

STANDARD
UTILITY SPECIFICATIONS AND DETAILS
FOR WATER, SEWER, AND STORM DRAIN

BOARD OF PUBLIC WORKS
CITY OF LEWES
P.O. BOX 518
LEWES, DELAWARE

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**Standard Utility Specification and Details
City of Lewes Board of Public Works, Delaware**

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PURPOSE

The purpose of this standard is to define the materials, equipment, machinery and other components to be used in the construction, renovation, repair or replacement of water systems, sanitary sewer systems, sewage pumping stations and storm drainage systems.

Where a specific reference to a manufacturer and/or model, type or style is made, it is the intention to standardize and maintain uniformity throughout the City of Lewes. Where such reference exists, no substitutes or alternates will be considered unless otherwise noted.

The materials acceptable for use in the City of Lewes, by the Lewes Board of Public Works, subject to approval of the City Engineer and the Board of Public Works are as follows.

A. General

1. **Laying Pipe in Freezing Weather:** No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the City Engineer shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation, unless all required precautions as to the minimum length of open trench and promptness of refilling are observed.
2. **Artificial foundation:** Whenever directed, the Contractor shall lay pipe upon an artificial foundation which he shall construct. Such foundation may consist of gravel or concrete; all to be of the form and dimensions and placed in the manner required by the City Engineer. All artificial foundations shall be of a character equal to that as hereinbefore specified.
3. **Minimum separation:** A minimum separation between water and sewer lines of 10'-0" shall be maintained. A minimum vertical separation of 18 inches between water mains and sewer lines shall be maintained. If minimum vertical separation cannot be achieved in the field, the sewer line shall be encased in concrete in accordance with the City of Lewes Board of Public Works Standard Detail for Concrete Encasement, for a length as directed by the City Engineer. Water services shall be installed in a PVC, SDR 80 casing where indicated on the plans. Where water mains and sewer lines cross, sewer pipe joints shall be equidistant from the intersection and as far from water main joints as possible.
4. **Testing:** The Contractor shall furnish all labor, tools, materials, water, and equipment, including mirrors, flashlights, or other artificial lighting, weirs, pump, compressors, stopwatch, gauges, and meters, subject to the approval of the Engineer for testing and/or replacement of pipe, in accordance with these specifications. The Contractor shall perform all testing in the presence of the City Engineer. All Materials shall be installed in accordance with the manufacturer's recommendations.

5. **Backfill:** Material from excavation shall be used for backfill unless, in the opinion of the City Engineer, such material is not suitable for use as backfill. Backfill materials shall be hand placed and mechanically tamped in six inch layers, placed uniformly on both sides of the pipe, to a point at least one foot above the pipe crown. Each layer shall be thoroughly compacted for the full trench width and under, around and over the pipe. Mechanical tampers shall exert a pressure of not less than 250 foot pounds per square foot of area of tamping face. Upon completion of backfilling, the City Engineer may require tests to determine the degree of compaction of the backfill material. If the results of the test indicate densities less than 95%, the Contractor shall remedy the condition as directed in such portions of the trenches as may be required.
6. **Trench Restoration:** Utility trenches shall be restored per the Code of the City of Lewes Article V, Section 167-10.

B. Water System

1. **Polyvinyl chloride (PVC) plastic pipe** shall meet or exceed the requirements of AWWA C 900 latest edition. It shall have outside diameters equal to cast iron pipe with a standard dimension ratio (SDR) of 18. The pipe shall be rated for a working pressure of at least 150 psi plus a surge allowance of at least 35 psi and shall have a minimum ultimate hydrostatic strength of 600 psi. Polyvinyl chloride pipe and fittings shall be manufactured with integral wall bell and spigot joints which shall utilize a flexible O-ring rubber gasketed joint conforming to ASTM D 3139, "Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals". Pipe ends shall be beveled to accept gasketed fittings. Pipe shall be manufactured in lengths not to exceed 20 feet. PVC pipe shall be as manufactured by Uponor ETI Company or approved equal.
2. **Ductile iron water mains** shall be class 50, cement mortar lined double thickness with a bituminous seal coat, mechanical joint or rubber gasket push-type joints, bituminous coated on the exterior in accordance with ANSI A-21.51 (AWWA C151) and ANSI A-21.11. All piping shall withstand a minimum working pressure of 150 psig. Pipe shall not be more than 18 or 20 feet in nominal length. Ductile iron pipe shall be as manufactured by Griffin Pipe Products Co., Tyton or approved equal.
3. **Pipe Installation:** Pipe and fittings shall be carefully handled and lowered into the trench. The ends of pipe shall abut against each other in such manner that there shall be no shoulder or unevenness on the inside of the main. Use lubricant specified and supplied by pipe manufacturer and approved for water usage for proper pipe joint installation. Special care shall be taken to insure that the pipes are well bedded on a solid foundation, and any defects due to settlement shall be made good. Bell holes shall be dug sufficiently large to insure the making of proper joints. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Great care shall be taken to prevent the pipe wall from being damaged, and any wall damage shall be repaired to the satisfaction

of the City Engineer by the Contractor. Pipe and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. At the close of each work day the end of the pipeline shall be tightly closed with an expansion type stopper or plug so that no dirt or other foreign substance may enter the line, and this stopper or plug shall be kept in place until pipe laying is again resumed. Whenever a pipe or fitting requires cutting, to fit into the line or to bring it to the required location, the work shall be done in a satisfactory manner so as to leave a smooth end, and without extra compensation. All cutting of pipe shall be in accordance with manufacturer's recommendation. In jointing pipe and fittings, the Contractor shall exercise particular care to insure that the outside of the spigot and inside of the bell are entirely free of oil, tar and greasy substances to insure a tight fit. All concrete required to construct buttresses behind plugs, tees, bends and other fittings and anchorages beneath horizontal or vertical bends shall be placed as directed and/or as shown on the City of Lewes, Board of Public Works Standard Details.

4. **Minimum cover** for all water mains and services shall be 3'-6".
5. **Disinfection** of all water mains and services shall be in accordance with AWWA Standard C601, latest edition. A sufficient amount of HTH tablets shall be placed in each length of pipe, hydrants, hydrant branches and other appurtenances, to insure adequate disinfection treatment of the main and services after their completion. Tablets shall be fastened to the inside top of every length of pipe as laid, using gasket cement known as "Permatex No. 2". Water for filling the mains and services shall be introduced at a velocity of less than 1 foot per second in order to permit the HTH or Perchloron to completely dissolve and have a reasonably uniform distribution throughout the pipe system. It is the intent of this specification to require a sufficient amount of chemical to be equivalent to a dosage of 50 p.p.m. of chlorine. After the chlorine has been in contact with the mains, services or storage units for twenty-four (24) hours or longer, samples collected from the extremities of the pipe system shall indicate a residual chlorine content of 5 p.p.m. or more. If less than 5 p.p.m. residual chlorine is indicated, the system shall be drained and the disinfection treatment repeated. If samples collected at the extremities indicate a residual chlorine of 5 p.p.m. or more, the system shall be drained or flushed to waste and then refilled.
6. **Water main and service testing.** The water main and services shall be filled with water, supplied by the Contractor, and the pressure raised to obtain a minimum test pressure of 100 psi measured at the highest point of the section of pipeline under test. Particular care shall be taken to eliminate all air from the pipeline. The water main and services shall be subject to a leakage test at the specified test pressure, measured at the highest point of the section of pipeline under test. This test shall be a minimum of four (4) hours duration during which time the leakage shall not exceed 25 gallons per inch diameter per mile in 24 hours, and this is not to include any visible leaks. Should the test show the main and/or services to be defective, the Contractor shall remedy such defects and retest as specified above. This procedure shall be repeated until the test requirements are met.

7. **Fittings** shall be **ductile iron**, compact body, in accordance with ANSI 21.53 and rated for 350 PSI working pressure as manufactured by Tyler Pipe, U.S. Pipe, or approved equal. Fittings shall be provided with mechanical joint ends in accordance with ANSI A 21.11 and double cement lined with bituminous seal coating inside and out in accordance with ANSI 21.4 edition.
8. **Gate valves** shall be iron body, rubber-encapsulated resilient seat, non-rising stems, mechanical joint ends, square nut operated, and shall open by turning to the right. Gate valves shall be in conformance with AWWA C-509, latest edition, and be rated for 200# PSI working pressure. Gate valves shall be as manufactured by, American Flow Control, Series 2500, Mueller Company, Model A-2360 U.S. Pipe or approved equal.
9. **Valve boxes** shall be two-piece screw type with 5¼-inch shafts. Valve boxes shall be adjustable. Lids shall be extra deep with two holes and the word "WATER" cast in the upper surface. Valve box assemblies shall be as manufactured by Tyler/Union, Bingham & Taylor, QWP or approved equal.
10. **Tapping sleeves** shall be stainless steel as manufactured by PowerSeal, Model #3490, Mueller, or approved equal.
11. **Fire hydrants** shall be a traffic model compression type with 5-1/4" main valve opening, one 4-1/2" pumper nozzle and two 2-1/2" hose nozzles and shall have a 6" side inlet mechanical joint shoe connection to accommodate the class of pipe hereinbefore specified. Depth of bury shall be suitable for a minimum trench of 3'-0". Hydrants shall conform with AWWA C 502, latest edition. Hydrant seat shall be provided with bronze threaded connection. The operating nut shall be pentagon shape measuring 1-1/2" National Standard point to flat. Non-kinking hose nozzle chains are required. Drain mechanisms shall be bronze to preclude galvanic corrosion of dissimilar metals and shall operate automatically with the opening and closing of the main valve. Hydrants shall receive prime and shop coats of paint at the factory. Submit coating specifications for approval. Final coating color to be Pennsbury paint (color as directed by the Board of Public Works). The Contractor shall be responsible for field touch up or repainting of hydrants as required. Hydrant barrel shall be provided with a reflective tape of a minimum of 2" in width around the barrel under the top flange. The entire hydrant assembly, including the valve seat and all moving parts, shall be removable from the top without the need to excavate and/or remove the hydrant. The design shall be that lubrication of the operating threads is possible without disassembly. A certificate of inspection and test shall be furnished including submission of a flow and friction loss curve. Provide one (1) hydrant wrench for every two (2) hydrants supplied. Fire hydrants shall be Model B-62-B as manufacturer by American Darling, and shall open by turning to the right.
12. **Pipe restraint** at bends or other special fittings shall be with retainer glands system approved by the City Engineer manufactured by Tyler, U.S. Pipe, EBAA, or UniFlange, or with concrete buttresses as shown in the, City of Lewes Board of Public Works Standard Details.

13. **Pipe repair clamps** shall be complete circle, stainless steel, as manufactured by PowerSeal, Model 3121AS, Mueller, or approved equal.
14. **Service saddles** shall be stainless steel as manufactured by PowerSeal. For ¾" and 1" IP or CC outlet service, saddles shall be PowerSeal, Model 3411, Mueller, or equal and for ¾", 1", 1-¼", 1-½", and 2" IP or CC outlet service, saddles shall be PowerSeal, Model 3412, Mueller, or equal.
15. **Pipe plugs** shall be brass with AWWA taper thread as manufactured by Mueller, Model H-10034, or approved equal.
16. **House service pipe** shall be polyethylene with a Standard Dimension Ratio (SDR) of 9, meeting the requirements of AWWA C-901 as manufactured by Cresline, Polystar, or approved equal.
17. **Corporation stops** shall be manufactured by Mueller. Corporation stops with Conductive Compression Connection for CTS O.D. tubing shall be as manufactured by Mueller, Model H-15008, or approved equal. Corporation stops shall be spaced a minimum of 24 inches apart along the barrel of the main. A hole-type cutter shall be used to tap mains for installation of corporation stops and the coupon removed. Auger-type drills will not be allowed. Wet taps of existing water mains will have to be accomplished. Corporation stops should be located at least two feet from the pipe ends. If two insertions are made, one on each side of the main, they should be separated (measured along the pipe length) by at least one foot. Multiple insertions made on the same side of the main should be staggered 30 degrees around the circumference as well and separated by at least two feet.
18. **Curb stops** with female iron pipe thread, both ends, shall be as manufactured by Mueller, Model H-10291, or approved equal.
19. **Straight couplings** for Conductive Compression Connection for CTS O.D. tubing X male iron pipe thread shall be as manufactured by Mueller, Model H-15428, or approved equal.
20. **Curb boxes** shall be screw type with arch pattern base as manufactured by Tyler/Union, 6500 Series, Bingham & Taylor, or approved equal. No recessed lids will be accepted.
21. **Couplings** for polyethylene pipe shall be manufactured by Ford, Model Numbers C16-33, C16-34, C17-33, C17-44, C87-33, C14-44, C87-77 or Mueller equals.
22. **Unions** for Conductive Compression Connection for CTS O.D. tubing, both ends, shall be as manufactured by Mueller, Model H-15403, or approved equal.
23. **Polyethylene pipe inserts** shall be stainless steel as manufactured by Mueller, or approved equal.
24. **Meter pits** shall be manufactured by Mid State, 18" x 30" for 5/8" x 3/4" and 1" meters.

25. **Meter setters** shall be manufactured by Ford, Style 18" x 30" x 9" rise or 20" x 32" x 18" rise.
26. **Meter pit covers** shall be manufactured by Ford, Model C-32.
27. **Angle ball valve** for meter pits shall be as manufactured by Ford, Model #BA13-232W.
28. **Angle dual cartridge check valve** for meter pits shall be as manufactured by Ford, Model # HA31-323
29. **Yard hydrants** shall be manufactured by Wood Ford, Model U150M , complete with vacuum breaker. Hydrants shall be freeze proof, self-draining and suitable for 3'-6" depth of bury. All operating parts shall be brass.
30. **Water meters** shall be manufactured by AMCO, sizes and models as follows:

5/8" & 3/4"	AMCO C-700
1"	AMCO C-700

Compound meters shall be AMCO C-3000 sized as necessary.

31. **Remote registers** shall be AMCO, Model C-700.
32. **Backflow prevention devices** shall be manufactured by Watts Regulator, models as follows:

Double Check Valve Assemblies	Watts Regulator Model 709
Reduced Pressure Detector Assemblies	Watts Regulator Model 909RPDA

33. **Pipeline detection tape** shall be Lineguard Type III Detectable Tape as manufactured by Lineguard, Inc. of Wheaton, Illinois, or approved equal. The tape shall be a minimum of 2 inches wide, blue in color, imprinted with the words "Caution - Water Line Below", and be capable of being detected with inductive methods.

C. Sanitary Sewer System

1. **Polyvinyl Chloride (PVC) pipe and fittings** shall equal or exceed the requirements of ASTM D 3034 and shall have a minimum Standard Dimension Ratio (SDR) of 35 and the minimum pipe stiffness, as tested in accordance with ASTM D 2412, shall be 45 when measured under 5 percent deflection at 73°F. Pipe shall be manufactured with integral wall bell and spigot joints. All polyvinyl chloride (PVC) pipe fittings shall utilize an elastomeric o-ring gasketed joint as manufactured by Certainteed, Spears, Harco, or approved equal.
2. **Polyvinyl chloride fittings** shall be manufactured in accordance with the same specifications

and shall have the same thickness, depth of socket, and annular space as the pipe. Wye branches shall be complete pipe sections. Saddles will not be permitted for use.

