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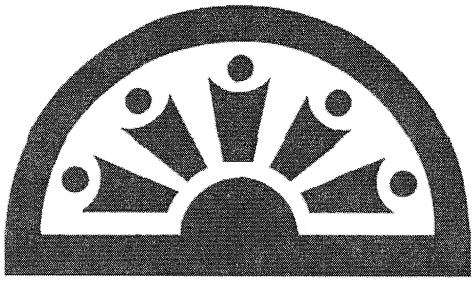

WEST POINT

SANITARY SEWER SYSTEM

SEPTEMBER 2008

STANDARD FOR DESIGN AND CONSTRUCTION SPECIFICATIONS

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CITY OF WEST POINT, GEORGIA
SANITARY SEWER SYSTEM CONSTRUCTION SPECIFICATIONS

1.0 SCOPE

This specification covers the material requirements and installation procedures for all sanitary sewer pipe, structures and appurtenances to be accepted into the City of West Point sewer system. Any sewer pipe, structures or appurtenances which the City has reason to believe are not in conformance with these specifications will not be accepted.

2.0 GENERAL

The contract drawings approved by the City indicate the extent and general arrangement of the sanitary sewer system. If any departure from the approved contract drawings is deemed necessary by the contractor, details of such departures and the reasons therefore shall be substituted to the City as soon as possible for approval. No such departures shall be made without the City's written approval. All approved sewer system plans and these specifications shall be considered as supplementary, one to the other, so that materials and labor indicated, called for, or implied by these specifications and not on the plans shall be supplied and installed as though specifically called for on the plans. No utility system shall be constructed, erected, altered, or repaired unless a certified utility manager or certified utility foreman who holds a current certification is present at the job site of such construction, erection, alteration, or repair of the utility system. Proof of such certification shall be provided to the City prior to the commencement of any utility work. All contractors should be aware of the City's construction specification requirements prior to construction. Sanitary sewer as built including tap locations shall be submitted to the City prior to final approval.

3.0 QUALITY ASSURANCE

Acceptance of all sewer pipe, structures and appurtenances shall be on the basis of the City's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable standards. Each pipe shall be clearly marked as required by the governing ASTM Standard Specifications to show its class, date of manufacture and the name and trademark of the manufacturer. Latitudes in workmanship and finish allowed by the ASTM Specifications not withstanding all pipe shall be first quality, have smooth exterior and interior surfaces, and be free from cracks, blisters, and other imperfections, and true to theoretical shapes and forms throughout each length. All pipes shall be subject to inspection by the City at the trench and other points of delivery for the purpose of accepting or rejecting

pipe, independent of laboratory tests, which does not conform the requirements of this Section. Pipe, which does not conform, shall be marked as such by the City and shall not be delivered or used in the work. On-the-job repairing of rejected pipe will not be permitted. Any pipe or special items which have been broken, cracked or otherwise damaged before or after delivery or which have failed to meet the required tests shall be removed from the site of the work and shall not be used therein.

4.0 PIPE MATERIALS

4.1 Polyvinyl Chloride Gravity Sewer Pipe (six-inch diameter through 18-inch diameter):

A. Pipe: PVC gravity sewer pipe shall be SDR 26 manufactured in accordance with ASTM D 3034 November 1985 or latest revision, and supplied in lengths of 20-feet. Pipe eighteen (18") inches or larger shall have a minimum wall thickness conforming to ASTM F679 under the classification for PS115 as amended to date.

B. Joints: Joints for pipe and fittings shall be of the bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage. The joint system shall be identical for pipe and fittings and performed in strict conformance with ASTM D 3212 and ASTM F 477.

C. Fittings: Fittings for pipe shall be one piece with no solvent-welded joints. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings delivered ready for use.

D. Testing: Material acceptance will be on the basis of the City's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable ASTM standards, latest revisions.

4.2 Ductile Iron Pipe (six-inch diameter through 48-inch diameter):

A. Ductile iron pipe shall conform to AWWA C151 and shall be a minimum of class 50 or greater if specified by the designing engineer. All ductile iron pipe shall have cement mortar lining. Cement mortar lines ductile iron pipe may be acceptable at the City's discretion in limited situations. The City will determine the polyethylene lining for pipe and fittings. Fittings shall conform to AWWA C110 with a rated working pressure of 150 PSI. Pipe and fittings shall be

furnished with a bituminous outside coating. Minimum cover shall be four-feet. Where cover is less than four (4") feet, ductile iron pipe must be used.

B. Joints: Pipe shall have push-on joints. All non-restrained fittings shall be mechanical type. Joints shall conform to AWWA C111. Restrained joint pipe and restrained joint fitting shall be either the bolted joint type or modified push-on joint type with joint restraint using ductile iron components. Restrained joint pipe on piers shall have bolted joints and shall be specifically designed for clear spans of at least 18-feet. Ductile iron pipe must be approved by the City prior to installation and must meet AWWA Standards.

C. Testing: Acceptance of the material will be based upon the City's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with all applicable standards.

4.3 Reinforced Concrete Pipe (24-inch diameter or greater unless approved by the City):

A. Pipe: Pipe shall be reinforced concrete bell and spigot with type two cement and calcareous aggregate conforming to ASTM C 76 for Wall C pipe. Pipe shall be supplied in lengths of at least eight feet.

B. Joint: Pipe shall have rubber gasket type joints with steel and rings conforming to ASTM C 443. A rectangular groove shall be supplied in the spigot end to receive the rubber gasket, and it shall be so formed to a rectangular shape and confined on all four sides. Bell and spigot surfaces shall be accurately formed and smooth to provide a close sliding for with a nominal clearance of 1/16-inch.

B. Testing Requirements: Concrete pipe with a diameter of 60-inches or greater shall undergo a certified material test and inspection of manufactured pipe for defects and imperfections defined in paragraph 4.1.2. of ASTM C 76. Concrete pipe with a diameter between 30 inches and 60 inches shall in addition undergo plant load bearing testing. Test results on pipe, joint material, and made-up joints must be performed by an independent testing laboratory approved by the City. Results to be supplied shall include materials, absorption, crushing (where applicable), and hydrostatic leakage on pipe each size in accordance with applicable specifications.

