must indicate either North, South, East or West.
- U. Curb stop boxes must be set to grade and aligned over the valve for operation.

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3.06 LARGE WATER METERS

- A. Large meters shall be the same diameters as the water service lateral unless otherwise approved.
- B. Large meter pits and vaults shall be installed in accordance with the appropriate detail.
- C. Large meters shall be provided as specified and approved by the Sanitary District.

END OF SPECIFICATION

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SPECIFICATION 02753 - TESTING & DISINFECTING WATER MAINS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this Specification includes, but is not limited to:

1. Testing water pipeline:
 - a. Hydrostatic pressure testing
 - b. Leakage testing
2. Disinfection of Water Lines:

B. Related work specified elsewhere

Specification 02715 - Water Mains
Specification 02740 - Water Valves and Fire Hydrants
Specification 02742 - Water Service Connections

C. Applicable Standard Details

General Notes Water

1.02 QUALITY ASSURANCE

A. Testing Agency: Bacteriological testing shall be performed by a testing laboratory approved by the State Health Department, engaged and paid for by the Contractor and approved by the County.

B. Referenced Standards:

1. American National Standards Institute (ANSI); American Water Works Association (AWWA):
 - a. ANSI/AWWA B300 Standard for Hypochlorite
 - b. ANSI/AWWA B301 Standard for Liquid Chlorine

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- c. ANSI/AWWA C600 Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, Section 4, Hydrostatic Testing
 - d. AWWA C651 Standard for Disinfecting Water Mains
- C. Test Acceptance:
- 1. No test will be accepted until the results are below the specified maximum limits.
 - 2. The Contractor shall, at his own expense, determine and correct the sources of leakage and retest until successful test results are achieved.

1.03 SUBMITTALS

- A. Test Procedures: Submit a testing sequence schedule including a list of testing equipment to be used.
- B. Certificates:
 - 1. Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting that the chlorine form composition provided meets specification requirements.
 - 2. Submit, prior to starting testing, certification attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified in Part 2, Products.
- C. Test Reports: Submit two copies of the testing laboratory certified test reports of each bacteriological test.

1.04 GENERAL REQUIREMENTS

- A. If the Contractor intends on utilizing water from the Queen Anne's County Sanitary District to meet these specifications, he shall request permission from the County within 7 days in advance of each activity and submit to the County a log of water usage by date and gallons on a minimum monthly basis.
- B. Appropriate backflow prevention must be utilized in this event.

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PART 2 - PRODUCTS

2.01 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump
- B. Pressure hose
- C. Test connections
- D. Water meter
- E. Pressure gauge, calibrated to 0.1 lbs./sq.in.
- F. Pressure relief valve

2.02 DISINFECTING CHEMICALS

- A. Liquid chlorine, calcium hypochlorite, or sodium hypochlorite conforming to ANSI/AWWA Standards B300 and B301. Tablets are not permitted, granules are acceptable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Backfill trenches in accordance with Specification 02221 - Trenching.
- B. Provide the water line under test with reaction thrust blocking; hydrostatic testing shall not begin until the concrete thrust blocking has set; allow 2000 psi 28-day strength concrete to set (cure) for a minimum of 7 days prior to testing; if High Early Strength 3,000 psi 3-day strength concrete is used, hydrostatic testing may not begin until the concrete has set a minimum of 2 days.
- C. Provide pumps, piping, tanks, connections, and appurtenances. Contractor will provide the necessary water for testing.

3.02 TESTING WATER LINES

- A. Water mains shall be pressure and leakage tested in accordance with AWWA C-600, AWWA C-900, Uni-Bell Plastic Pipe Association AND as specified herein.
- B. Any defective work which shows up while conducting tests or before conditional acceptance, shall be replaced or repaired by the Contractor at his own cost and

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expense. Any leaks occurring after conditional acceptance but before final acceptance due to either blown joints or cracked pipe or fittings, shall be repaired by the Contractor.