3. **Ductile iron pipe** shall be centrifugally cast with push-on joints. Ductile iron sewer pipe shall be in accordance with ANSI A 21.10 and rated for 350 PSI working pressure. All pipe and fittings shall be double cement lined inside and bituminous coated inside and out per ANSI A21.4. Pipe shall be as manufactured by U.S. Pipe and Foundry Company or approved equal.
4. **Ductile iron fittings** shall be made of ductile iron in accordance with ANSI A21.10 and ANSI A21.11 and rated for 350 PSI working pressure. Fittings shall be mechanical joint, compact body, with double cement lined inside and bituminous coated inside and out in accordance with ANSI 21.4.
5. **Force main pipe** shall be PVC having a Standard Dimension Ratio of 18 (4" diameter and larger) or 21 (2" diameter) conforming to AWWA C900 & ASTM D2241 with integral bells or ductile iron pipe class 50 or 52 with double cement lining and bituminous coated inside and out in accordance with ANSI 21.4, with integral bells. In pre-approved cases, force main pipe may be HDPE having a Dimension Ratio of 11 (160 psi) ductile iron pipe size (DIPS) complying with AWWA C-901 or C-906 as applicable.

Each pipe section including bell or coupling shall be subjected to a hydrostatic test of not less than 500 psi for at least 10 seconds. Pipe shall be tested in accordance with conditions specified in ASTM D618. Any pipe that leaks or is unable to withstand the test pressure shall be rejected. The test shall be conducted at the factory and certification stating that the operation has been conducted as specified and the pipe meets all conditions of this specification shall be submitted to the Board of Public Works.

6. **Force main fittings** shall be compact body ductile iron, rated for 350 psi working pressure, with mechanical joints where installed below grade and ductile iron flange connections above grade as manufactured by Tyler, Atlantic, or approved equal.
7. **Pipe installation:** Install pipe in accordance with ASTM D2321 and these specifications. Pipe and fittings shall be carefully handled and lowered into the trench. Special care shall be taken to insure that each length shall abut against the next in such manner that there shall be no shoulder or unevenness of any kind along the inside of the pipe. Before pipe is placed, the bottom of the trench shall be carefully shaped to fit the lower part of the pipe exterior with reasonable closeness for a width of a least 60% of the pipe width as indicated on the plans. Bell holes shall be dug sufficiently large to insure the making of proper joints and so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Any defects due to settlement shall be made good by the Contractor without additional compensation therefore. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipe shall be used. Whenever a pipe requires cutting to fit into the line or

to bring it to the required location, the work shall be done in a satisfactory manner so as to leave a smooth end. The pipes shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. The open ends of all pipelines shall be provided with a stopper carefully fitted so as to keep dirt and other substances from entering. This stopper shall be kept in the end of the pipeline at all times when laying is not in actual progress. All concrete required to support and reinforce wye branches, bends and other fittings shall be placed as directed, and the cost thereof shall be included and covered by the various items for furnishing and laying wye branches, bends and other fittings.

8. **Leak Testing:** Infiltration/Exfiltration tests shall be performed on all sanitary sewer services and shall generally conform as follows: All sewer services above the groundwater line will be tested by the exfiltration method. This method will involve plugging the upstream pipe ends of the lower and upper manhole and filling the intermediate pipe section with water. Water shall be introduced into the upper manhole to a level two (2) feet above the top of pipe elevation in the manhole and this level maintained for a period of time sufficient to allow complete pipe and manhole water absorption. Measurements of time versus the quantity of water require to maintain this level shall then be taken for the period of time required to provide substantial and meaningful results. Testing results shall be converted to gallons per day. Water for exfiltration tests shall be supplied by the Contractor. All sewer services below the groundwater line will be tested by the infiltration method. This method will involve measuring the amount of infiltration into the pipe section at the lower end of the pipe section by means of a weir installed in the pipe or by other means, as approved by the Engineer. Sewers shall be tested in sections of not more than 1,000 foot lengths unless otherwise approved by the Engineer. Each section shall meet the infiltration or exfiltration requirements specified herein. All sheeting shall be removed, except as may be indicated otherwise, backfill placed to finished grade, and dewatering operations ceased at least 48 hours prior to infiltration tests. The maximum allowable leakage, as determined by the infiltration or exfiltration method shall be 10 gallons per inch of pipe diameter, per mile, per day (24 hours). All material and labor required shall be furnished by the Contractor and the cost thereof included in the prices bid for furnishing and laying pipe. Exfiltration tests incorporating the use of low pressure air accomplished in accordance with the requirements of ASTM C 828 and the pipe manufacturer's recommendations, may be used in lieu of the water test, subject to approval of the Engineer. Procedural and equipment details shall be submitted to the City Engineer prior to acceptance of its use as a testing method.
9. **Mirror Testing:** Upon completion of pipe laying and backfilling, a mirror test to check for defects, or leakage, and for horizontal or vertical misalignment shall be conducted. Mirror testing shall consist of reflecting sunlight or artificial light via mirrors through the completed section of pipeline, which, in order to be accepted, shall be true and straight in horizontal and vertical alignment to allow for the full passage of the reflected light. Sewer services do not require mirror testing.
10. **Deflection Testing:** Sanitary sewers shall be tested to determine the amount of vertical deflection in the completed pipeline as follows: Deflection testing as specified hereinafter shall be accomplished on all sanitary sewers installed. Installation of sanitary sewers shall be

complete prior to the start of deflection testing. All sheeting shall be removed except where written approval by the City Engineer has been obtained. All backfill shall be placed, consolidated and dewatering operations ceased 14 days prior to the start of deflection testing. One of the following methods of testing shall be utilized: **Mandrel** – A steel ball or mandrel with a diameter equivalent to 95 percent of the inside diameter of the pipe to be tested shall be pulled through the pipeline, from manhole to manhole, by hand. If the steel ball is unable to pass through the pipe without applying excessive force (as judged by the City Engineer), it will be construed as evidence that the pipe has deflected more than 5 percent of the inside pipe diameter. A permanent record of all testing with locations where excessive pipeline deflection occur shall be kept by the Contractor and forwarded to the City Engineer after completion of testing on each line. If a mandrel is utilized, it shall be approved by the City Engineer prior to use. Mandrels shall have an odd number of gauging plates. The minimum number of plates shall be nine with a contact surface length equal to the inside pipe diameter plus two inches for pipelines 10 inches in diameter and smaller. On larger diameter, the contact surface length shall equal the inside pipe diameter. **Deflectometer** – A deflectometer or a similar instrument, either of which must be approved for use by the Engineer, shall be pulled through the pipeline from manhole to manhole. The instrument shall measure the vertical deflection in the pipeline to the nearest tenth of one percent. A permanent record of all testing with locations where excessive pipeline deflections (greater than 5% of inside diameter of pipe) occur shall be kept by the Contractor and forwarded to the City Engineer after completion of testing on each line. The Contractor shall immediately replace all sections of pipe which deflect more than 5 percent as measured by one of the methods described above.

11. **House lateral cleanouts frames and covers** shall be manufactured by East Jordan Iron Works, 1565.
12. **Flexible adaptor coupling** shall be leak proof and flexible for connecting existing pipe sections as required, as manufactured by Fernco or approved equal.
13. **Pipe restraint** at bends or other special fittings shall be with retainer glands system approved by the City Engineer manufactured by Tyler, U.S. Pipe, EBAA, or UniFlange or with concrete buttresses as shown in the, City of Lewes Board of Public Works Standard Details.
14. **Manholes** shall meet requirements of ASTM C 478. Joints between the riser sections shall be fitted with a D-LOK manhole joint gasket meeting the requirements of ASTM C 443. The seal between the manhole sections shall be in accordance with ASTM C 923. Precast reinforced concrete base and riser sections shall be as manufactured by Atlantic Concrete Products Company or equal. Pipe joints shall be fitted with A-LOK or Z-LOK joint gaskets. Interior and exterior joint spaces of all manhole risers shall be mortared.
15. **Sewer brick** shall conform to the “Standard Specifications for Sewer Brick”, ASTM C 32, Grade SS except that the maximum absorption for the average of five bricks shall not exceed 10%; and the individual brick maximum shall not exceed 14%.

16. **Mortar** shall be in accordance with the “Standard Specifications for Portland Cement”, ASTM C 150 for Type II.
17. **Manhole steps** shall be polypropylene plastic clad #5 deformed reinforcing bar, ASTM A615, Grade 60, with a notched tread ridge and a retainer lug on each side, and OSHA approved as manufactured by M.A. Industries, Inc., Peachtree City, Georgia; ICM, Inc., Jacksonville, Arkansas, or equal.
18. **Manhole flow channels** shall be built with sewer brick. Precast flow channels are not acceptable.
19. **Exterior waterproof coating:** Manholes shall receive a two coat application of Koppers Super Service Black waterproof bitumastic coating or approved equal.
20. **Manhole frame and cover** shall be 1545 as manufactured by East Jordan Iron Works or equal with “Sanitary Sewer” cast in the cover.
21. **Manhole watertight inserts** shall be Sewer Guard by, Model MEC-4, as manufactured by Preco Industries Ltd, or approved equal.
22. **Pipeline detection tape** shall be Lineguard Type III Detectable Tape as manufactured by Lineguard, Inc. of Wheaton, Illinois, or approved equal. The tape shall be a minimum of 2 inches wide, green in color, imprinted with the words “Caution - Sewer Line Below”, and be capable of being detected with inductive methods
23. **Air release valve:** Sewage combination air valves shall be Model 36WW with backwash attachments as manufactured by Cla-Val. or equal, suitable for sewage force main line, sewage pump, or waste water systems with working pressures to 150 pis.

D. Pump Stations

1. **Gate valves** shall be rubber-encapsulated resilient seat, non-rising stems, mechanical joint ends, square nut operated, and shall open by turning to the right. Gate valves shall be manufactured by American Flow Control, Series 2500, or Mueller.
2. **Check valves** shall be resilient seat as manufactured by American Flow Control series 2100, Mueller or approved equal.
3. **Plug valves** shall be manufactured by Dezurik series 100 or approved equal.
4. **Pumps** for various applications shall be manufactured by Myers, Gorman Rupp, or EBARA. Submersible wastewater pumps shall be used whenever possible and appropriate.
5. **Pump station access hatches** shall be manufactured by Siegfried Machine & Supply, Inc.,

Bilco, or approved equal.

6. **Telemetering equipment** shall be “Chatterbox” manufactured by Raco.
7. **Wet wells** shall meet requirements of ASTM C 478. Joints between the riser sections shall be fitted with a D-LOK manhole joint gasket meeting the requirements of ASTM C 443. The seal between the manhole sections shall be in accordance with ASTM C 923. Precast reinforced concrete base and riser sections shall be as manufactured by Atlantic Concrete Products Company or equal. Pipe joints shall be fitted with A-LOK or Z-LOK joint gaskets. Interior and exterior joint spaces of all manhole risers shall be mortared. Top of wet well shall be poured in place.
8. **Wet well exteriors** shall receive a two coat application of Koppers Super Service Black waterproof bitumastic coating or approved equal.
9. **Wet well interior surfaces** shall receive a minimum two (2) coat application of a two component, high solids polyamidamine epoxy coating. The total dry film thickness shall measure 12 mils minimum. Coating material shall be Series N69 Hi-Build Epoxoline by Tnemec, or equal. Interior surfaces shall be white.

E. Storm Drains

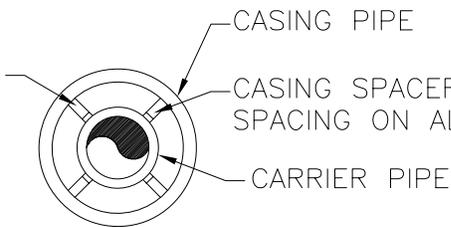
1. **Reinforced concrete pipe and fittings** shall be class IV furnished in accordance with ASTM C-76, latest edition. Joints shall be composed of concrete fitted with rubber gaskets as specified in ASTM C-443.
2. **Ductile iron pipe** shall be centrifugally cast in accordance with ANSI A21.6 or A21.8, with mechanical joints and shall be class 56, in accordance with ANSI A21.51. All ductile iron pipe and fittings shall be bituminous coated inside and out per ANSI A21.4.
3. **Pipe Installation** : Refer to Section C. 7.
4. **Mirror Testing**: Upon completion of pipe laying and backfilling, a mirror test to check for defects, or leakage, and for horizontal or vertical misalignment shall be conducted. Mirror testing shall consist of reflecting sunlight or artificial light via mirrors through the completed section of pipeline, which, in order to be accepted, shall be true and straight in horizontal and vertical alignment to allow for the full passage of the reflected light.
5. **Ductile iron pipe fittings** shall be made of ductile iron in accordance with ANSI A 21.10 and rated for 350 PSI working pressure.
6. **Catch basins** shall be constructed in accordance with applicable sections of Delaware Department of Transportation 2001 Standard Specification 708 and 2002 Standard Details sections D-4 and D-5. Catch basins shall be of brick or precast concrete as manufactured by

Atlantic Concrete Product Company or equal. Brick catch basins shall be parged with cement mortar on the exterior surfaces.

7. **Junction boxes** shall be constructed in accordance with applicable sections of Delaware Department of Transportation 2001 Standard Specification 708. Junction boxes shall be of brick or precast concrete as manufactured by Atlantic Concrete Product Company or equal. Brick junction boxes shall be parged with cement mortar on the exterior surfaces.
8. **Catch basin frames and grates** as per Delaware Department of Transportation 1985 Standard Specification Section 708 and Standard detail sheet D-5 as manufactured by East Jordan Iron Works or Bingham and Taylor.
9. **Manholes and appurtenances:** Refer to Section C. 14 thru 20.

CARRIER PIPE SIZE	CASING PIPE SIZE
1	3
4	12
6	16
8	16
10	18
12	20
14	24
16	30
18	36
20	36
24	42
30	42
36	48
42	54
48	60

SPACER INSTALLED @ 6" O.C. (MIN) AND 1' (MAX) FROM EACH SIDE OF CARRIER PIPE JOINTS



CASING PIPE

CASING SPACER SHALL PROVIDE EQUAL SPACING ON ALL SIDES OF CARRIER PIPE

CARRIER PIPE

NOTE:

- 1 ENDS OF CASING PIPE SHALL BE CLOSED USING AN END SEAL EQUAL TO MODEL AC PULL-ON END SEAL AS MANUFACTURED BY ADVANCE PRODUCTS AND SYSTEMS, INC.
- 2 CASING PIPE DIAMETERS NOTED ABOVE ARE MINIMUM ALLOWABLE BASED ON THE CARRIER PIPE DIAMETER. CASING SHALL BE THE SIZE AND MATERIAL REQUIRED BY THE APPLICABLE PERMITTING AGENCY.