D. Lining: The reinforced concrete pipe shall be epoxy lined.

E. Contractor Inspection: The contractor shall inspect pipe after delivery for laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, hammer test, damaged ends, and gasket grooves. The contractor will not accept or use repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders.

4.4 Ductile Iron Pipe shall be used for the following conditions:

A. Where depth of soil cover is less than four (4) feet before or after sewer installation.

B. Where depth of soil cover is greater than fifteen (15) feet before or after sewer installation.

C. Where sewer crosses over or under a storm drain pipe.

D. Where sewer crosses over or under a water main.

E. Where sewer crosses over or under a stream or ditch.

F. Other locations deemed necessary by the City of West Point.

5.0 SANITARY SEWER DESIGN CRITERIA

5.1 No gravity sewer conveying raw wastewater shall be less than eight (8") inches in diameter.

5.2 HYDRAULICS

A. Gravity sewer pipe shall have straight alignment and consistent grade change between manholes.

B. Sewers shall yield mean velocities of not less than 2.0 feet per second based on the Manning Formula using an "n" value of 0.013.

C. Recommended and absolute minimum pipe slopes for gravity sewer based on the size of pipe to be installed are summarized in the following table.

Slope Requirements

Diameter	Minimum	Recommended
8-inch	0.40%	0.70%
10-inch	0.28%	0.50%
12-inch	0.22%	0.40%
14-inch	0.17%	0.40%
15-inch	0.15%	0.30%
16-inch	0.14%	0.30%
18-inch	0.12%	0.24%
21-inch	0.10%	0.20%
24-inch	0.08%	0.16%
27-inch	0.07%	0.14%
30-inch	0.06%	0.12%
36-inch	0.05%	0.10%

D. The over sizing of pipe to meet minimum grade requirements shall be prohibited.

E. The maximum slope of a gravity sewer shall be 15.0%. If approved by the City of West Point, slopes between 15.0% and 20.0% may be used with the addition of concrete anchors. The Developer's Engineer shall determine the size and spacing of anchors. The City of West Point shall approve all anchor designs.

5.3 Angle formed by alignment of influent and effluent sewer pipe at manhole shall be greater than (>) or equal (=) to 90° and less than (<) or equal to 270°.

5.4 When increasing the size of gravity sewer pipe, pipe crowns shall be matched at manholes.

5.5 The surcharging of manholes shall be prohibited.

5.6 EXCAVATION

The contractor is to perform all excavation of every description and of whatever substance encountered to the depth shown on the approved construction drawings for all sewers, manholes, piers, conduits, and other appurtenances. All excavation is to be performed in strict conformance with the Occupational Safety and Health Act of 1970 (PL 91-596) or latest applicable

revision. Contractor is responsible for acquiring all applicable city and county permits. Excavation shall be accomplished by open cut, unless otherwise directed. No tunneling shall be done, except as approved by the City or the Georgia Department of Transportation. It is the responsibility of the contractor to ascertain all permits by all governing agencies prior to installing any sewer pipe or appurtenances beneath their roadway pavement.

5.7 Trench Dimensions:

The top portion of the sewer pipe trenches may have sloping or vertical sides to widths, which will not cause damage to adjoining structures, roadways, pavements, utilities, and private property. For untimbered trenches and trenches held by stay bracing only, the width of the lower portion of the trench to a height of two-feet shall be specified in the "Maximum Trench Widths and Depths" Section 6.5. Where skeleton and solid sheeting is used, trench width may be increased to dimensions approved by the city, but shall not be greater than that necessary to clear the walls when lowering pipes into the trench. Where in the opinion of the City trench excavation may damage adjoining poles, roadways, utilities, and private property, the City may order suitable sheeting to be installed for their protection. Such orders shall in no way relieve the contractor from that responsibility of protection of these facilities, nor shall the lack of those orders relieve the contractor from that responsibility. If trenches are excavated to widths in excess of the above limitations, or collapse because of insufficient bracing and sheeting, the developer will be required to use special methods of constructing pipe foundations and backfilling as specified herein. All construction must meet or exceed OSHA Standards. Trench excavation shall not advance more than 600 feet ahead of pipe laying, unless approved. The bottom of all trenches shall be smooth and flat and with backfill material affording full bearing of the pipe barrell. The depth and width required shall be directed by the City. Excavation in excess of the depth required for proper trenching shall be corrected by one of the special methods specified herein, as ordered by the city. Bell holes shall be excavated in a manner which will receive pipe bells of all load, and ensure support is provided throughout the length of the pipe barrel. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of Class "C" concrete. If trenches are excavated to excessive dimensions or collapse because of inadequate or improperly placed bracing and sheeting, the pipe shall be laid using the next class of bedding. If over excavation for manholes and other structures occur, the area under the structure or manhole shall be backfilled with granular bedding material to the required grade.

5.8 Bracing and Sheeting:
The contractor shall provide bracing and sheeting when required by regulations or to prevent damage to adjoining structures, roadways, and pavements, utilities, trees, or private property which are specifically required to remain.

A. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the City it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

B. Steel Sheet Piling: Continuous locking joint steel sheet pilings may be substituted for timber sheeting when approved by the City. Steel piling may be removed, without cutting, provided the rate of removal is kept in pace with the tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the piling. Complete withdrawal of the piling in advance of the tamping and backfilling will not be permitted. Piling, where directed to be left in place by the City for reasons of safety, will be cut off where directed.

5.9 Dewatering Trenches: Trenches requiring dewatering shall be dewatered continuously to maintain a water level below the bottom of the trench. Dewatering running sand shall be accomplished by well pointing. Where soil conditions do not permit use of well pointing, construct trench drains of crushed stone or gravel to conduct water to sumps. Any problems from the dewatering process shall be the responsibility of the contractor. Dewatering wells must be removed and all voids filled when the job is completed.

5.10 Trench Stabilization: Wherever the sub-grade is by nature too soft and mucky in the opinion of the City for the proper installation of the sewer, the City may order the contractor to undercut the ditch and backfill with crushed stone or gravel not larger than ¾ inch in size. The stone shall be brought to grade and compacted.