- C. All water used in testing shall be potable from an approved source. The Contractor shall be responsible to supply all potable water required for testing.
- D. Pressure testing shall be conducted on sections not greater than 10,000 linear feet of water main between valves. After properly filling the line and expelling any air, a pressure test shall be conducted. A test pressure of 150 psi shall be maintained for 15 minutes with no loss. Adequate measuring devices, including a 4 inch face pressure gauge in increments of 1 psi, shall be utilized by the Contractor. One pressure test shall be performed on every 10,000 linear feet of water main installed.
- E. A leakage test on the entire water system, including service connections shall be performed upon successful completion of the pressure test. Normal operating pressure of at least 70 psi shall be maintained throughout the test period of 24 hours. The amount of additional water pumped in during the test provides a measurement of the amount of leakage, if any. The allowable leakage may not exceed 10 gallons per inch of pipe diameter per mile of pipe. Service connection pipe will not be considered when determining the allowable leakage.
- F. If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
- G. When charging and testing mains which are not close enough to connect directly by pipe or hose lines to existing mains, tank wagons shall be used to haul water and serve as suction wells.

3.03 DISINFECTION OF WATER LINES

- A. Disinfection procedures shall be completed in accordance with AWWA C-601, Maryland Department of the Environment regulations, and as specified herein.
- B. Prior to disinfection, all new and exposed portions of existing systems shall be flushed clean to the satisfaction of the County at a velocity of 2-1/2 feet per second.
- C. The entire water system, including service connections shall be disinfected with a chlorine concentration of 50 parts per million of free chlorine which delivers a 24

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hour residual reading of 25 parts per million of free chlorine. The County shall be present to inspect the method of disinfection used and confirm test results.

- D. All labor, tools, materials, equipment, gauges and meters, necessary for making the tests and chlorinating these mains shall be furnished by the Contractor.
- E. Water used for disinfection shall be properly disposed by the Contractor in accordance with a method approved by the County and State Department of the Environment. If the water is heavily chlorinated it shall be neutralized prior to disposal.
- F. Unless otherwise specified herein, water remaining in the water lines shall be de-chlorinated to levels less than or equal to 1.5 ppm. In no case will the Contractor be required to flush the water lines to chlorination levels less than that found in the existing potable source.

3.04 TRACER WIRE LOOP CONTINUITY TEST

- A. Tracer wire shall be tested once installed to test its continuity. Any gaps in continuity discovered are to be repaired by Contractor

END OF SPECIFICATION

SPECIFICATION 02800 - DIRECTIONAL DRILLING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Directional drilling shall include all work necessary and required for the installation of the pipe as shown on the drawings and as specified herein. Service furnished by the Contractor shall be performed in accordance with the best industry practice and these Contract Documents. The Contractor shall furnish all labor, equipment, and consumables necessary to successfully install the pipe by the horizontally drilled, directionally controlled method of installing pipe where called for on the drawings.
- B. The directional drilling method shall be mechanical with fluid assistance.
- C. All directionally drilled pipe is to be installed only by an experienced crew having the experience of installation on at least five similar projects involving directionally drilled pipelines.

1.02 INSPECTION

- A. The Contractor will at all times provide and maintain instrumentation which will accurately locate the pilot hole and measure drilling fluid flow discharge rate and pressure. The County will have access to these instruments and readings at all times.

1.03 SUBMITTALS

- A. Certification of Experience: Each bidder shall submit a comprehensive list of experience presenting similar experience on at least five projects involving horizontally directionally drilled utilities. Information to be submitted shall include, but not be limited to, date and duration of work, location, pipe/cable duct information (i.e. length, diameter, material, etc.); utility Owner information (i.e. Name, address, telephone number, contact person); and pipeline/cable duct use.
- B. Shop Drawings shall be submitted for the following materials and procedures:
 - a. Details of equipment and detailed working drawings describing the proposed method of directional drilling. This shall include the arrangement of the equipment, location and size of drilling and receiving pits, methods of dewatering, method of removing

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spoils material, size and capacity of equipment, method of installing pipe, method of fusing pipe segments, type of cutting head, method of installing detection wire, pipe and seals, support segments, method of monitoring and controlling line and grade. Sufficient material shall be submitted to show compliance with the Contract Documents and to show that articles proposed for use are acceptable. Directional drilling work shall not proceed until shop drawings have been reviewed and approved by County. If in the opinion of the County, modifications to the methods are required during construction, the County may direct the Contractor to discontinue any directional drilling activities until working drawings are submitted and approved delineating such modifications.