CASING PIPE

NO SCALE

JOB NO.: 2004002-C

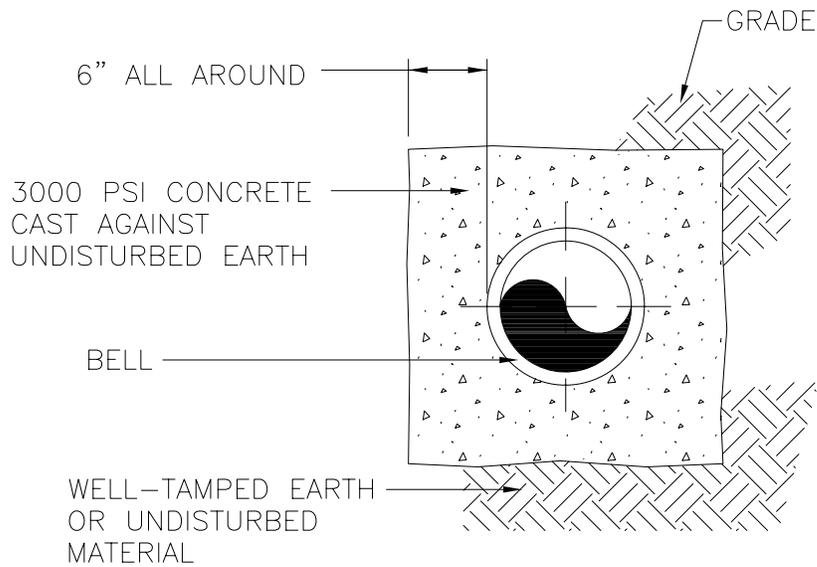
SCALE: NONE

DATE: MAY 2004

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

100

DRAWING NO.



CONCRETE ENCASEMENT

NO SCALE

NOTES:

- 1 ENCASEMENT SHALL BE A MINIMUM OF 10 FEET IN LENGTH IN EACH DIRECTION, OR AS DIRECTED BY THE ENGINEER.
- 2 THE CROSSINGS SHALL BE ARRANGED SUCH THAT THE SEWER JOINTS WILL BE EQUAL DISTANCE AND AS FAR AS POSSIBLE FROM WATER MAIN JOINTS.

JOB NO.: 2004002-C

SCALE: NONE

DATE: MAY 2004

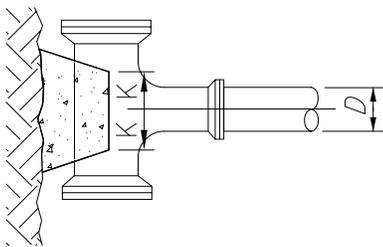
**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

101

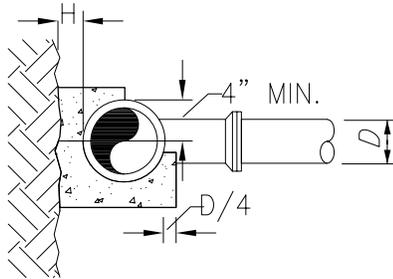
DRAWING NO.

BUTTRESS DIMENSIONS										
	D	6"	8"	10"	12"	16"	20"	24"	30"	36"
BUTTRESS FOR TEES	H	8"	9"	10"	1'-0"	1'-2"	1'-4"	1'-6"	1'-9"	2'-0"
	I	8"	10"	1'-0"	1'-3"	1'-8"	2'-1"	2'-6"	3'-1"	3'-9"
	J	7"	9"	1'-0"	1'-2"	1'-6"	1'-11"	2'-4"	2'-10"	3'-5"
	K	6"	8"	8"	8"	10"	1'-2"	1'-4"	1'-6"	1'-10"
	K*	5"	5"	5"	5"					
BUTTRESS FOR PLUGS	E	6"	8"	8"	10"	1'-0"	1'-4"	1'-8"	2'-0"	2'-0"
	F	1'-0"	1'-4"	1'-8"	2'-0"	2'-8"	3'-3"	4'-0"	4'-9"	5'-9"
	G	1'-5"	1'-11"	2'-5"	2'-10"	3'-9"	4'-9"	5'-8"	7'-6"	8'-10"

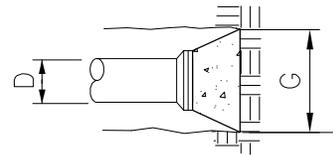
K* FOR COMPACT FITTINGS



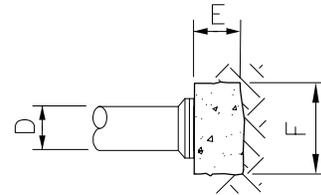
PLAN-TEE



SECTION-TEE



PLAN-PLUG



SECTION-PLUG

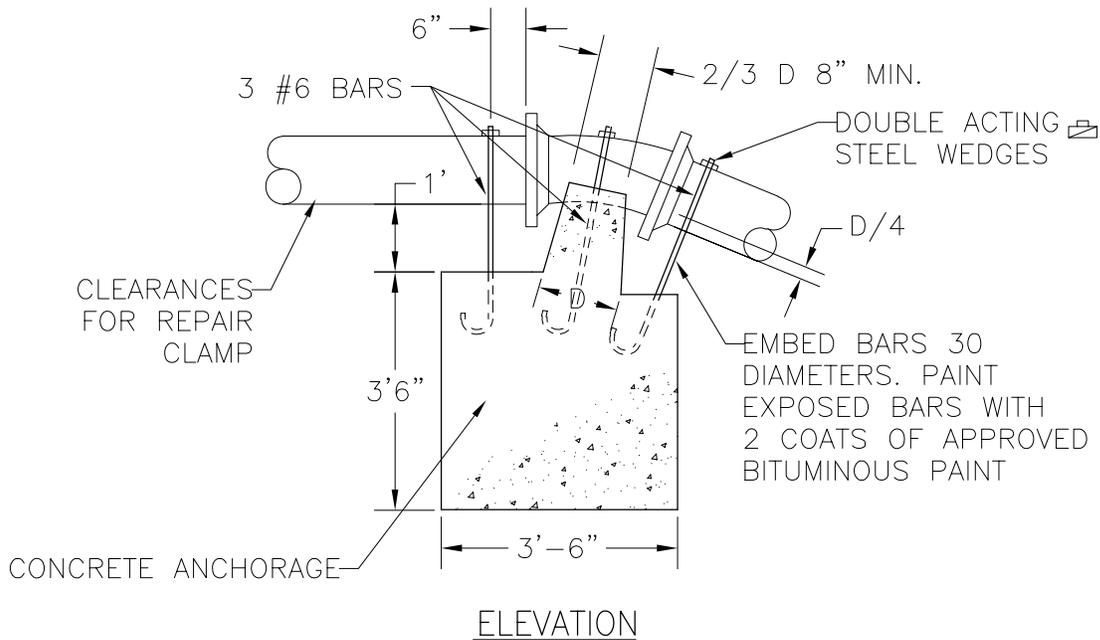
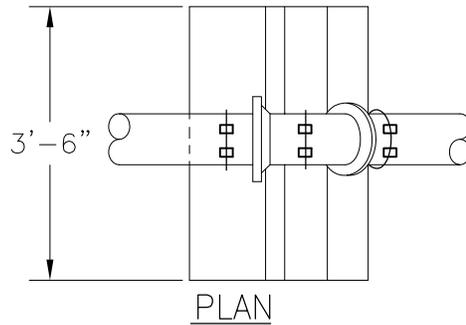
NOTES:

1. ALL CONCRETE TO HAVE MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
2. BUTTRESS DIMENSIONS GIVEN ARE MINIMUM DIMENSIONS BASED UPON 3000 PSI SOIL BEARING CAPACITY AND 150 PSI INTERNAL PIPE PRESSURE.
3. ALL CONCRETE SHALL BE CARRIED TO UNDISTURBED EARTH.

BUTTRESS DETAILS FOR TEES AND PLUGS

NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	102 DRAWING NO.
SCALE: NONE		
DATE: MAY 2004		



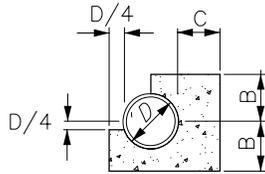
NOTES:

1. ALL CONCRETE TO HAVE MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
2. BUTTRESS DIMENSIONS GIVEN ARE MINIMUM DIMENSIONS BASED UPON 3000 PSI SOIL BEARING CAPACITY AND 150 PSI INTERNAL PIPE PRESSURE.
3. ALL CONCRETE SHALL BE CARRIED TO UNDISTURBED EARTH.

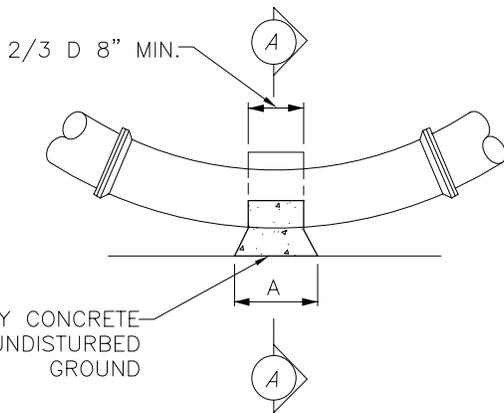
ANCHORAGE DETAIL FOR VERTICAL BENDS

NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	103 DRAWING NO.
SCALE: NONE		
DATE: MAY 2004		



SECTION A-A



PLAN

BUTTRESS DIMENSIONS FOR HORIZONTAL BENDS										
BEND	D	6"	8"	10"	12"	16"	20"	24"	30"	36"
5%	A						1'-8"	2'-0"	2'-6"	3'-0"
	B						10"	1'-0"	1'-3"	1'-6"
	C						10"	1'-0"	1'-1"	1'-2"
11¼°	A	6"	8"	10"	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-0"
	B	7"	8"	9"	10"	1'-0"	1'-2"	1'-4"	1'-7"	1'-11"
	C	7"	7"	8"	8"	9"	10"	1'-0"	1'-1"	1'-2"
22½°	A	9"	1'-0"	1'-6"	1'-9"	2'-3"	3'-0"	3'-6"	4'-2"	5'-4"
	B	7"	8"	9"	10"	1'-0"	1'-2"	1'-4"	1'-7"	2'-0"
	C	8"	9"	10"	11"	1'-2"	1'-4"	1'-6"	1'-9"	2'-0"
45°	A	1'-3"	1'-8"	2'-1"	2'-6"	3'-4"	4'-2"	5'-0"	6'-3"	7'-6"
	B	7"	8"	9"	11"	1'-3"	1'-6"	1'-8"	2'-0"	2'-6"
	C	8"	9"	10"	11"	1'-2"	1'-4"	1'-9"	2'-3"	2'-8"
90°	A	2'-0"	2'-6"	3'-0"	3'-6"	5'-0"	SPECIAL DESIGN			
	B	6"	9"	1'-0"	1'-3"	1'-6"				
	C	1'-10"	1'-9"	1'-8"	1'-7"	1'-5"				

NOTES:

1. ALL CONCRETE TO HAVE A MINIMUM COMPRESSION STRENGTH OF 3000 PSI.
2. BUTTRESS DIMENSIONS GIVEN ARE MINIMUM DIMENSIONS BASED UPON 3000 PSI SOIL BEARING CAPACITY AND 150 PSI INTERNAL PIPE PRESSURE.
3. ALL CONCRETE SHALL BE CARRIED TO UNDISTURBED EARTH.
4. NO DRY MIX TO BE USED.

BUTTRESS DETAIL FOR HORIZONTAL BENDS

NO SCALE

JOB NO.: 2004002-C

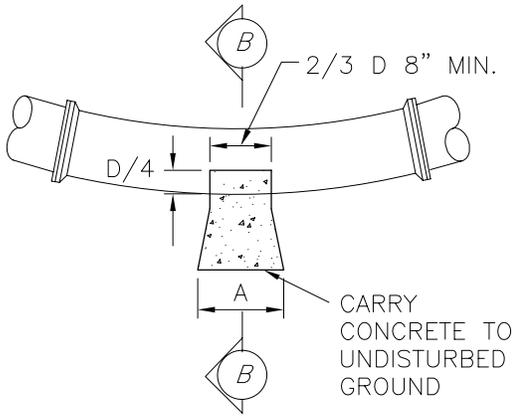
SCALE: NONE

DATE: MAY 2004

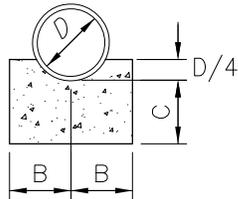
**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

104

DRAWING NO.



ELEVATION



SECTION B-B

BUTTRESS DIMENSIONS FOR VERTICAL BENDS

BEND	D	6"	8"	10"	12"	16"	20"	24"	30"	36"
11¼°	A						1'-8"	2'-0"	2'-6"	3'-0"
	B						10"	1'-0"	1'-3"	1'-6"
	C						10"	1'-0"	1'-1"	1'-2"
22½°	A	6"	8"	10"	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-0"
	B	7"	8"	9"	10"	1'-0"	1'-2"	1'-4"	1'-7"	1'-10"
	C	7"	7"	8"	8"	9"	10"	1'-0"	1'-1"	1'-2"
45°	A	9"	1'-0"	1'-6"	1'-9"	2'-3"	3'-0"	3'-6"	4'-2"	5'-4"
	B	7"	7"	8"	10"	1'-0"	1'-2"	1'-4"	1'-7"	2'-0"
	C	7"	7"	8"	8"	9"	10"	1'-0"	1'-1"	1'-2"
90°	A	1'-3"	1'-8"	2'-1"	2'-6"	3'-4"	4'-2"	5'-0"	6'-3"	7'-6"
	B	7"	8"	9"	11"	1'-3"	1'-6"	1'-9"	2'-3"	2'-6"
	C	7"	8"	10"	11"	1'-3"	1'-6"	1'-9"	2'-3"	2'-8"

NOTES:

1. ALL CONCRETE TO HAVE A MINIMUM COMPRESSION STRENGTH OF 3000 PSI.
2. BUTTRESS DIMENSIONS GIVEN ARE MINIMUM DIMENSIONS BASED UPON 3000 PSI SOIL BEARING CAPACITY AND 150 PSI INTERNAL PIPE PRESSURE.
3. ALL CONCRETE SHALL BE CARRIED TO UNDISTURBED EARTH.
4. NO DRY MIX TO BE USED.