6.0 ROCK EXCAVATION

6.1 Definition of Rock: Any material, which cannot be excavated with a backhoe, having a bucket curling force rated at not less than 18,300 pounds (Caterpillar Model 215 or equal) and occupying an original volume of at least ½ cubic yard.

6.2 Excavation: Where rock is encountered in trenches, it shall be excavated to the minimum depth which will provide eight inches or more clearance below the pipe barrel and manhole. Remove boulders and stones to provide a minimum of six inches clearance between the rock and any part of the pipe or manhole.

6.3 Blasting: The contractor shall provide only experienced workmen to perform blasting. All blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The contractor shall be responsible for repairing any resulting damage. If the contractor persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the City may direct the contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge. The contractor blasting shall be insured.

6.4 Removal of Rock: Excavated rock shall not be used as backfill material. Rock which is surplus or not suitable for use as rip-rap shall be disposed of.

6.5 Maximum and Minimum Trench Widths: Trench widths for each pipe installation will be dictated by the soil conditions encountered. Trench width for all pipe materials shall be kept to nine inches minimum and 12 inches maximum on both sides of the outside diameter of the pipe.

7.0 BEDDING-FLEXIBLE CONDUIT

7.1 The following bedding materials and installation requirements shall be followed for polyvinyl chloride pipe being installed.

A. Trench Preparation: The bottom of the trench shall be flat and excavated to the minimum depth below the bottom of the pipe barrel as shown on the drawing.

B. Bedding Placement and Compaction: The contractor shall place and compact the bedding material to the proper grade. The bedding material shall be carefully placed by hand and hand tamped to provide full support under the pipe and to the top of the pipe. The contractor shall be cautious when tamping so no voids will be present in the backfill in the haunch area of the pipe. No compaction of the backfill other than hand tamping will be allowed until the backfill above the pipe reaches two feet above the top of the pipe.

C. Bedding Material: Crushed stone bedding shall meet the requirements of ASTM C 33 No. 57, No. 6 or No. 67 stone. Bedding for PVC pipe shall be in accordance with ASTM D2321.

8.0 BEDDING – RIGID CONDUITS

8.1 Class of Bedding for Various Depths of Installation of Reinforced Concrete Pipe:

Bedding for reinforced concrete pipe shall be in accordance with ASTM C 12 Bedding standards with the depths of installation shown on the approved drawings and in accordance with Table I hereinafter.

8.2 Bedding for ductile Iron Pipe: The contractor shall excavate the trench to ¼ the normal pipe diameter below the depth shown on the approved plans. Bedding material shall be placed and compacted by the contractor to the proper grade. Bedding shall then be carefully placed and compacted to provide full support under and up to the center line of the pipe.

8.3 Bedding Material: In most instances, clean native soil meeting the Class I material requirements may be used for bedding of Ductile Iron Pipe. Crushed stone bedding material shall meet the requirements of ASTM C 33 No. 57, No. 6, or No. 67 stone.

TABLE 1 TRENCH WIDTHS AND DEPTHS IN FEET FOR REINFORCED CONCRETE PIPE, WITH VARIOUS BEDDING METHODS				
Maximum Trench Width	**Class Of Pipe**	**C**	**B**	**A**
4' – 7"	3	13	16	30
4' – 7"	4	20	28	30
4' – 7"	5	30	30	30
5' – 5"	3	13	16	28
5' – 5"	4	20	28	30
5' – 5"	5	30	30	30
6' – 1"	3	14	18	30
6' – 1"	4	22	28	30
6' – 1"	5	30	30	30
6' – 9"	3	14	17	29
6' – 9"	4	22	27	30
6' – 9"	5	30	30	30
7' – 6"	3	15	18	26
7' – 6"	4	20	24	30
7' – 6"	5	30	30	30
8' – 3"	3	16	18	28
8' – 3"	4	22	27	30
8' – 3"	5	30	30	30
9' – 0"	3	16	18	28
9' – 0"	4	22	27	30
9' – 0"	5	30	30	30
9' – 9"	3	16	18	28
9' – 9"	4	22	27	30
9' – 9"	5	30	30	30

8.4 Bell Holes: Bell Holes shall be provided in all classes of bedding so as to relieve pipe of all load. Bell holes are not required for clay plain-end pipe.

8.5 Increase in Bedding Classes: The determination of the bedding class shall be from the actual width of the trench. If the contractor increases the width of the trench for his convenience of due to collapse of trench walls so that a higher class of bedding is required, the increase cost of same shall be borne by the contractor. If the bearing value of the sub grade is determined by the contractor or the City to be inadequate for a particular class of bedding, the contractor

shall substitute higher class bedding. In inundated area's, the contractor shall add the necessary granular bedding material to stabilize the pipe trench as determined by the City. Class D bedding is not authorized.

9.0 BACKFILLING

The contractor shall backfill all trenches fully to restore the ground surface to its original condition. The contractor shall dispose of all surplus material. Backfill material cannot contain any rock larger than six inches square or any trees, stumps, or limbs. The right-of- way shall be sloped with contour of the land so that the right-of-way does not act as a ditch for water run off.

9.1 Suitable Backfill Material: Suitable backfill material is earth material excavated from the trench which is clean and free of rock, organic, and other unsuitable material. The contractor should use extreme care when selecting the initial back-fill material to be placed to a depth of 12 inches over the top of the pipe. This initial backfill material should be free of all rock, and clods which could damage the pipe in any way. If the backfill material excavated from the trench is not suitable for use as initial backfill material, the contractor will obtain suitable materials elsewhere.

9.2 Procedures for Backfilling: The contractor shall place the initial backfill material carefully around the pipe or over the bedding material covering PVC or ductile iron pipe in uniform six- inch layers to a depth of at least 12 inches above the pipe bell. Each layer shall be compacted thoroughly without disturbing or damaging the pipe. Caution should be taken when compacting backfill material above polyvinyl chloride pipe. The backfill material over PVC pipe should be compacted by hand tamping until a depth of one feet above the top of the pipe is reached. The contractor shall backfill on both sides of all types of pipe simultaneously to prevent side pressure.