- b. All drawings, catalog cuts and other descriptive data covering several related item in the same system shall be submitted at the same time in order that their complete integrated applicability in the entire system be adequately reviewed.
- c. Bentonite/drilling mud, or other drilling fluid: product information, material specifications, handling procedures, material safety data sheet, special precautions required, and the method of mixing and application.
- d. Contractor shall submit the disposal site for drill spoils including all agreements and permits as necessary to demonstrate to the County that the materials are being properly disposed of. This information is for record purposes and will not be approved by the County. The contractor shall be solely responsible for the proper disposal of all drill spoils in accordance with all Federal, State and local laws.

PART 2 PRODUCTS

2.01 POLYETHYLENE PLASTIC PIPE

- A. Polyethylene plastic pipe to be used for the pipe on this project shall be as specified in Specification 02615, High Density Polyethylene (HDPE) Pipe System.

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall take precautions to protect the pipe while being handled. Chains, end hooks, or cable slings shall not be used to handle the pipe. Care shall be taken to protect the pipe from scarring, gouging, or excessive vibration.
- B. The directional drilling procedure shall include provisions to guard against electrocution such as grounded mats, ground cables, hot boots and gloves. In addition, the drilling equipment shall include an alarm system capable of detecting electrical current as it nears electric lines. Electrical utilities are shown on the drawings for the Contractor's information only, and their exact location is not guaranteed.

3.02 EXISTING UTILITIES

- A. Any utilities known to exist within the project limits are shown on the drawings. The Contractor must exercise caution, including, but not limited to, undertaking the following steps:
 - 1. Verify the horizontal location of all underground utilities in the immediate area by a Miss Utility locate. Accurately locate vertically all utilities crossing the pipeline alignment, or influenced by the installation, by test pitting.
 - 2. Modify drilling practices or down hole assemblies to prevent damage to adjacent underground utilities.

3.03 DRILLING FLUID

- A. The composition of all drilling fluid used shall be submitted prior to utilization. The fluids shall be inert and of no risk to the environment. No fluid shall be used that does not comply with permit requirements and environmental regulations.
- B. The drilling fluid should remain in the bore hole to increase the stability of the surrounding soil and to reduce the drag on the pulled pipe.
- C. Disposal of drilling fluid and all other spoils shall be the responsibility of the Contractor and shall be conducted in compliance with all relative environmental regulations, right of way, and work space agreements and permit requirements.

- D. Drilling fluid returns at locations other than the entry and exit points shall be minimized. The Contractor shall immediately clean up any drilling fluid that inadvertently surfaces. Contractor shall have a vacuum truck available on a daily basis to clean up any areas where drilling fluid has surfaced.
- E. Excess drilling fluid shall be disposed of at an appropriate disposal site in accordance with all Federal, State and Local regulations. The Contractor is responsible for transporting all excess fluids and other spoils to the disposal site and paying all disposal costs.
- F. Drilling fluid shall not be discharged into the sanitary or storm drain system, ditch, or waterway.

3.04 DRILLING WATER AND RESTORATION

- A. Clean water required for drilling shall be provided by the Contractor. The Contractor is responsible for transporting and storing all water required.
- B. After the installation of the pipeline is completed, the drilling area, receiving area, and other areas where the drilling fluid has surfaced, shall be completely restored to the condition the existing prior to construction.