BUTTRESS DETAIL FOR VERTICAL BENDS

NO SCALE

JOB NO.: 2004002-C

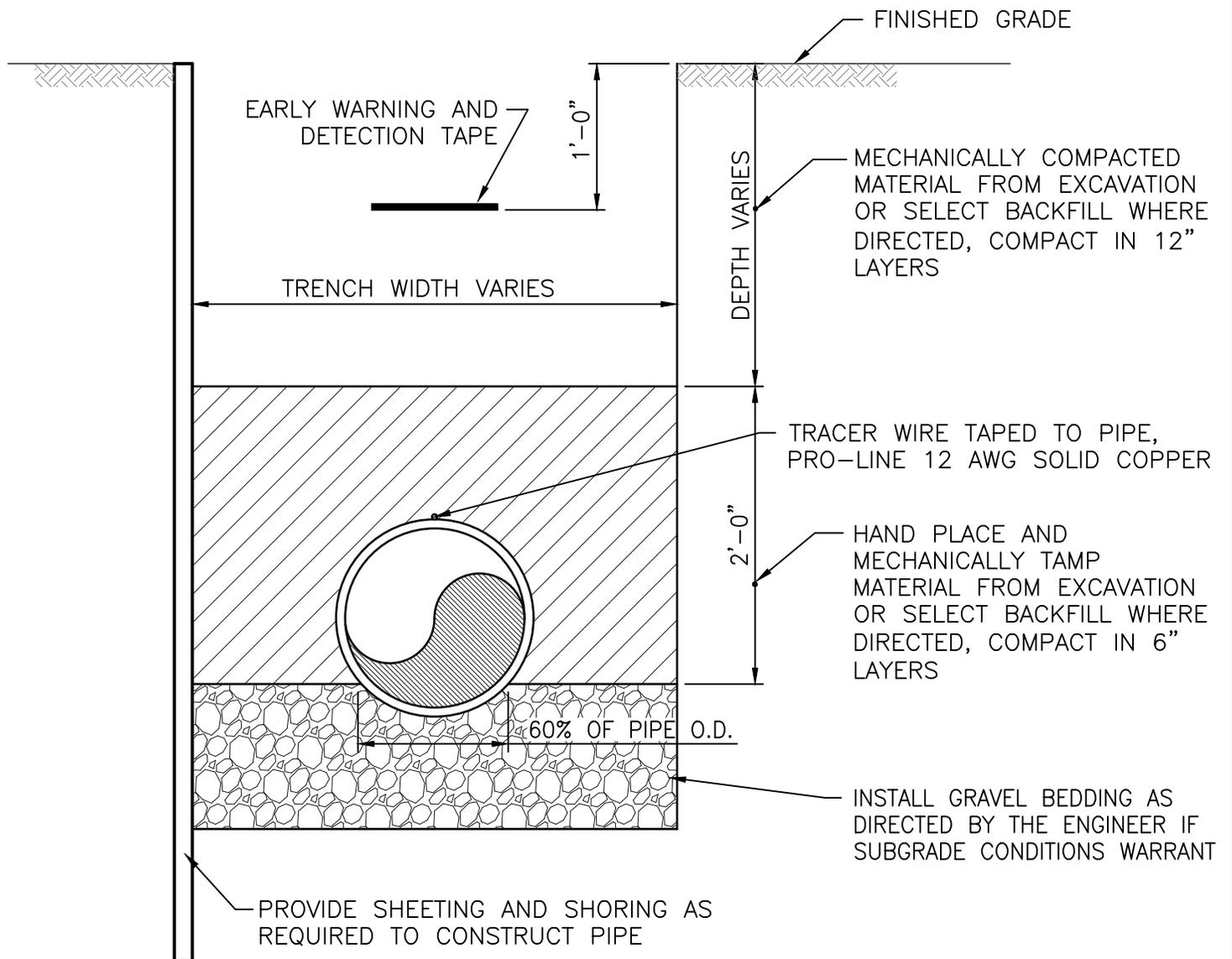
SCALE: NONE

DATE: MAY 2004

STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

105

DRAWING NO.



PIPE BEDDING AND BACKFILL DETAIL

NO SCALE

JOB NO.: 2004002-C

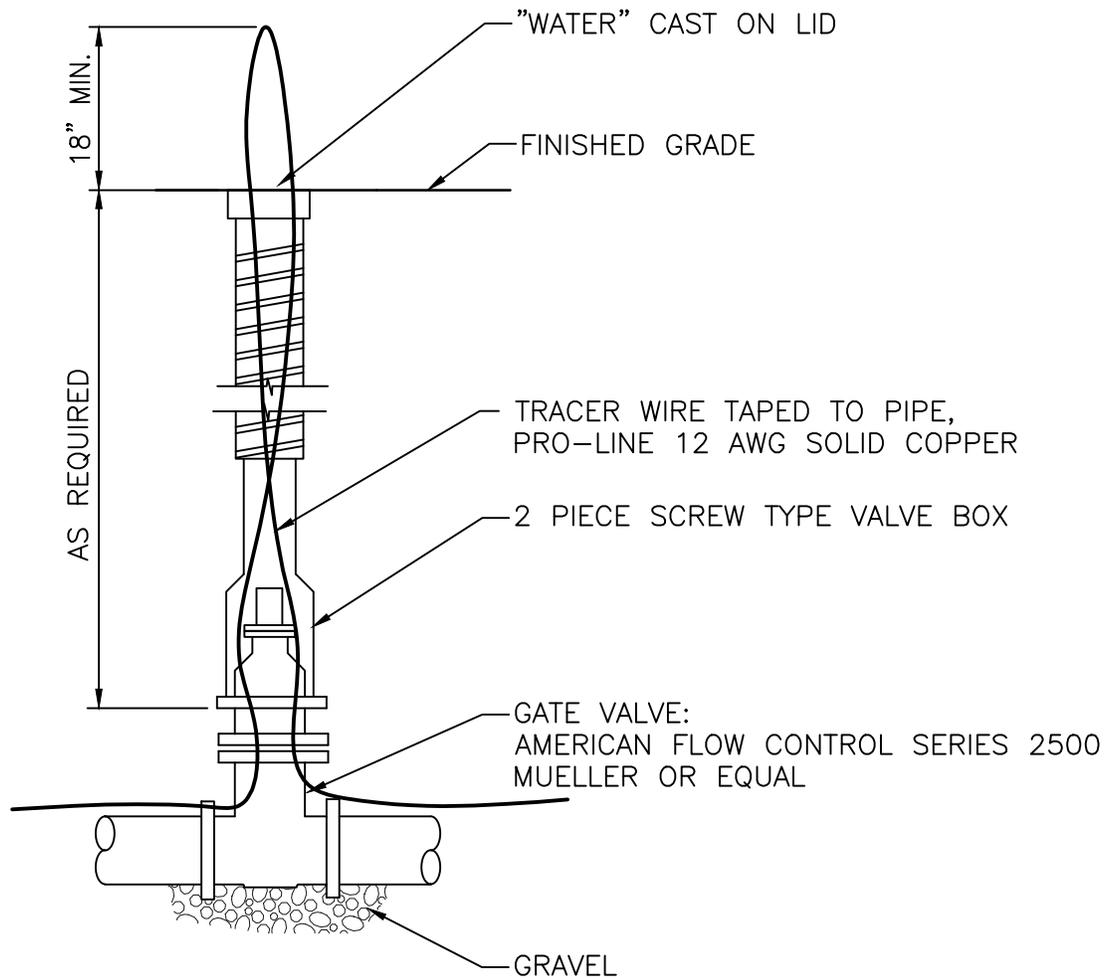
SCALE: NONE

DATE: OCT. 2018

STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

106

DRAWING NO.



NOTE:
 1. RETAINER GLANDS SHALL HAVE STAINLESS STEEL T-BOLTS.

GATE VALVE DETAIL
 NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	200 DRAWING NO.
SCALE: NONE		
DATE: OCT. 2018		

HYDRANT BARREL SHALL BE PROVIDED WITH A REFLECTIVE TAPE OF A MINIMUM OF 2" IN WIDTH AROUND THE BARREL UNDER THE TOP FLANGE

HYDRANT, CITY OF LEWES BOARD OF PUBLIC WORKS STANDARD

ORIENT NOZZLE PERPENDICULAR TO STREET

18" MIN.

"WATER" CAST ON LID

EXISTING GRADE

EXISTING GRADE

PLACE GRAVEL 6" ABOVE DRAIN OPENING AND FULL WIDTH OF TRENCH

TRACER WIRE TAPED TO PIPE, PRO-LINE 12 AWG SOLID COPPER

ADJUSTABLE VALVE BOX

3'-6" MIN

6" GATE VALVE

3000 PSI CONC. BLOCKING BETWEEN UNDISTURBED EARTH AND FITTING

SUPPORT HYDRANT ON PRESSURE TREATED WOOD BLOCKING

GRAVEL
CONCRETE BUTTRESS

1'-0"

1'-0" MIN

6 DI

NOTE:

1. RETAINER GLANDS SHALL HAVE STAINLESS STEEL T-BOLTS.

FIRE HYDRANT DETAIL

NO SCALE

JOB NO.: 2004002-C

SCALE: NONE

DATE: OCT. 2018

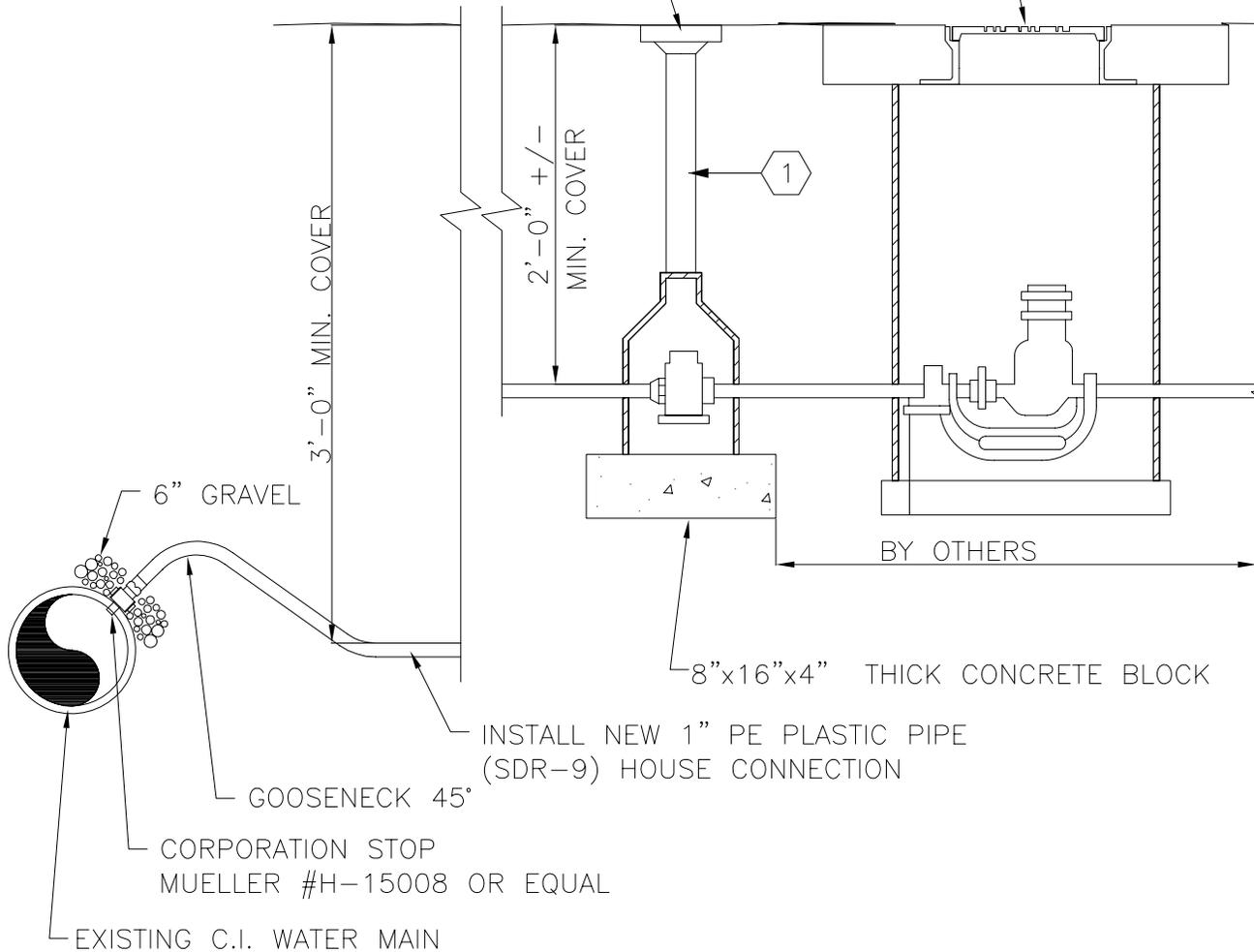
STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

201

DRAWING NO.

REMOVE EXISTING CURB STOP AND BOX AND REPLACE WITH NEW CURB STOP (MUELLER H-10291) AND BOX

METER AND BOX



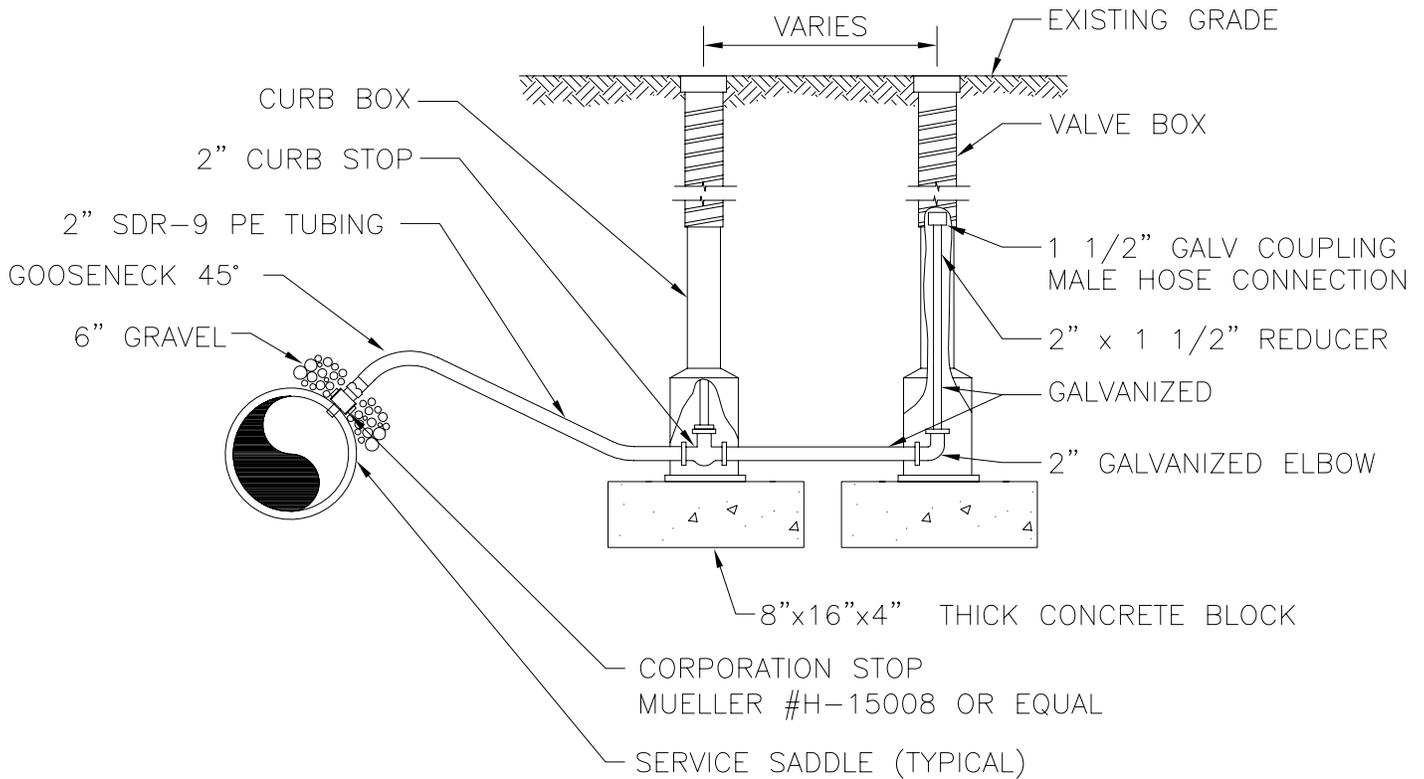
NOTE:

1. THE CONTRACTOR SHALL ADJUST CURB STOP DEPTH AS NECESSARY TO MAINTAIN MINIMUM COVER OVER SERVICE PIPE AT SIDEWALK.
2. PVC WATER MAIN REQUIRES SERVICE SADDLE MANUFACTURED BY POWER SEAL, MODEL 3411 OR 3412.
3. SPECIAL CARE SHALL BE TAKEN DURING BACKFILL OPERATION TO PREVENT DAMAGE TO PIPE AT CORPORATION STOP.