9.3 Compaction Methods for Fill More Than Two Feet Above the Pipe: The contractor shall compact the backfill in six-inch layers if using light power tamping equipment, such as a "jumping jack." The contractor shall compact the backfill in two-foot layers if using heavy tamping equipment, such as a hammer with tamping feet. Pipe shall have at least thirty inches (30") of cover before wheel loading and at least forty-eight inches (48") of cover before using heavy-duty tamping equipment such as a hydrohammer.

9.4 Backfill Under Roads: Backfill to be placed under roads shall be compacted to 95% Standard Proctor Density per ASTM D 698 or as required

by all local governmental agencies that have jurisdiction over the road. The contractor shall be responsible for compaction tests.

9.5 Settlement: If trenches settle, the contractor shall refill and grade the surface to conform to the adjacent surfaces.

9.6 Surfacing of Trenches in Dirt Streets and Driveways: Where trenches are along dirt streets and across dirt driveways open to vehicular traffic, the remaining 12 inches of backfill up to the traveled surface shall be made with crusher run stone, compacted and maintained until the pavement is replaced.

9.7 Surfacing of Trenches in Paved Streets and Driveways: Where trenches are in paved streets and driveways, the remaining 12 inches of backfill up to the traveled surface shall be made with crusher run stone, compacted and maintained until the pavement is replaced.

9.8 Additional Material: Where final grades above the pre-existing grades are required to maintain minimum cover, the contractor is to supply additional fill material to meet the final grade requirements shown on the drawings. The contractor may utilize excess material excavated from the trench if the material is suitable. If the excess excavated materials are not suitable, or if the quantity available is not sufficient, the contractor shall provide additional fill material.

10.0 MANHOLES

10.1 Acceptable Manhole Materials: Manholes shall be precast per applicable ASTM C 478 standards. Manholes shall be eccentric. Manholes shall have copolymer coated plastic steps on centers between 12 and 16 inches for all manholes over two feet in depth. All manholes shall have flexible boot seals where the sewer pipes enter and leave the manhole. All flexible rubber boot seals shall be jointed to the manhole at the manufacturing plant. Holes for pipe entering or leaving the manhole shall be core drilled to a minimum of six inches above the base floor of the manhole at the plant or in the field and a rubber boot installed. Manholes shall use mastic seat at the joints and shall be grouted inside and outside.

10.2 Manhole Trench Excavation: Manhole trenches shall be excavated to a minimum of 12 inches below the planned elevation of the base if the manhole. The contractor shall place and compact 12 inches of stone bedding material as a manhole foundation and set the bottom of the manhole to the required grade shown on the approved plans before constructing the manhole.

10.3 Bedding Material: All bedding material shall be crushed stone, unless shown or specified otherwise. Crushed stone bedding material shall meet the requirements of ASTM C 33 No. 57 and No. 67 stones.

10.4 Backfilling Around Manholes: Excavated material may be used for backfilling manholes above bedding if suitable and approved by the City. Backfill shall be placed in six-inch layers and compacted to 95% modified proctor per ASTM standards. Contractor shall be responsible for providing tests.

10.5 Inverts: Manhole inverts shall be pre-cast as per Section 10.1 Standards. **Invert Formation:** Invert channels shall be properly formed, rounded, and troweled smooth. Inverts shall be formed to the top of the pipe at the back of the table and ¾ of the pipe at the channel. The bench shall have a 2-inch in 12-inch slope. Special care shall be taken to lay the channel and adjacent pipes to grade. The inverts shall have a cross section of the exact shape of the pipes which it connects. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer and entering branch or branches shall have a true curve of a radius as large as the size of the manhole will permit. The connections of the sewer with the wall and channel of the manhole shall be tight and smooth. When brick filler material is used in the construction, the depth of grout above the brick work shall be at least two inches thick.

10.6 Top Elevations: All manholes outside paved areas shall be built to have top elevations shown on the plans or directed by the City. Manholes in paved areas shall be built to top elevations even with the existing grade. Adjustments of ring and covers for street resurfacing shall be accomplished utilizing an adjustment ring allowing vertical adjustments beginning with ¾ inch minimum and increasing at ¼ inch intervals up to 2 inches of height. Adjustment rings shall be "clear-span manhole and adjusting ring" or equal. Ring and cover adjustments in general shall not be greater than 18 inches unless approved by the City.

10.7 Drop Connections: Drop connections will be required, where called for on the drawings. Drop pipes shall be the same size as the sewer which they serve. Openings in walls of Pre-cast concrete manholes for drop connections shall not be made at joints. Drop connection fittings and riser pipes of PVC shall be encased in Class "C" concrete. Drop connections for pre-cast concrete manholes shall conform with the typical details for manholes shown in the Appendix. Drop connections shall be carefully backfilled to prevent dangerous

side pressures. A drop manhole connection is required if a sewer is designed to enter a manhole at an elevation greater than two (2') feet above the manhole invert.

10.8 Casting: Manhole rings and covers shall be per the City's standard drawings shown in the Appendix. Covers shall be either, the non-traffic, traffic, or bolt-down watertight type. Traffic type manhole covers will be used when the manhole is to be placed in pavement and/or will be subjected to vehicular loadings. Bolt-down watertight manhole covers will be used on all manholes to be placed in flood plain areas and other areas as determined by the City.

10.9 Future Sewer Connections: Where shown on the drawings, a 12-foot long pipe stub for future sewer connections shall be laid on proper grade and alignment and plugged with a factory plug with the same type joint as used on the sewer pipe. The location of the end of the stub is to be flagged in the field by the contractor and indicated on the as-built drawings to be supplied to the City by the developer.

10.10 CORROSION PROTECTION.

A. Manholes and riser sections should be epoxy coated in situations where high concentrations of hydrogen sulfide gas are present.

B. Manholes receiving a force main discharge should be coated for corrosion protection.

11.0 FORCE MAINS:

11.1 Force main shall be PVC AWWA C900 Class 150.

11.2 All fittings shall be ductile iron.

11.3 All bends, tees and crosses shall be blocked.

11.4 Air release valves should be installed in all high points and other areas as required.

11.5 FITTING CLASSIFICATION

A. Ductile iron fittings for use with push-on joint pipe shall be standard mechanical, compact series, with a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C153/A21.53, latest revisions.