3.05 ALIGNMENT ADJUSTMENTS AND RESTARTS

- A. The Contractor shall follow the pipe alignment as shown on the Plans within the tolerances specified herein. The Contractor shall notify the County for approval if any adjustments need be made to the proposed alignment prior to performing the adjustment.
- B. In the event difficulties are encountered at any time during the directional drilling requiring the complete withdrawal from the drilled hole, the Contractor shall be allowed to withdraw from and abandon the drilled hole, and begin a second installation attempt within the limits identified by the County.

3.06 DETECTION WIRE

- A. A detection wire shall be pulled along with the pipeline.
- B. The detection wire shall be ¼ inch, 7 x19 Galvanized Aircraft Cable having a breaking strength of 7000 pounds, as manufactured by Weisner, or approved equal.

- C. The detection wire shall be segmented to terminate at each end of pipe entering a cleanout assembly. Five feet of wire shall be coiled at each cleanout assembly. Wire stretches are not to exceed 900 feet without an access point to be able to reach and attach to the wire

3.07 DIRECTIONAL DRILLING

- A. The pilot hole shall be drilled along the path shown on the drawings to the following tolerances:
 - 1. Vertical Alignment – Plus or minus 0.2 foot.
 - 2. Horizontal Alignment - Plus or minus 0.5 foot.
- B. The drilling system shall include electronic monitoring of the drilling head horizontal and vertical location with an accuracy range within one inch of the actual position of the pipeline. Position readings shall be recorded at a maximum of 10-foot intervals.
- C. A swivel shall be used to connect the pull section to the reaming assembly to minimize torsional stress imposed on the pipe section.
- D. The pull section shall be supported as it proceeds during pull back so it moves freely.
- E. The equipment must be capable of boring the following lengths in single bores. Boring pits will not be permitted to be any closer than the following distance:

| <u>Pipe Size</u> | <u>Boring Distances</u> |
|----------------------|-------------------------|
| 3 inches to 4 inches | 500 feet |
| 6 inches to 8 inches | 200 feet |

The maximum length of each pull shall be as recommended by the pipe manufacturer for this application. Pulls beyond this length shall not be acceptable due to the possibility of damaging the structural integrity of the pipe.

- F. At the County's option, the Contractor shall test pit his pipe installation to verify horizontal and vertical location. Cost for this test pitting shall be included in the price bid per linear foot of pipeline. Test pits shall be backfilled in accordance with the typical trench detail shown on the drawings.

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- G. Contractor shall maintain a drill log to show actual in-place depths at intervals of 50-feet which are to be turned over to the County at the end of the job.

END OF SPECIFICATION

SPECIFICATIONS

DIVISION 3 - CONCRETE

03310 Concrete (Utility)

SPECIFICATION 03310 - CONCRETE (UTILITY)

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this Specification includes, but is not limited to:

Cast-in-place Cement Concrete Construction
Reaction and Support Blocking
Cradles and Encasement

B. Related Work Specified Elsewhere:

Specification 02221 - Trenching, Backfilling & Compacting
Specification 02575 - Paving Repair and Resurfacing
Specification 02610 - Sanitary Sewer Pipe
Specification 02715 - Water Mains
Specification 02740 - Valves and Fire Hydrants

C. Applicable Standard Details

Concrete Cradle and Encasement Details
Concrete Collar for Valves
Thrust Blocking for Vertical Bends
Thrust Block for Bends, Tees, Caps

1.02 QUALITY ASSURANCE

A. Reference Standards:

Maryland Department of Transportation, State Highway Administration (SHA)
Standard Specification for Construction & Materials, 1982 as Amended
American Society for Testing and Materials (ASTM):

C31 Making and Curing Concrete Test Specimens in the Field
C39 Test for Compressive Strength of Cylindrical Concrete Specimens
C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C172 Sampling Fresh Concrete

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1.03 SUBMITTALS

A. Certificates:

1. Submit a Statement of Compliance from the concrete producer, together with supporting data, attesting that the cement concrete conforms to the State Specifications for the class of concrete being used.
2. Submit certified results of compressive strength tests performed by an independent testing laboratory.