HOUSE SERVICE CONNECTION DETAIL

NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	202 DRAWING NO.
SCALE: NONE		
DATE: MAY 2004		



NOTE:

1. THE CONTRACTOR SHALL ADJUST CURB STOP DEPTH AS NECESSARY TO MAINTAIN MINIMUM COVER OVER SERVICE PIPE AT SIDEWALK.
2. PVC WATER MAIN REQUIRES SERVICE SADDLE MANUFACTURED BY POWER SEAL, MODEL 3411 OR 3412.
3. SPECIAL CARE SHALL BE TAKEN DURING BACKFILL OPERATION TO PREVENT DAMAGE TO PIPE AT CORPORATION STOP.

BLOWOFF DETAIL

NO SCALE

JOB NO.: 2004002-C

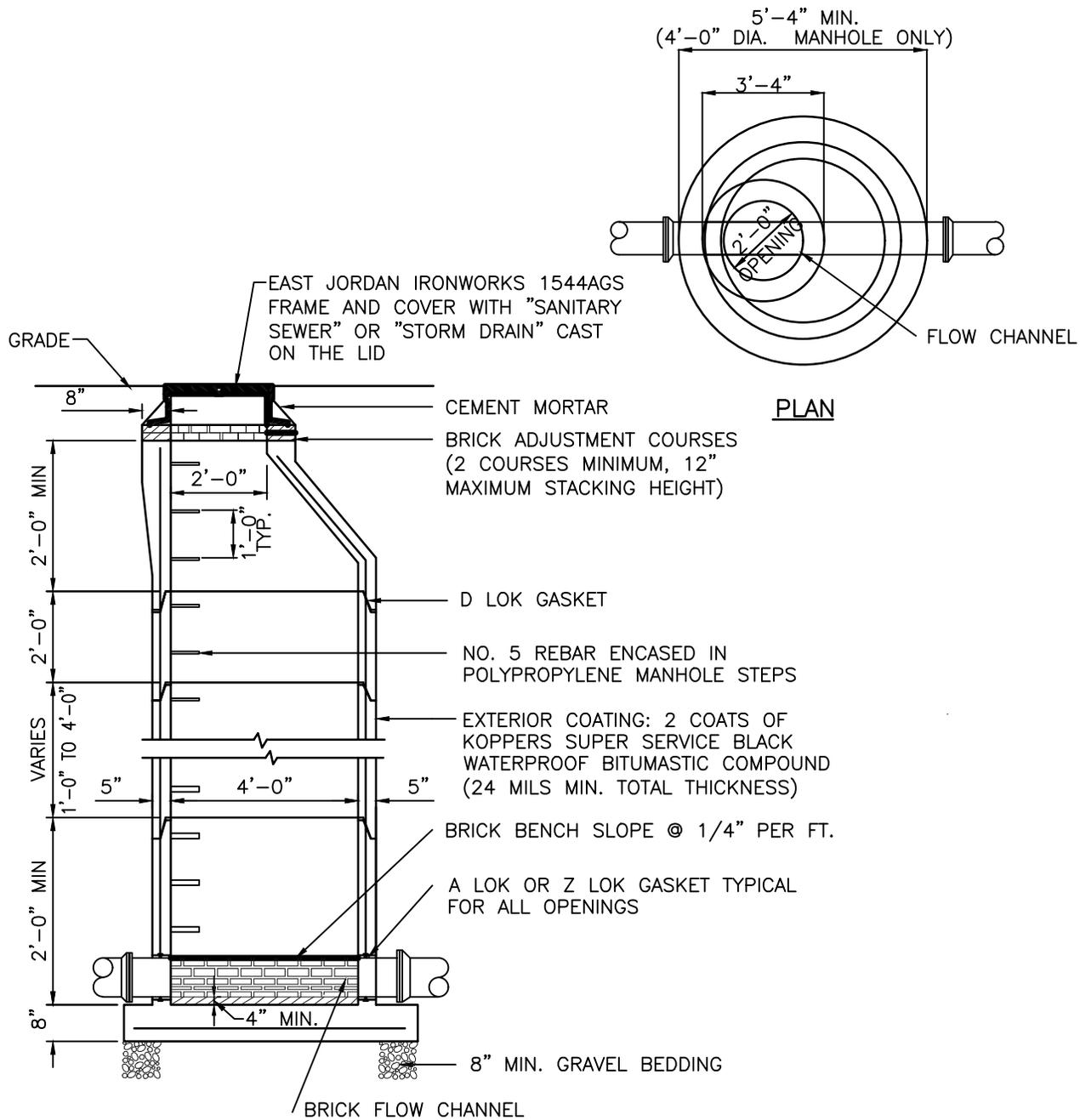
SCALE: NONE

DATE: MAY 2004

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

203

DRAWING NO.



SECTION

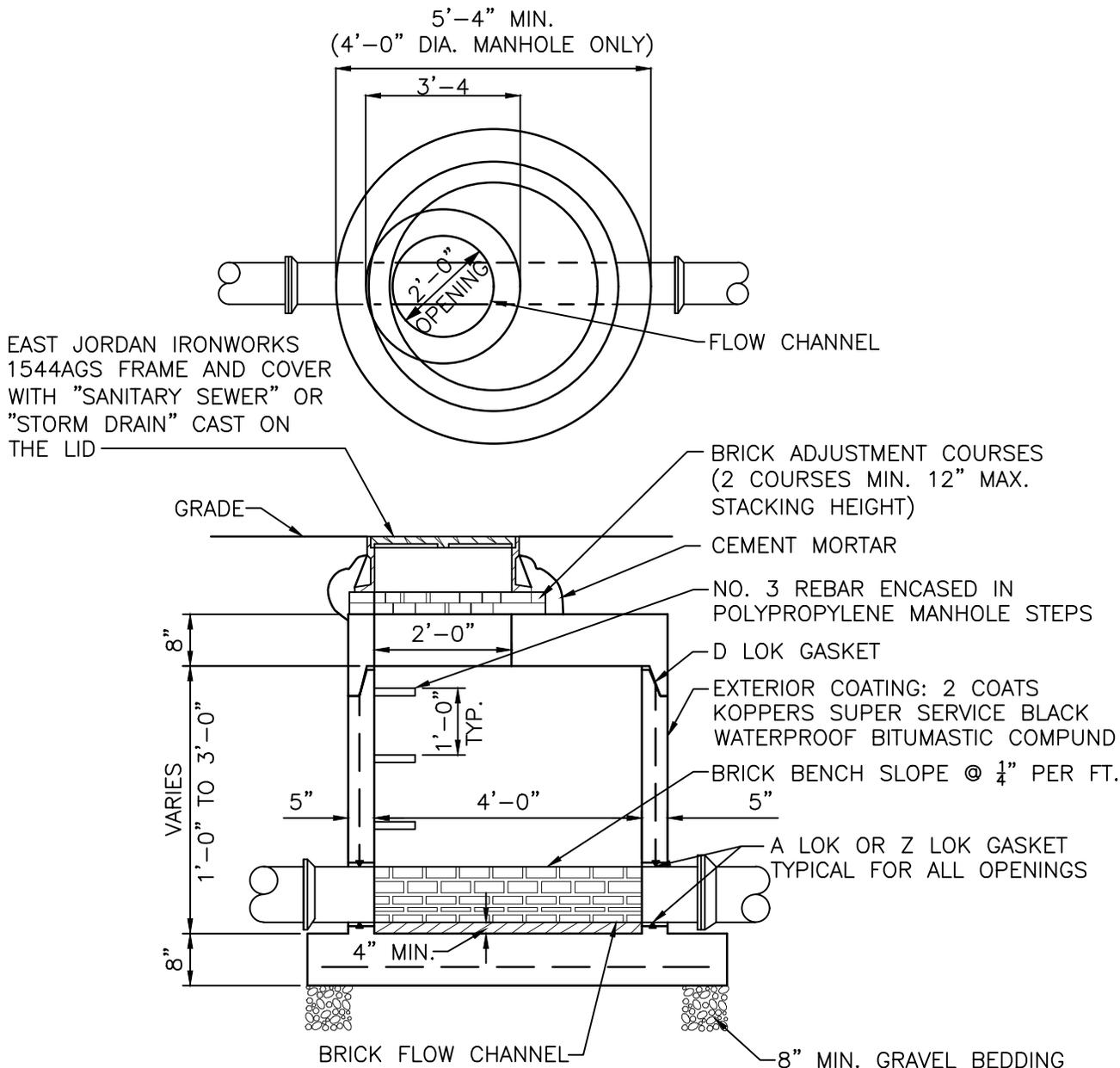
NOTES:

- 1. MANHOLE SHALL CONFORM TO ASTM C-478
- 2. DETAIL APPLIES TO SANITARY SEWER AND STORM WATER MANHOLES.

PRECAST CONCRETE MANHOLE DETAIL

NO SCALE

JOB NO.: 2004002-C	<p>STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE</p>	<p>300 DRAWING NO.</p>
SCALE: NONE		
DATE: OCT. 2018		



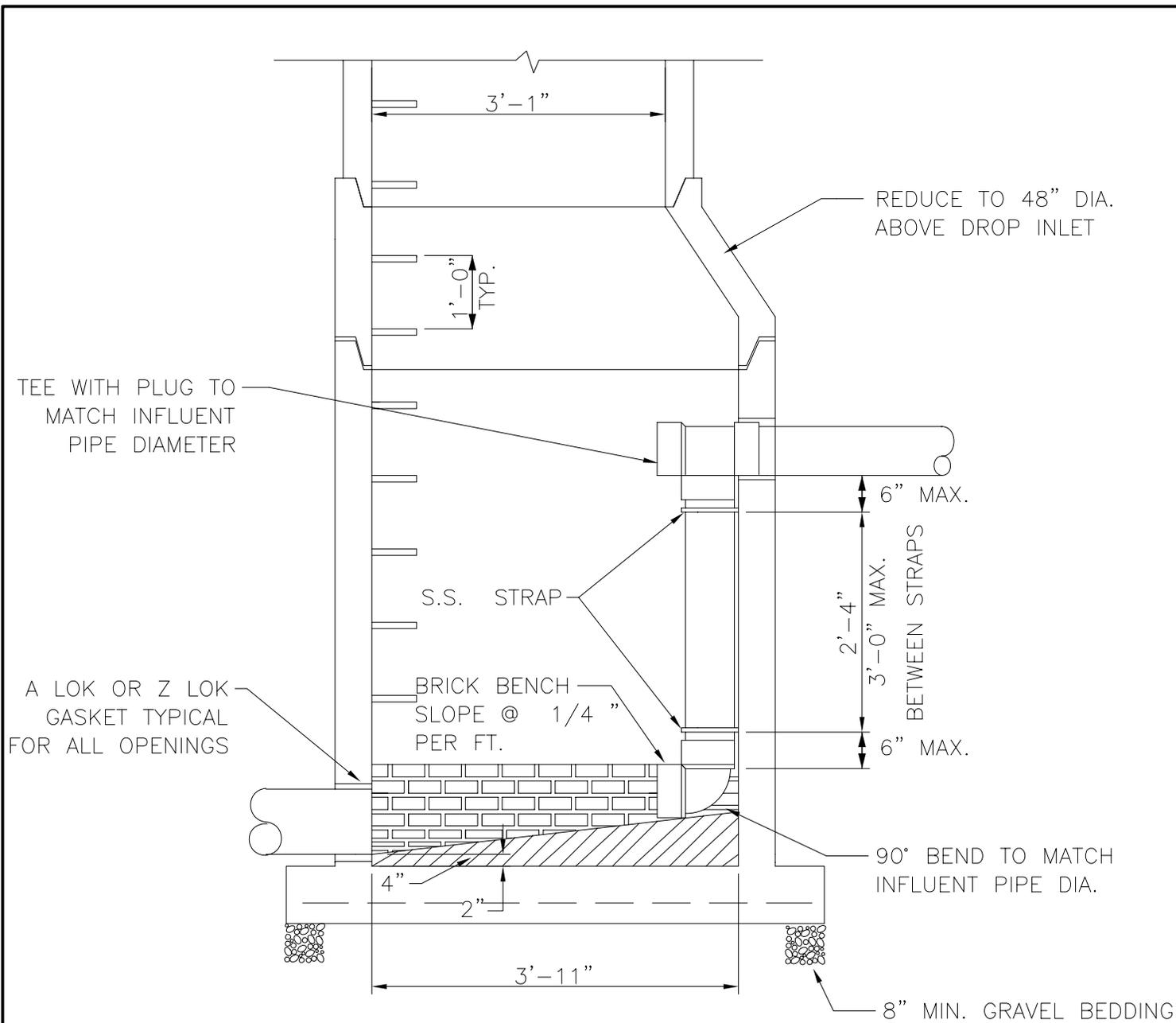
NOTE:

1. MANHOLE SHALL CONFORM TO ASTM C-478
2. DETAIL APPLIES TO SANITARY SEWER AND STORM WATER MANHOLES

SHALLOW PRECAST CONCRETE MANHOLE DETAIL

NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS	
SCALE: NONE	BOARD OF PUBLIC WORKS	301
DATE: OCT. 2018	CITY OF LEWES, DELAWARE	DRAWING NO.



NOTES

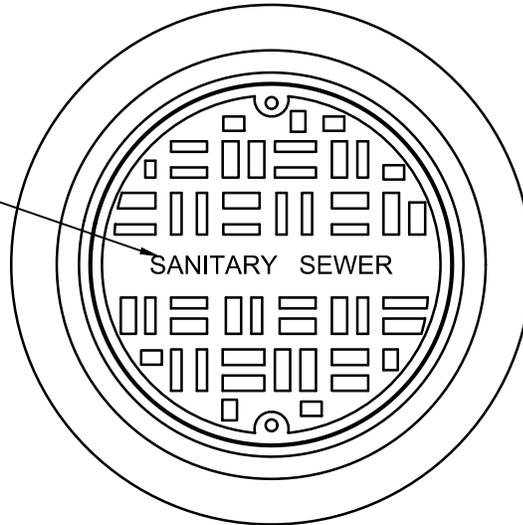
1. STAINLESS STEEL STRAPS SHALL BE 1/8 " X 1" MIN.
2. STAINLESS STEEL STRAP CONNECTORS SHALL BE EXPANSION BOLTS OR APPROVED EQUAL.