B. Ductile iron flanged fittings shall be in accordance with ANSI/AWWA C110/A21.10, latest revision. Flanged fittings up to twelve (12) inches in size shall have a minimum pressure rating of 350 psi. Flanged fittings over twelve (12") inches in size shall have a minimum pressure rating of 250 psi.

C. Ductile iron restrained-joint fittings shall be of the flex-ring type having a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C153/A21.53, latest revisions.

12.0 LATERAL SEWERS

12.1 Installation Requirements: The contractor shall install wyes or tees in the locations shown on the plans for connection of existing or future service lines. The contractor shall install service lines with proper grades and alignment to the property line where shown on the drawings or otherwise required. Service lines for future service shall be plugged using Etco Stoppers or equal at the right-of-way line using the stopper of the appropriate size. All laterals shall extend from the sewer line to edge of the property line. All sewer laterals shall be tapped into any sewer trunk line using the appropriate tapping machine. Dry sewer laterals shall have permanently glued caps. All sewer laterals constructed from pipe will have tracer wire buried directly on top of the pipe and stubbed up at the property line for connecting to. No service laterals should be connected to a sewer manhole.

12.2 Material, Bedding and Backfilling Requirements: Laterals shall be installed using polyvinyl chloride pipe or ductile iron pipe in accordance with the material requirements based on depth of cover. Laterals and sewer mains are to be bedded and backfilled in accordance with bedding requirements as shown on the plans.

12.3 Cleanout: Service lines with cleanouts must have a bronze top with a bronze cap when installed in parking areas. All cleanouts must be kept at surface level. See sewer laterals in the Appendix.

13.0 PIPE LAYING

13.1 Clearing: The contractor shall clear the permanent easement before excavating. The contractor shall remove from the site all trees, growth, debris, stumps, and other objectionable matter. The construction easement should only be cleared if necessary. The easement width will be according to the job specifications.

13.2 Location and Grade: The drawings shall show the alignment and grade of the sewer and the position of the manholes and other appurtenances. The grade line shown on the sewer profile and called for on the plans shall be the grade of the invert of the pipe. The contractor shall use laser equipment to establish the pipe alignment and grade required on the plans. The pipe shall be laid so that the pipe bells are upstream to the direction of the sewerage flow.

13.3 Pipe Inspection: All pipes shall be carefully examined for cracks and other defects before laying. If any pope or fitting is discovered to be defective after having been laid, it shall be removed and replaced with sound material at the expense of the Contractor.

13.4 Locating Wire and Detector Tape: The Contractor shall install mylar marking tape and detection wire one foot (1') above all non-ferrous pipe and properly connect to fittings as required by the Georgia Environmental Protection Division.

13.5 Protection of Other Utilities and Structures:

A. The official code of Georgia requires that utilities be located in the proposed work area prior to commencing any clearing, grading or excavation activity.

B. The Utilities Protection Center can be reached at 1-800-282-7411 or 811.

C. Damage to existing utility lines, services, poles, and structures shall be repaired or replaced by the Contractor at his own expense.

D. A minimum clearance of ten (10') feet horizontal and eighteen (18") inches vertical must be maintained between new sewer lines and existing water mains. In cases where it is not practical to maintain a ten (10') foot separation, the Georgia Environmental Protection Division may allow a deviation on a case-by-case basis if supported by data from the design engineer. Supporting data could consist of documenting the presence of bedrock, the use of concrete encasement, using mechanical joints, etc. Such deviation may allow

installation of the sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth self located on one side of the sewer and at an elevation so the bottom of the water main is at least eight (8') foot above the top of the sewer.

14.0 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

14.1 Conformance with Governmental Agencies: The contractor shall comply with all construction operation requirements, safety requirements, traffic control requirements, road maintenance requirements and repair requirements of the City of West Point and/or the Georgia Department of Transportation while installing any sewer line and/or appurtenance along highways, streets and roadways. Contractor must obtain permits from the City, the County and/or the State before construction begins.

14.2 Protection of Traffic: The contractor is to provide and maintain suitable signs, barricades, and lights for protection of traffic. All highway signs removed for construction shall be replaced as soon as possible. The contractor shall not close or block any highway, street or roadway without first obtaining permission from the proper authorities. Experienced flagmen shall be provided to direct and expedite the flow of traffic.

14.3 Construction Operations: The contractor is to perform all work along highways, streets and roadways to minimize traffic interference.

A. Stripping: Where the pipeline is laid along road shoulders, the contractor shall strip and stockpile all sod, topsoil, and other material suitable for shoulder restoration.

B. Trenching, Laying, and Backfilling: Trench excavation shall not be open cut any further ahead of pipe laying operations than is necessary. The contractor shall backfill and remove excess material immediately behind laying operations. All lines shall be plugged at the end of each day.

C. Shaping: The contractor shall reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Topsoil, sod, and any other materials removed from shoulders shall be replaced.

14.4 Excavated Materials: The contractor shall not place excavated material along highways, streets, and roadways in a manner which obstructs traffic. All

scattered excavated material shall be swept off the pavement. If all material cannot be removed from the pavement, the contractor is to notify the governmental agency having jurisdiction over the street or roadway so that they may assist the contractor in clean up efforts. The contractor shall be responsible for any fees or damage resulting from his construction activity.

15.0 REMOVING AND REPLACING PAVEMENT

15.1 Removing Pavement: The contractor shall remove existing pavement as necessary for installing the pipe line and appurtenance.

A. Marking: Before removing any pavement, the contractor shall mark the pavement neatly paralleling the pipe line and existing street lines. The marks shall be spaced the width of the trench.

B. Breaking: The contractor shall break the asphalt pavement along the marks using jack hammers or by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.

C. Machine Pullings: No pavement shall be pulled with machines until it is completely broken and separated from the pavement that is to remain.

D. Damage to Adjacent Pavement: The contractor shall not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, the contractor is responsible for removing and replacing the damaged pavement.

E. Sidewalks: Sidewalks shall be removed and replaced to their full width.

F. Curbs: The contractor shall remove and replace or tunnel under any curb encountered.

15.2 Replacing Pavement: Upon completion of the placing and consolidation of the backfill, the contractor shall arrange to have the compaction tested by an independent testing laboratory approved by the City. This is per City/County requirements. After the compaction testing has been satisfactorily completed, the contractor shall replace all pavement, sidewalks and curbs that had to be removed.