B. Shop Drawings:

1. Submit detailed shop drawings of reinforcing steel.

PART 2 - PRODUCTS

2.01 CEMENT CONCRETE

A. Ready - mixed, conforming to Section 918, State Highway Administration Specifications.

1. Requirements for State approved batch plants, design computations and plant inspection shall not apply. The acceptability of concrete will be based on conformance with the Cement Concrete Criteria specified below and the results of the specified tests.

B. Cement Concrete Criteria:

1. Mix No. 2 :

28 - day compressive strength: 3000 psi
Slump: 2 to 5 inches

2. Mix No. 6 (High Early Strength) :

28 - day compressive strength: 4500 psi
Slump: 2 to 5 inches

3. Minimum cement content and maximum water - cement ratio conforming to Table

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918.06, State Highway Administration Specifications.

2.02 REINFORCEMENT STEEL

A. Reinforcement Bars:

1. Conforming to Section 911.01, State Highway Administration Specifications. Deformed, Grade 40.

B. Steel Wire Fabric:

1. Conforming to Section 911.06, State Highway Administration Specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with Section 608, State Highway Administration Specifications for construction requirements including formwork, curing, protection and finishing of cement concrete.
- B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasement, manhole bases, inlets and vaults.
- C. Support pipe, valves and fittings at the required elevation with brick or concrete block. Do not use earth, rock, wood, or organic material as supports.

3.02 CONSTRUCTION

- A. Construct cast-in-place vaults, inlets, endwalls, curbs, sidewalks and miscellaneous reinforced structures of Mix No. 2 concrete. Mix no. 2 concrete shall be central-plant mixed.
- B. Construct manhole bases, reaction and support blocking, cradles encasements and miscellaneous mass concrete of Mix No. 2 concrete. Mix No. 2 concrete may be from a mobile cement concrete plant or truck - mixed.
- C. Construct reinforced and plain cement concrete roadway pavements and base courses of High Early Strength concrete. High Early Strength Concrete shall be central - plant - mixed.

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- D. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.
- E. Place concrete utilizing all possible care to prevent displacement of pipe or fittings. Return displaced pipe or fittings to line and grade immediately.
- F. Insure tie rods, nuts, bolts and flanges are free and clear of concrete.
- G. Do not backfill structures until concrete has achieved its initial set, forms are removed, and concrete work is inspected by the County.
- H. Perform backfilling and compaction as specified in Specification 02221.
- I. Concrete buttresses shall be placed on all main horizontal bends, wyes, or other changes in direction.
- J. Any encasement called for on the Contract Drawings shall be encased by a minimum of six inches of concrete around the perimeter of the pipe.

3.03 FIELD TESTS OF CONCRETE DURING CONSTRUCTION

- A. Perform compressive strength tests, slump tests, and air content tests for each 50 cubic yards of each class of concrete placed, or fraction thereof.
 - 1. Keep a slump cone and an air meter in close proximity to all concrete placements.
 - 2. Sample concrete in accordance with ASTM C172.
 - 3. Determine air content in accordance with ASTM C231 or ASTM C173 as applicable.
- B. Cast at least 5 cylindrical test specimens for each batch. Test two cylinders at 7 days; test two cylinders at 28 days. Hold the remaining cylinder in reserve for testing in the event that any of the other cylinders are damaged prior to testing.
 - 1. Prepare and cure test cylinders in accordance with ASTM C31. Determine concrete compressive strength in accordance with ASTM C39. Compute and evaluate in accordance with ASTM C94.
- C. If test cylinders fail to meet compressive strength requirements, the County may require additional core tests in accordance with ASTM C42.

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- D. All field and laboratory testing referenced shall be performed by an independent concrete testing laboratory engaged by the County. The Contractor shall assist the County, or the County's agent, when appropriate. If the results of any test indicates a non-compliance with the requirements of the specifications, the Contractor shall correct the condition. The Contractor shall be responsible to show compliance with the requirements of the specifications and contract drawings.

END OF SPECIFICATION