INSIDE DROP MANHOLE DETAIL

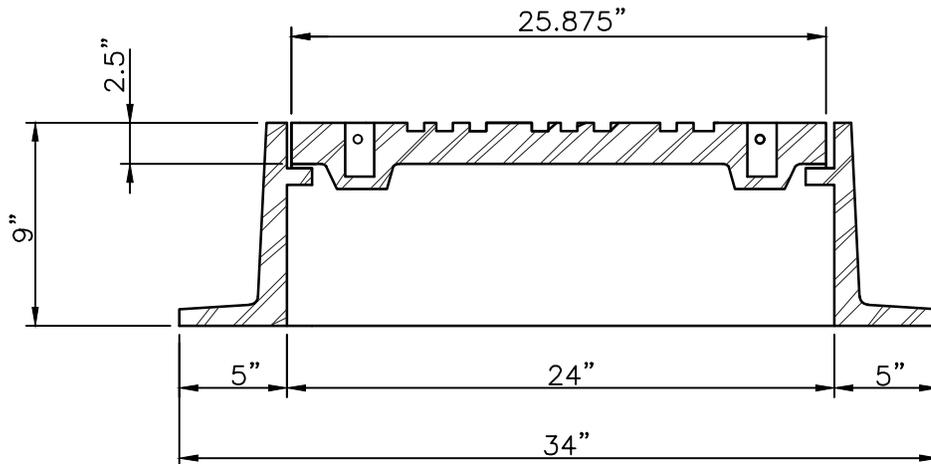
NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	302
SCALE: NONE		DRAWING NO.
DATE: MAY 2004		

"SANITARY SEWER" OR
"STORM DRAIN" CAST
ON COVER



EAST JORDAN IRON WORKS 1544AGS



MANHOLE FRAME AND COVER DETAIL

NO SCALE

JOB NO.: 2004002-C

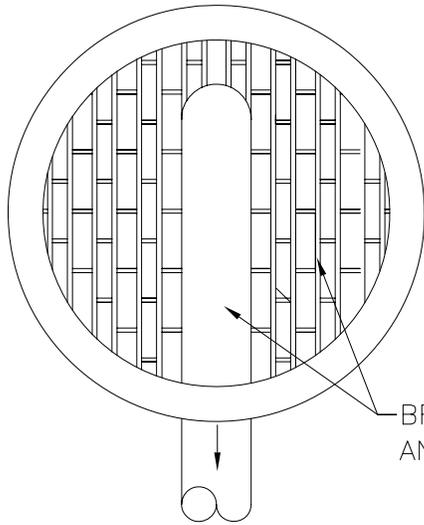
SCALE: NONE

DATE: OCT. 2018

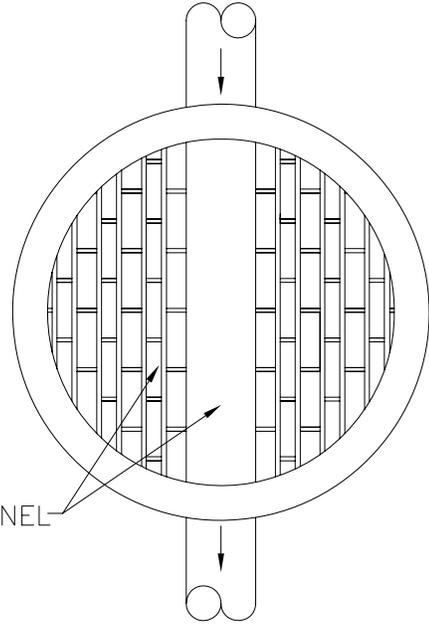
STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

304

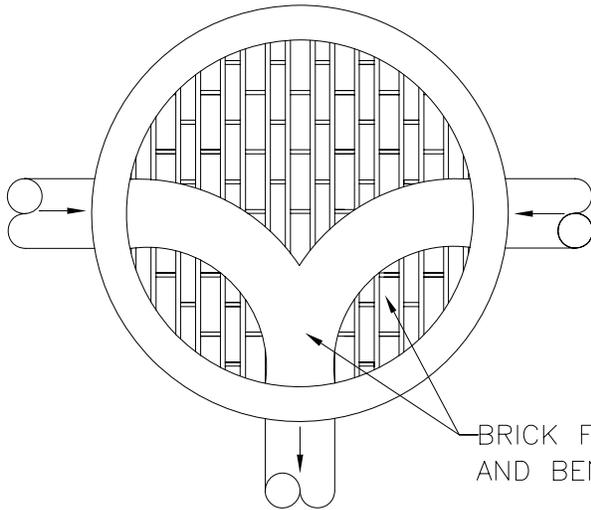
DRAWING NO.



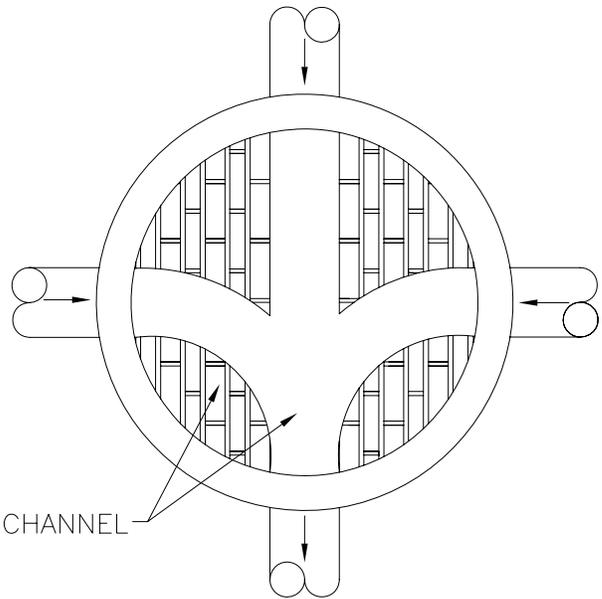
TERMINAL



1-WAY



2-WAY



3-WAY

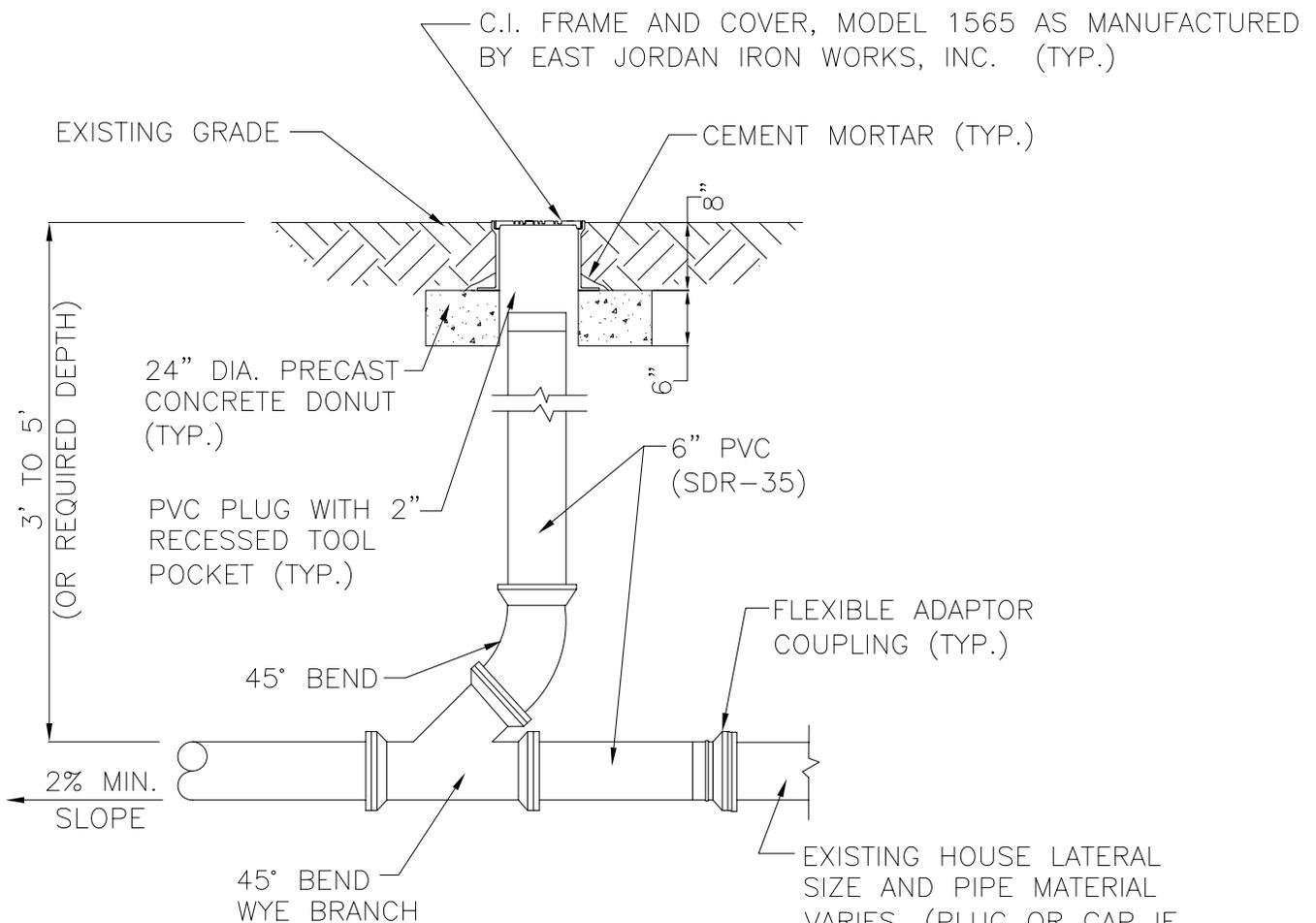
FLOW CHANNEL

NO SCALE

JOB NO.: 2004002-C
SCALE: NONE
DATE: MAY 2004

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

305
DRAWING NO.



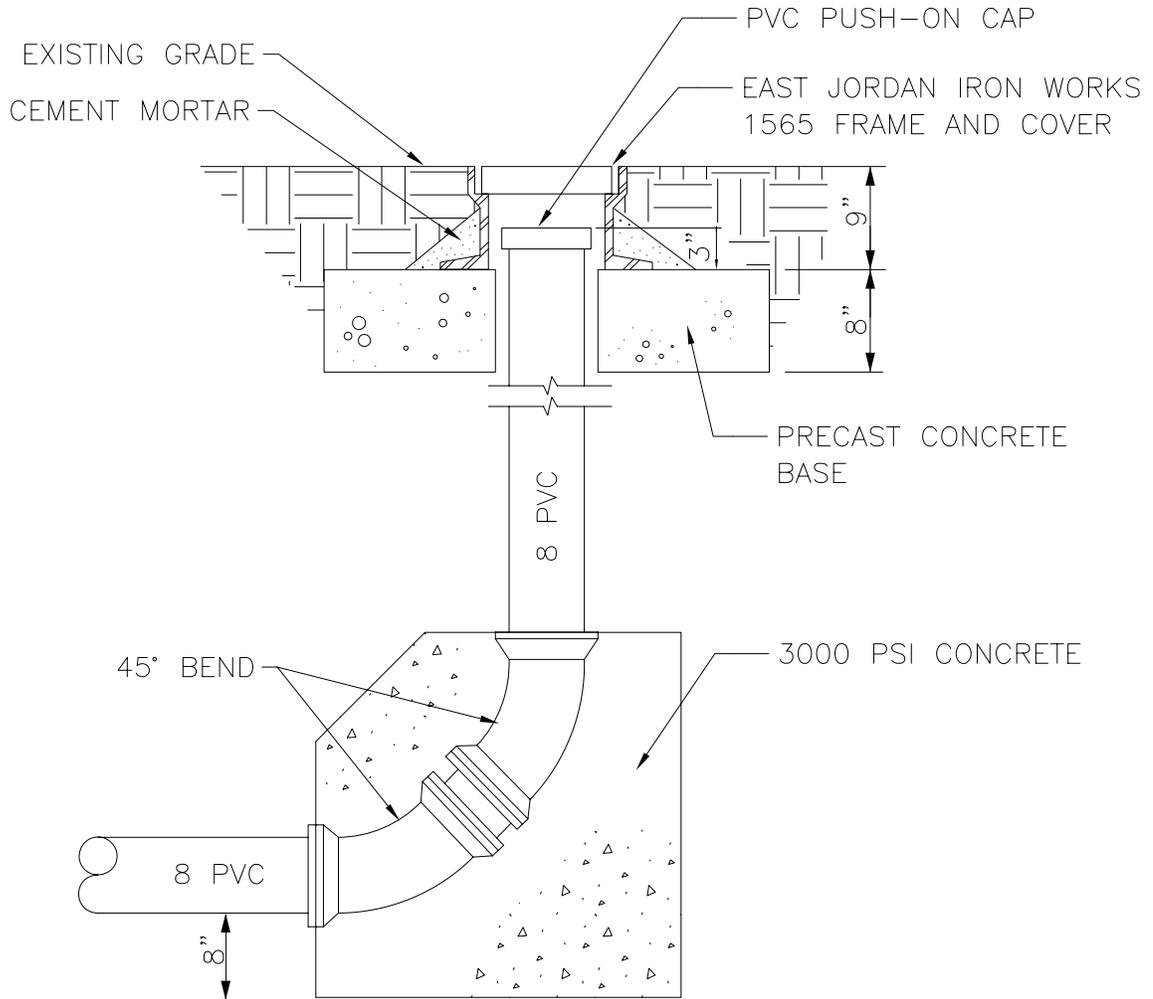
NOTES:

1. C.O. NOT TO BE LOCATED IN DITCH, SWALE, ETC.
2. MAINTAIN 10' MIN. SEPARATION BETWEEN WATER AND SEWER LINES.

STANDARD LATERAL CLEANOUT

NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	307 DRAWING NO.
SCALE: NONE		
DATE: MAY 2004		



TERMINAL CLEANOUT DETAIL

NO SCALE

JOB NO.: 2004002-C

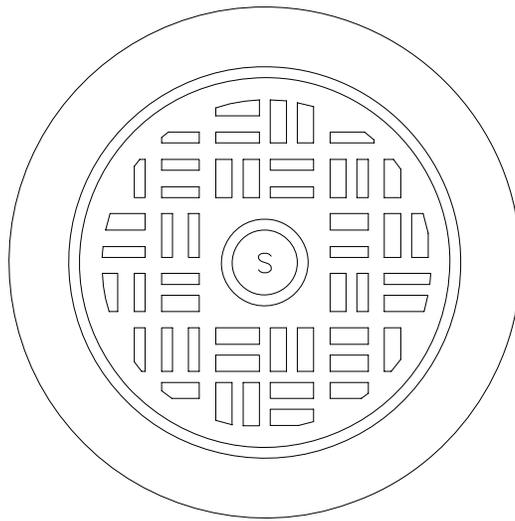
SCALE: NONE

DATE: MAY 2004

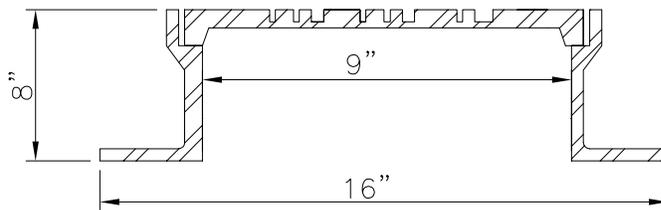
STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

308

DRAWING NO.