15.3 Materials to be Replaced: The contractor shall place the materials for pavement replacement to the dimensions shown on the drawings. The following types of sub-bases shall be replaced:

A. Graded Aggregate Sub-Base: The contractor shall furnish graded aggregate sub- base size of such quantities that the resulting mixture is well-graded from coarse to fine and meets the graduation requirements of Section 816 of the State Highway of Georgia Department of Transportation Standard Specifications.

B. Black Base: The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for the Black Base (Hot Mix). A pug mix rotary drum type mixer shall be used with a minimum capacity of not less than 50 tons per hour for asphalt production. The base shall be applied and compacted in two courses by asphalt spreader equipment of design and operation approved by the City. After compaction, the black base shall be smooth and true to establish profiles and sections.

C. Surface Course: The surface course for all pavement, including paint or tack coat then required by the governing agency, shall conform to the requirements of the Georgia State Highway Department of Transportation Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). The contractor shall produce the surface course in an asphalt plant of the same type as noted above for Black Base. The surface course shall be applied and compacted in a manner approved by the City. Any high, low or defective areas shall be immediately corrected by cutting out the course, replacing with fresh hot mix, and immediately compacting it to conform and thoroughly bond it to the surrounding area.

D. Concrete: The contractor shall provide concrete and reinforcing for concrete pavement on accordance with the requirements of the Georgia State Highway Department of Transportation Specifications for Portland Concrete Pavement.

15.4 Supervision and Approval of Pavement Restoration: Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. The contractor shall obtain agency approval of all pavement restorations before requesting final payment. The contractor shall obtain the City's approval of restoration of pavement not the responsibility of a regulatory agency such as private roads and drives. The contractor shall complete the pavement restoration as soon as possible after backfilling.

A. Replacement: Prior to replacing pavement, the contractor shall make a final cut in Concrete pavement nine inches from the edge of the trench. The

contractor shall make the cut using a rotary saw. Asphalt pavement shall be removed nine-inches back from the edge of the trench using jackhammers or other suitable tools. The contractor shall replace all street and roadway pavement as shown on the drawings. All driveways, sidewalks, and curbs shall be replaced with the same material and to the same dimensions as existed prior to construction.

B. Failure of Pavement: Should any pavement restoration or repairs fail or settle during construction or the warranty period, the contractor shall promptly restore or repair all defects.

16.0 BORING AND TUNNELING

The contractor shall furnish and install tunnel liner or pipe casing and install the pipeline therein in accordance with the following specifications:

16.1 Well Pointing: The contractor shall operate well points or drainage systems in the vicinity of the tunnel or casting construction to prevent the accumulation of flood water in the tunnel or casing and to maintain the ground water table below the tunnel or casing invert.

16.2 Damage to Existing Structures: The contractor shall take precautions to construct the tunnel so that no settlement of the over passing roadway or railway section will occur. In order to prevent such settlement, the use of poling plates, breast boards, shields, and soil solidification or a combination of these methods may be necessary. The City shall not be responsible for any damage, which may result from the tunnel construction.

16.3 Boring: The contractor shall furnish all materials and equipment and perform all labor required to install steel pipe casing at the locations indicated on the drawings. Boring design and materials shall be per all AERA, AASHTO, Georgia Dot, and other applicable standards.

A. Material: Steel-casing pipe shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM A 139, Grade B. All casing size and thickness shall be as follows:

UNDER RAILROADS		
Pipe Dia.	Casing Dia.	Wall Thickness
In.	In.	In.
6	14	0.250
8	18	0.250
10	20	0.281
12	22	0.312
14	24	0.344
16	30	0.406
18	30	0.406
20	32	0.469
24	36	0.469
30	42	0.500

UNDER HIGHWAYS		
Pipe Dia.	Casing Dia.	Wall Thickness
In.	In.	In.
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312
20	30	0.312
24	36	0.375
30	42	0.375

B. The steel sleeves shall be painted inside and outside with two coats of bitumastic paint prior to delivery on the job site.

C. Joint Usage of Casing Pipe: The contractor shall not install any pipe in steel casing which already carrying a pipeline without the written approval of the City.

D. Installation of Casing Pipe: The contractor shall install the steel casing pipe by the dry boring method. The contractor shall bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe to the preceding section in accordance with the AWS recommended procedures. After the boring and installation of the casing is complete, the contractor shall install a cleaning plug on the rig and clean the

casing. The carrier pipe shall be supported at each joint or as recommended by the manufacturer. All stainless steel casing spacers as manufactured by Cascade or approved equivalent shall be used.

E. Rock Formations: In the event that rock is encountered during the installation of the pipe casing which in the opinion of the City cannot be removed through the casing, the City shall direct the contractor to complete the crossing by installing a tunnel.

16.4 Tunneling: The contractor shall install the tunnel liner in strict accordance with the Department of Transportation (DOT) and / or Railroad Company requirements. The contractor shall provide any special insurance coverage required by the governing body. The tunnel installer shall have a minimum of five years of experience in the construction of tunnels of a similar size. The contractor shall submit evidence of the installer's experience for review by the City.

A. Blasting Permits: Prior to any work involving explosives, the contractor shall make application to the DOT or other appropriate agencies for a blasting permit. This permit will be in addition to any tunneling permit not involving explosives. The contractor shall comply with all requirements and conditions of all permits including required submittals.

B. Traffic Control Requirements: The contractor shall schedule the work so as not to interfere with or in any way endanger traffic flow on the highway or railway. The contractor shall provide all required safety measures as specified in the Georgia Manual on Uniform Traffic Control Devices.

C. Materials: Tunnel Liner Plates shall be manufactured from steel conforming with ASTM A569 with the following mechanical properties before cold forming:

Minimum tensile strength – 42, 000 PSI
Minimum yield strength -- 28, 000 PSI
Elongation, two-inches -- 30%

Liner plates shall be 10 gauge, with the neutral axis diameter shown on the drawings for each crossing. Minimum coatings required shall be galvanized in accordance with ASTM A 123 for liner plats and hot – dip galvanizing in accordance with ASTM A 307 for all other hardware. Additional protection required shall consist of a full bituminous coating meeting the requirements of AASHTO M 190. All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit

complete erection from the inside of the tunnel. The plates shall be equipped with two inch standard pipe half-couplings welded into a hole in the center of the plate for grouting of voids occurring outside of the liner. Couplings shall be fitting with threaded cast-iron plugs. Bolts shall be no less than 5/8-inch diameter. Shop drawings showing details of the plates, size and length of bolts, and section modulus in inches curbed per inch of width shall be furnished by the contractor for review by the engineer, the City and Georgia DOT.

D. Tunnel Construction Methods: After the tunnel has been completely constructed, the contractor shall thoroughly clean the interior and shall place structural quality concrete of a strength approved by the City within the invert of the tunnel. The contractor shall screen and trowel the top of the concrete to a smooth even surface at the exact level of the exterior of the pipe width placed to proper grade within the tunnel. As the pipe is jointed, it shall be drawn into position inside the tunnel. Systems of standard pipe, fittings, hose and special grouting outlets embedded in the liner plates shall be provided by the contractor. Care shall be taken to ensure that all parts of the system are maintained free from dirt. Grout composed of cement, sand, and water shall be forced under pressure into the grouting connections. Grouting shall be started in the lower connections and shall proceed until grout begins to flow from upper connections. Connections shall then be made to these holes and the operation continued to completion. Apparatus for mixing and placing grout shall be of a type approved by the design engineer and the Georgia DOT and shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow. Liner plates shall be installed as soon as possible, but no more than five feet of tunnel shall remain unlined while tunneling operations are in progress. Not more than one foot of tunnel shall be left unlined at the end of the day's operation. The contractor shall locate the liner plates with grout couplings at the top of the tunnel at intervals not to exceed five feet. Additional plates with grout couplings shall be installed on each side of the tunnel between the top couplings. After grouting is completed, pressure shall be maintained by means of stopcocks, or other suitable devices until the grout has set sufficiently. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

16.5 Installation of Pipe: After the installation of the casing or tunnel is complete, the contractor shall install the pipe line by a method which has received prior approval of the designing engineer and the City.

A. Pipe Closure: The contractor shall close the ends of the casing with four-inch brick walls, plastered with Portland Cement mortar. The contractor shall leave a drain opening at the bottom of the lower end.

B. Tunneling Closure: A brick bulkhead shall be constructed at both ends of the tunnel with a drain at the lower end. The bulkhead shall be a three course mortared brick wall, plastered with Portland Cement mortar and waterproofed with asphaltic roofing cement. Brick and mortar shall meet the requirements for manhole materials.

16.6 Safety During Boring: The contractor shall provide all necessary bracing, bulkheads, and Shields to ensure complete safety to all traffic at all times during the boring operation. All work shall be performed in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. If in the opinion of the City the installation is being conducted in an unsafe manner, the contractor will be required to stop work and bulkhead the heading until suitable agreements are reached between the contractor and the City. The City will not be responsible and shall be saved harmless in the event of delays to the contractor's work resulting from and cause whatsoever. All construction must meet or exceed OSHA requirements.

16.7 Safety During Tunneling: The contractor shall begin the tunneling operation in a pit, sheeted and shored as necessary and begin at and proceed from one end. The contractor shall observe all applicable requirements of all governing agencies and shall conduct the operations in such a manner that all work will be performed below the level of the roadbed. All work shall be coordinated and scheduled with all governing agencies. The contractor shall complete all tunneling work at one particular location before work is started at another location. All construction must meet or exceed OSHA requirements. A temporary bulkhead against the face of the excavation shall be provided and placed during the cessation of work where the heading is within 20 feet of railroad tracks or highway pavement. If in the opinion of the City the tunnel installation work is being conducted in a manner detrimental to the over passing roadway or to the safety of the traveling public, all operations of tunneling shall cease until the necessary corrections have been made. In the event that distress occurs to the roadway due to the tunneling operation, the contractor shall be required to submit a plan to repair the roadway. The plan must be acceptable to all governing agencies and the City.

16.8 Rip-Rap Material Requirements: The contractor shall use either stone rip-rap or sand -cement rip-rap throughout the job. The rip-rap shall meet the following material requirements:

A. Stone Rip-Rap: Stone rip-rap shall be composed of sound, tough, durable stones resistant to he action of air and water, slabby or shaley pieces will not be acceptable. The stone's specific gravity shall be 2.0 or higher. The minimum weight of each individual stone shall be 50 pounds. The maximum allowable dimension for an individual stone shall be 24 inches. At least, 50% of the stones shall have a minimum dimension of 12 inches. The contractor shall imbed the stone rip-rap neatly so as to form a compact layer at least 12 inches thick. The rip-rap shall be placed in such a way that the small stones are not segregated but evenly distributed. Chinking stones shall be placed in the crevices between the larger stones so that a dense, well grated mass is produced.

B: Sand-Cement Bag Rip-Rap: Sand-cement bag rip-rap shall be composed of cement sacks or burlap bags having a capacity of from one to two cubic feet. Bags previously used for sugar or chemicals will not be acceptable. Bags shall be filled with a mixture of one part Portland Cement to five parts sand.

17.0 CONCRETE PIERS

The contractor shall construct piers as shown on the approved drawings and in accordance with the following requirements.

17.1 Material: Concrete shall have a compressive strength of no less than 3, 000 PSI, with not less than 5.5 bags of cement per cubic yard and a slump between 2 ½ and four inches. For job-mixed concrete, the contractor shall submit the concrete mix design for approval by the City and the designing engineer. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, grade 40.

17.2 Bearing on Earth Foundations: Where excavation reveals undisturbed earth subsurface, the pier shall be constructed with spread footing foundations.

17.3 Bearing of Rock Foundations: Where excavation reveals level or benched rock having a Minimum safe bearing value of 20, 000 PSF, piers shall be constructed with foundations hearing directly on the rock. The contractor shall drill a minimum of four holes into the rock under each pier and grout

dowels into place to anchor the pier to the rock. Hole and dowel sized shall be in accordance with the requirements of the following table:

ANCHORAGE REQUIREMENTS FOR PIERS ON ROCK			
Carrier Pipe Size	Grout Hole Diam. (inches)	Grout Hole Depth (feet)	Reinforcing Bar Dowel Size
8 – 24"	2.5	8	5
27 – 36"	4	8	6
42 – 48"	4	8	6
54"	4	8	6

The contractor shall grout holes from the bottom up using a grout pump. The contractor shall take extreme care to ensure that the entire hole is filled with grout prior to inserting the dowel.