WEIGHT — APPROX. 85 LBS.
EAST JORDAN IRON WORKS 1565



CLEANOUT FRAME AND COVER DETAIL

NO SCALE

JOB NO.: 2004002-C

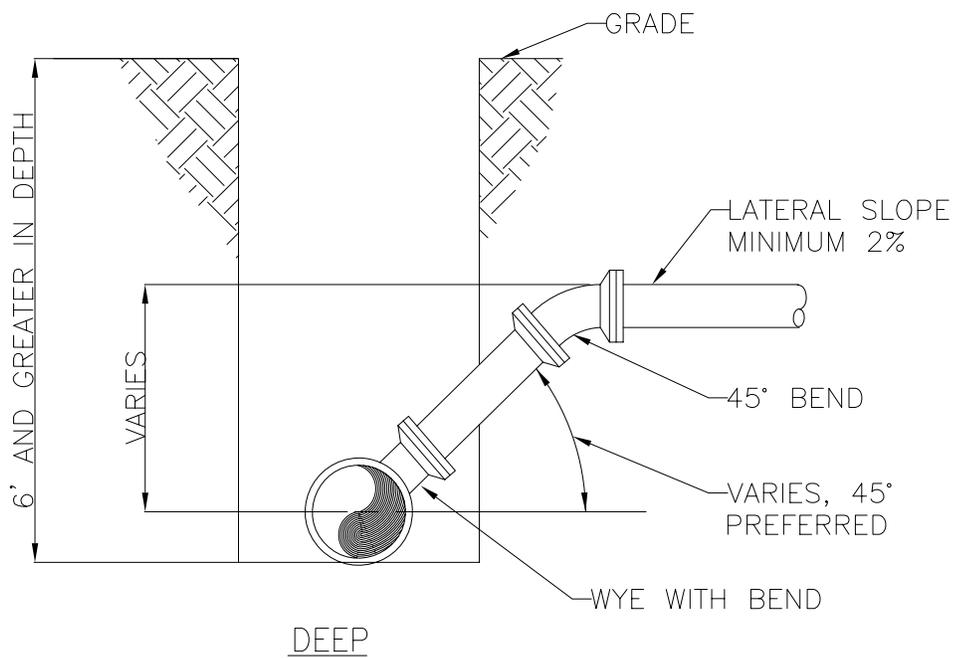
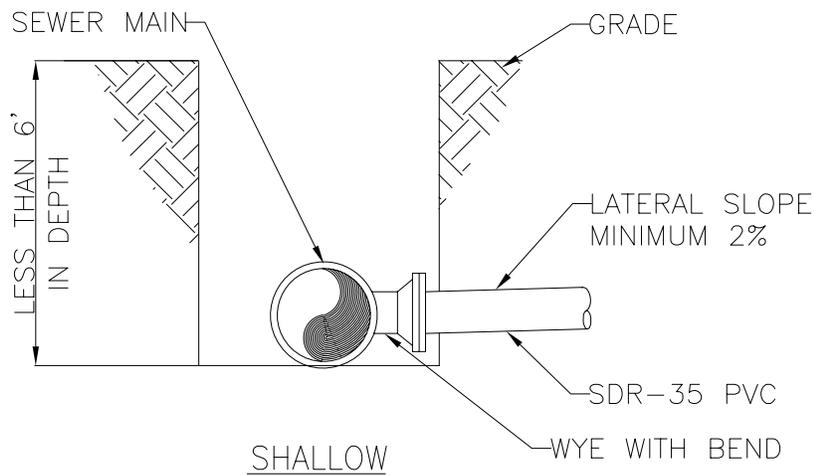
SCALE: NONE

DATE: MAY 2004

STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

309

DRAWING NO.



STANDARD HOUSE CONNECTIONS

NO SCALE

JOB NO.: 2004002-C

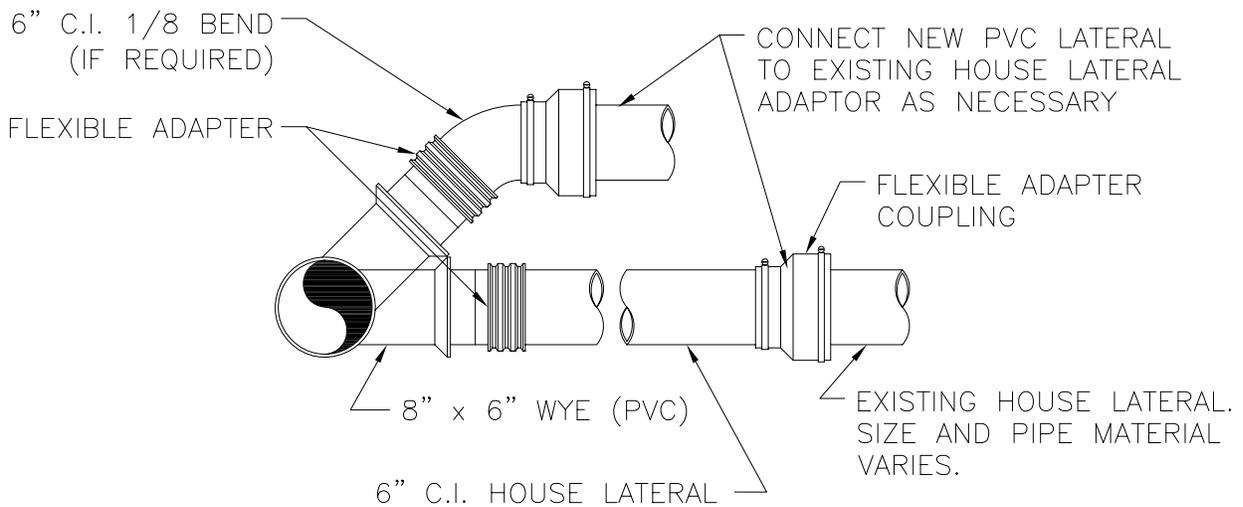
SCALE: NONE

DATE: MAY 2004

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

310

DRAWING NO.



SEWER LATERAL DETAIL- EXISTING CLEANOUT

NO SCALE

JOB NO.: 2004002-C

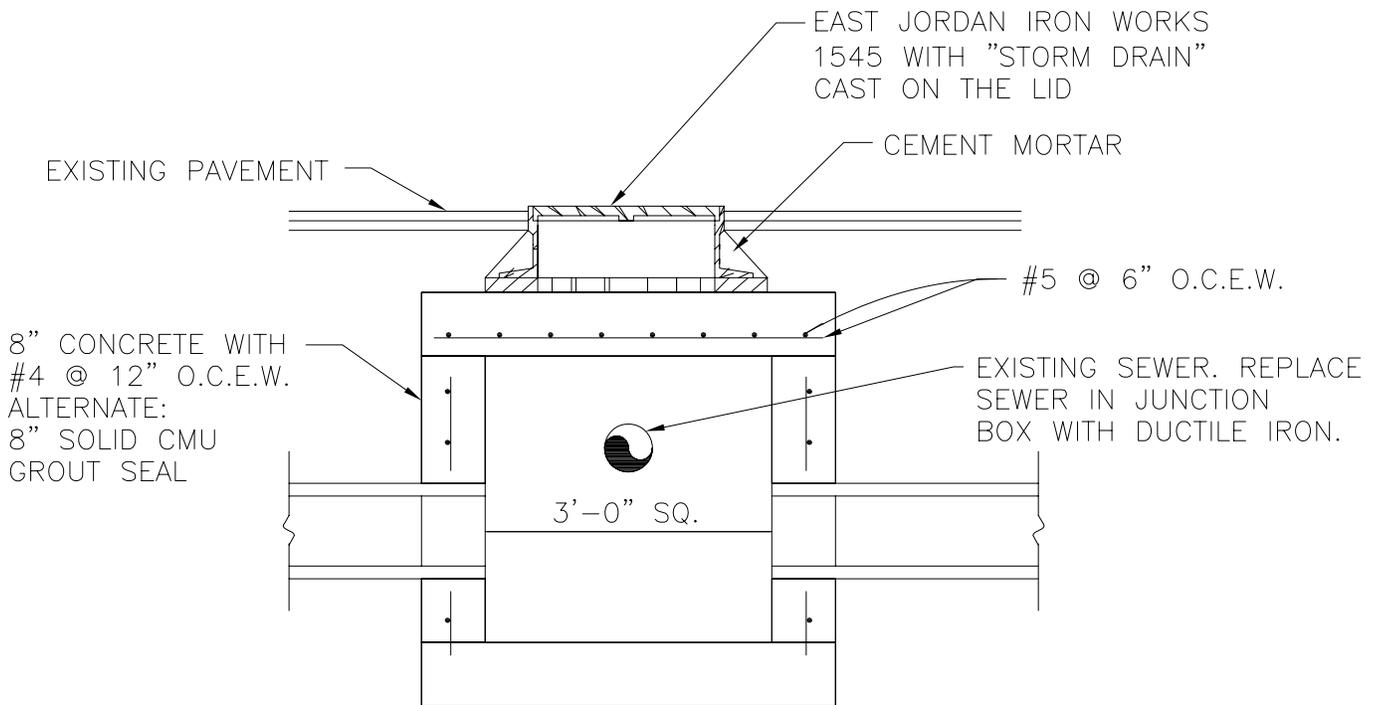
SCALE: NONE

DATE: MAY 2004

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

311

DRAWING NO.



JUNCTION BOX DETAIL

NO SCALE

JOB NO.: 2004002-C

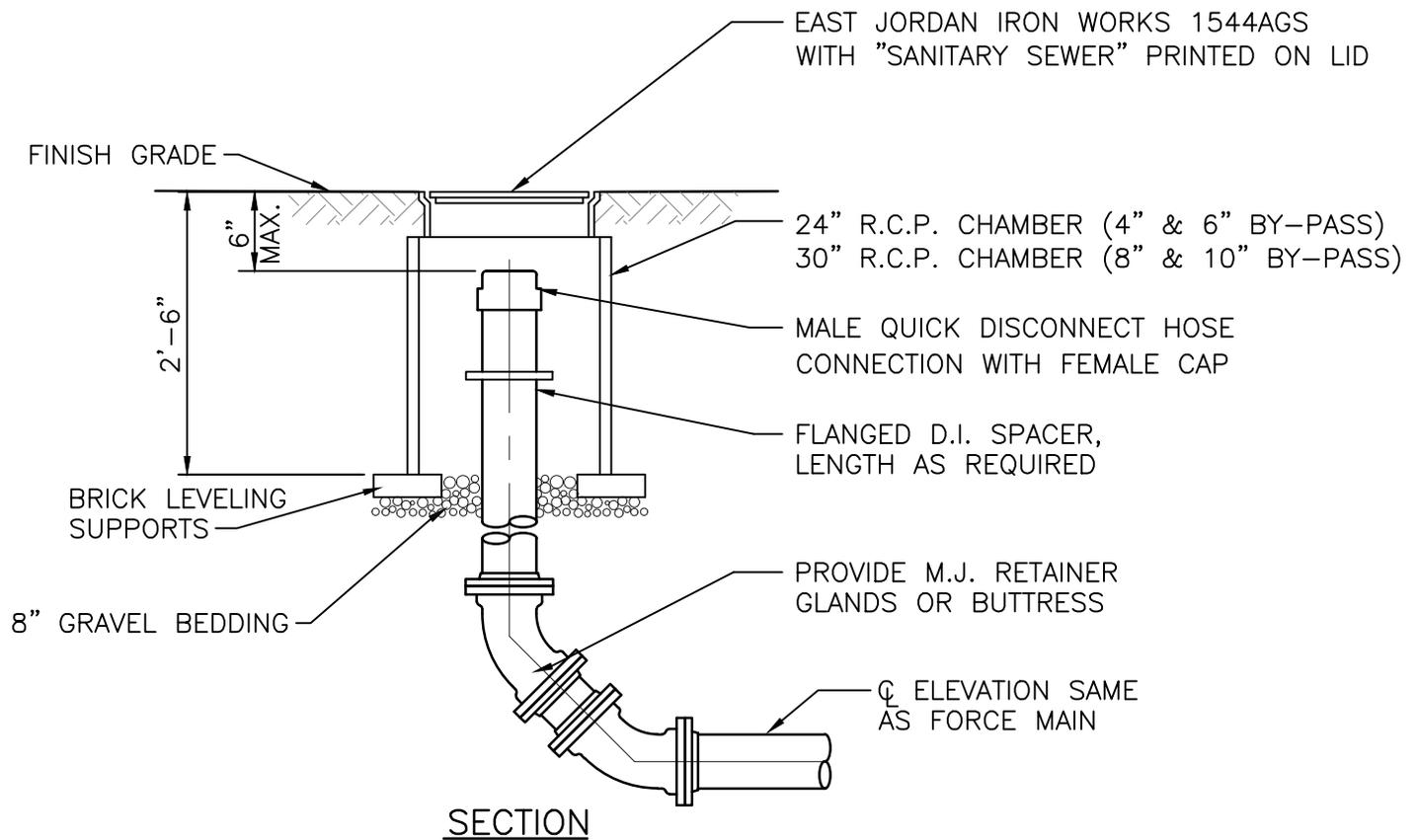
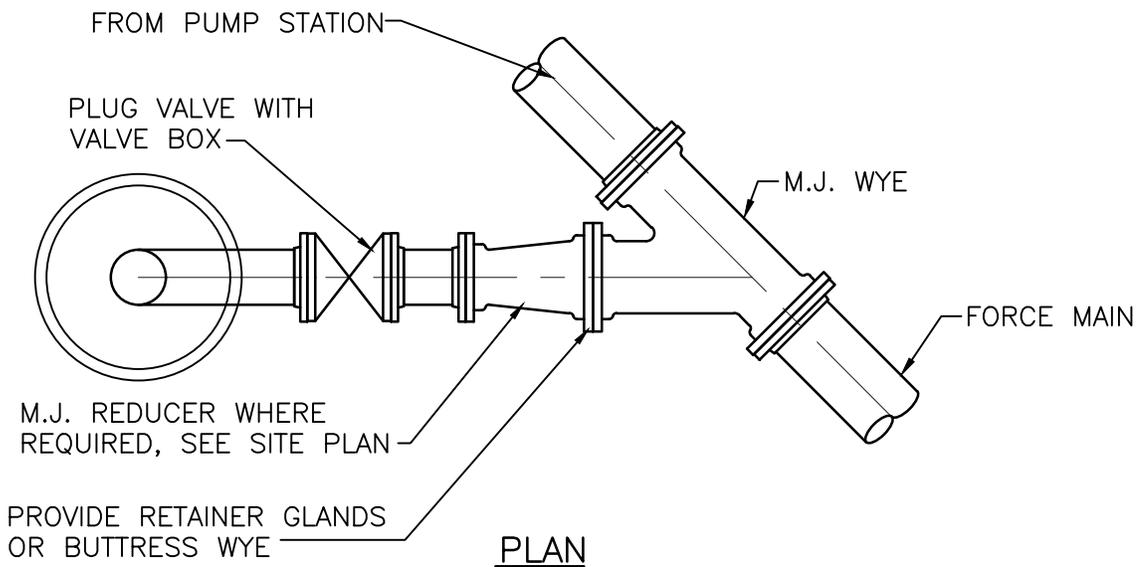
SCALE: NONE

DATE: MAY 2004

STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE

312

DRAWING NO.



BY-PASS CONNECTION DETAIL

NO SCALE

JOB NO.: 2004002-C

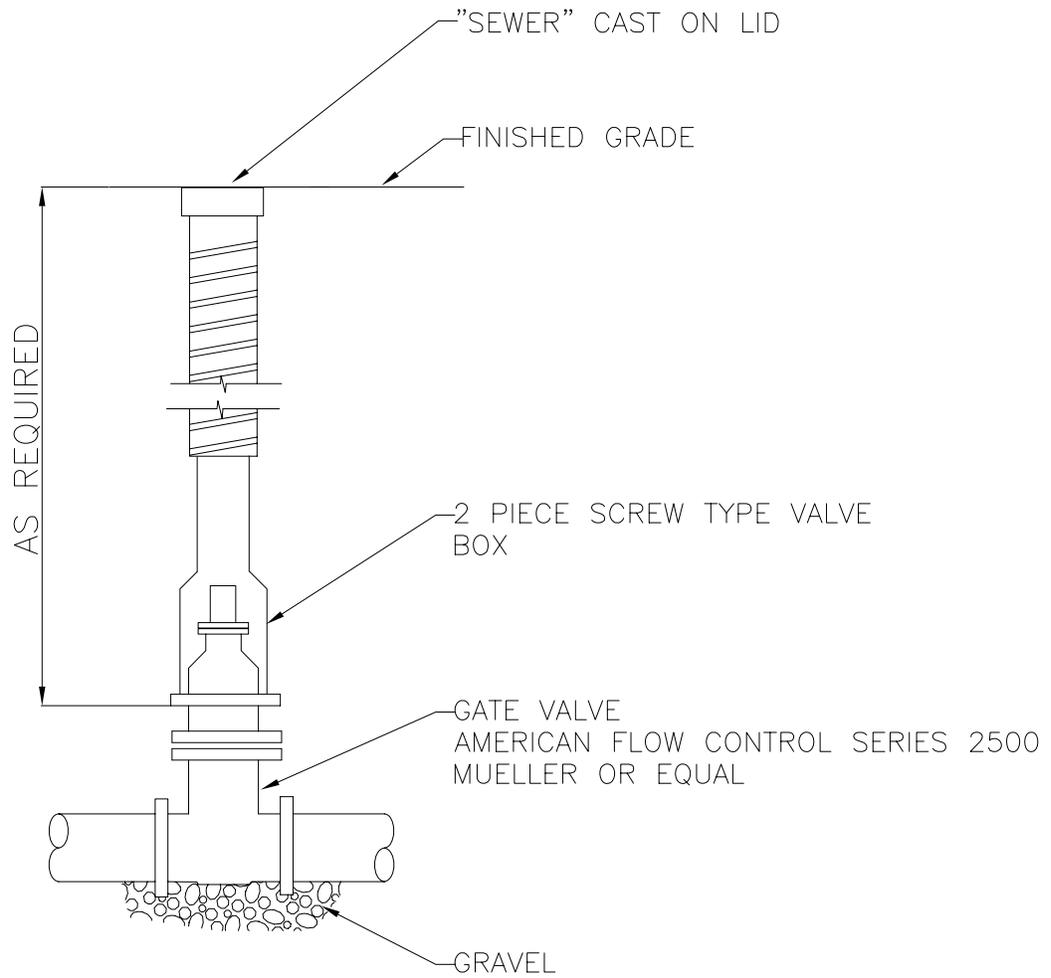
SCALE: NONE

DATE: OCT. 2018

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

400

DRAWING NO.



GATE VALVE DETAIL

NO SCALE

JOB NO.: 2004002-C

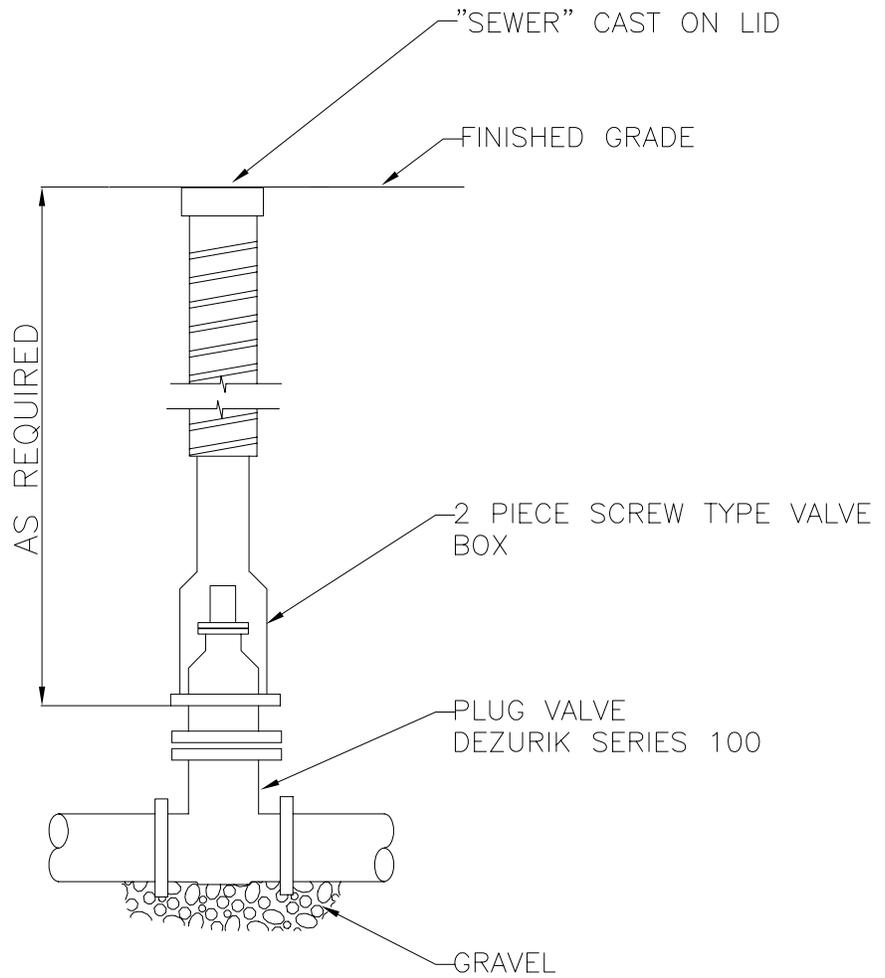
SCALE: NONE

DATE: MAY 2004

**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

401

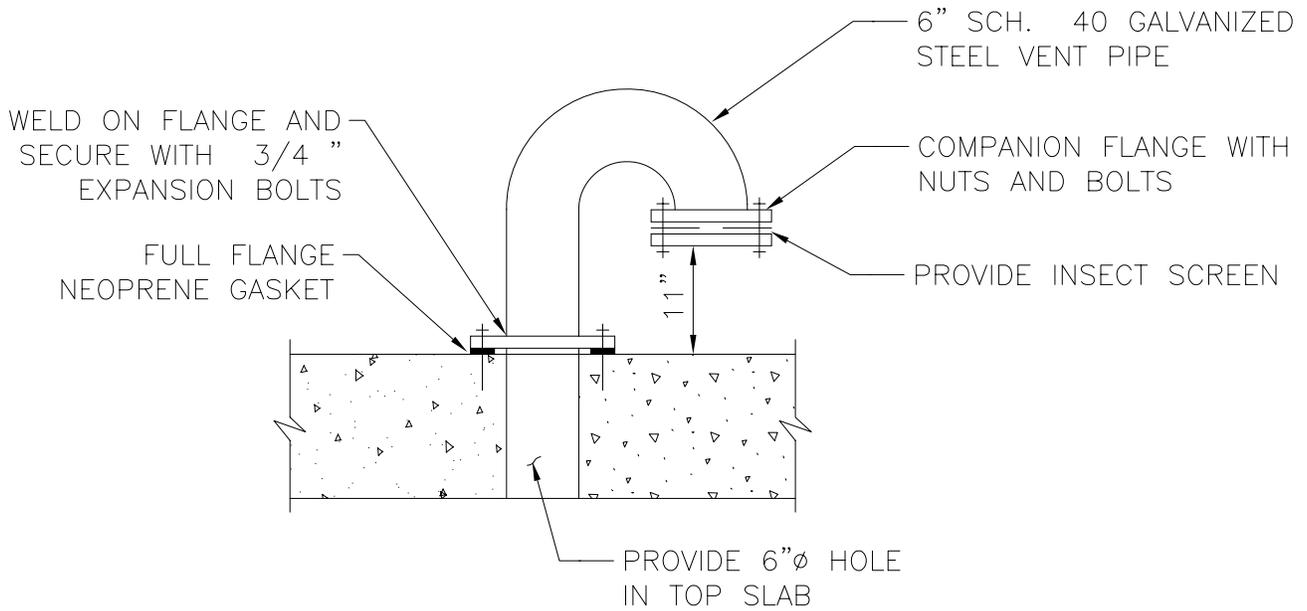
DRAWING NO.



PLUG VALVE DETAIL

NO SCALE

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	402 DRAWING NO.
SCALE: NONE		
DATE: MAY 2004		



VENT PIPE

NO SCALE

JOB NO.: 2004002-C

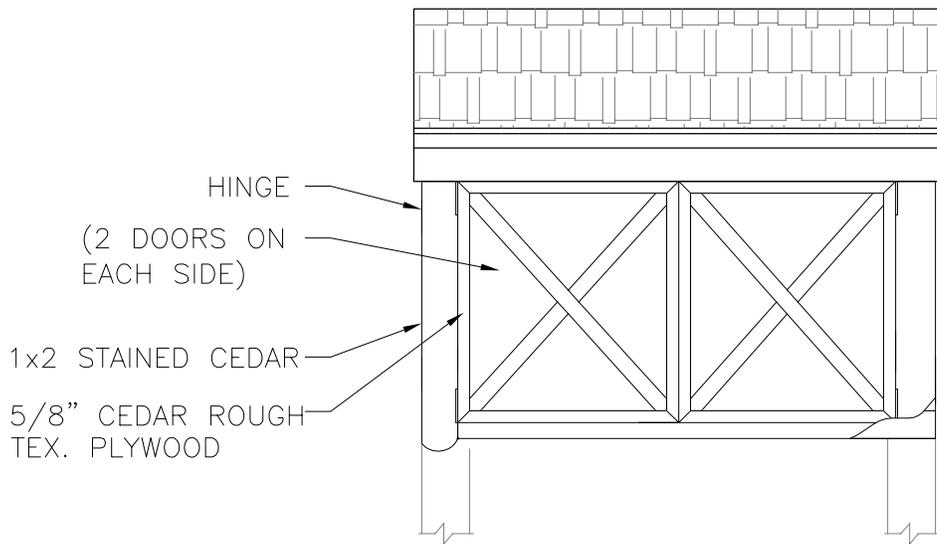
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DATE: MAY 2004

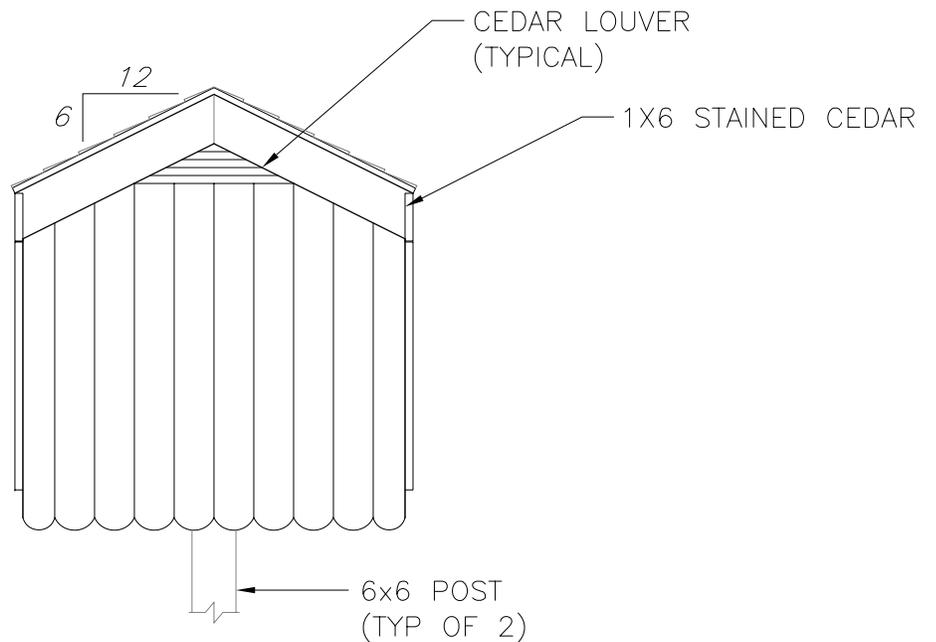
**STANDARD DETAILS
BOARD OF PUBLIC WORKS
CITY OF LEWES, DELAWARE**

403

DRAWING NO.



FRONT VIEW



END VIEW

SEE WALL SECTION AND
DETAILS ON SHEET 405

JOB NO.: 2004002-C

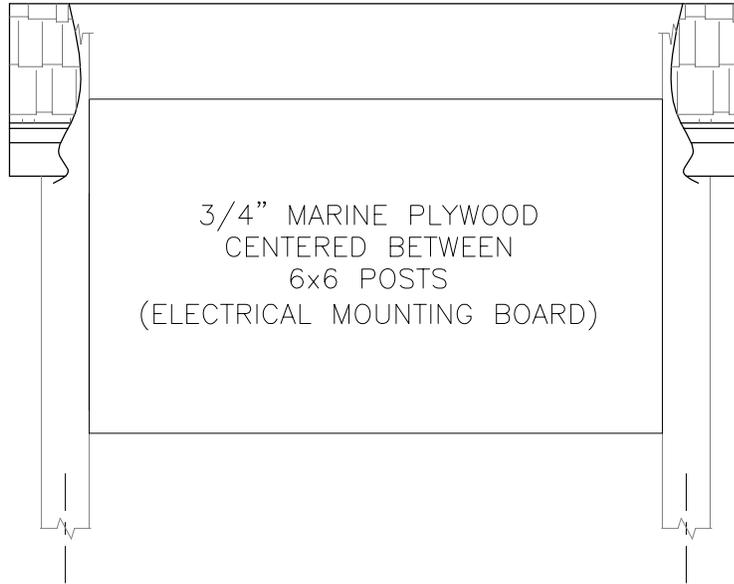
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DATE: MAY 2004

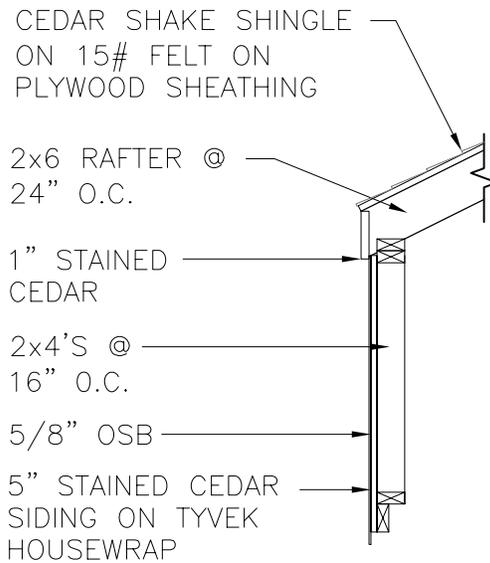
**STANDARD DETAILS
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CITY OF LEWES, DELAWARE**

404

DRAWING NO.



MOUNTING BOARD DETAIL



TYPICAL WALL SECTION

JOB NO.: 2004002-C	STANDARD DETAILS BOARD OF PUBLIC WORKS CITY OF LEWES, DELAWARE	405 DRAWING NO.
SCALE: NONE		
DATE: MAY 2004		