17.4 Installation: The contractor shall employ experienced formwork carpenters to construct all forms. Formwork shall be built sufficiently strong to resist lateral movement and distortion during pouring and to protect the pier from caving in.

A. Dewatering: Before placing concrete, the contractor shall dewater the bottom of the hole and clean out all mud, loose earth, and extraneous matter.

B. Pour Concrete: The contractor shall place concrete as soon as possible after the forms have been approved. Excavation shall not be left open for prolonged periods of time. Excavation shall be protected from surface and ground water. The contractor shall not allow water to accumulate in the excavation or in the surrounding areas.

C. Safety: The contractor shall take all necessary precautions to protect the work and personnel on the site. Open holes shall be covered when work is not in progress. All surrounding excavations and embankments shall be examined for all possible hazards.

D. Inspection: The contractor shall select and, with the approval of the designing engineer and the City, employ a consulting soils and foundation engineer to perform the following:
1. Inspect the material and evaluate its suitability.
2. Inspect the pneumatically drilled grout holes where applicable.

3. Check the dimensions and plumbness of the forms to ensure conformity with the drawings and specifications.
4. Evaluate the material penetrated by the excavation with regards to its lateral stability and uplift resistance.
5. Recommend remedial measures should insufficient later stability or uplift resistance exist.

18.0 TESTING AND ACCEPTANCE

The City reserves the right to continuously and/or periodically inspect construction methods to ensure compliance with these specifications. Unless other provisions have been specifically approved by the City, sewer lines and related facilities will be inspected and tested by the contractor with testing certified by the City before acceptance or continuity is established with the City's system. All lines must be clean and obstructions removed prior to requesting inspection and testing. When requested by the City, the contractor shall flush out lines and manholes before testing and inspection. The contractor shall be required to test the sanitary sewer system for water tightness and, if PVC pipe is installed; a deflection test shall also be required. The City of West Point requires the sanitary sewer system to be televised as per section 21.0.

A. Deflection Testing: The maximum deflection in the installed PVC pipeline shall not exceed 5% of the pipes original internal diameter. Deflection testing will be required using either a deflectometer or a "GO-NO-GO" mandrel. The City shall randomly select portions of the project to be deflection tested after a period of 30 days has elapsed after backfilling has occurred. Such portions shall consist of not less than 5% of the total reaches (reach being length of pipe between two manholes) in the project (excluding house leads).

The Contractor when using a mandrel shall use a pull line and a retrieve line. The pull line shall be blown in the line by means of air or water. The mandrel shall be placed in the pipe and be pulled up or down the pipe to the next manhole or defect. Testing shall be done in accordance with ASTMD 3034 Standards.

Where deflection is found to be in excess of 5% of the original pipe diameter, the Contractor shall excavate to the point of excess deflection and carefully compact around the point where excess deflection was found. The line shall then be retested for deflection. However, should after the initial testing the deflection pipe fail to return to the original size (inside diameter) the line shall be replaced.

In the event that deflection occurs beyond the 5% limit in any section of 5% or more of the reaches tested, the entire system shall be tested.

B. Manhole Vacuum Testing: All manholes shall be vacuum tested in accordance with ASTM C 1244, "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test" as amended to date. All pipes entering the manhole should be plugged, taking care to securely place the plug from being drawn into the manhole. The test head shall be placed near the top of the manhole frame and cover and the seal inflated in accordance with the manufacturer's recommendations. A vacuum pump of ten-inches (10") of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine-inches (9"). Following are minimum allowable test times for manhole acceptance at the specified vacuum drop:

Depth (Feet)	Time (Seconds)		
	48-inch Diameter	60-inch Diameter	72-inch Diameter
4	10	13	16
8	20	26	33
12	30	39	49
16	40	52	67
20	50	65	81
24	*59*	*78*	*97*
Add 2-ft. more depth	5	6.66	8

Note: These numbers have been taken from ASTM C 1244-93 (reapproved 2000).

1. If the manhole fails the initial test, repairs and adjustments necessary due to extenuating circumstances (i.e. pipe joint, plug sealing) should be made. Retesting shall proceed until a satisfactory test is obtained.
2. A final visual inspection shall be made by the Inspector and contractor. Any deficiencies noticed shall be repaired accordingly.
3. The cost for testing each manhole shall be included in the cost

per vertical foot to install the pre-cast concrete manhole. Retest cost required due to defects in the Contractor's work, shall be paid by the Contract.

4. Testing shall be performed on all new or refurbished manholes.

19.0 LOW PRESSURE AIR TEST PROCEDURES

A. The contractor shall perform a low pressure air test. Low pressure air testing shall be performed in accordance with ASTM F 1417 or UNI-B-6-90. All tests shall be conducted under the supervision of the City of West Point or its representative. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using air-lock balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0-psi. After this pressure is reached and the pressure allowed to stabilize (approximately 2 to 5 minutes), the pressure may be reduced to 3.5-psi before starting the tests. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs and retest the line. Minimum test time for various pipe sizes, in accordance with Uni-Bell PVC Pipe Assoc. UNI-B-6-90, as amended to date, is as follows:

Specification Time Required for a 1.0 PSIG Pressure Drop for Size and Length of Pipe Indicated for Q = 0.0015			
Pipe Diameter (inches)	Minimum Time (minutes second)	Length for Minimum Time (feet)	Time for Longer Length (second)
4	3:40	597	0.380
6	5:40	398	0.854
8	7:34	298	1.520
10	9:26	239	2.374
12	11:20	199	3.418
15	14:10	159	5.342
18	17:00	133	7.692
21	19:50	114	10.470
24	22:40	99	13.674

B. Required test equipment includes air-lock balls, braces, air hose, air source, timer, rotometer as applicable, cut-off valves, pressure reducing valve, 0-15 pressure gauge, 0-5 pressure gauge with gradations in 0.1 psi and accuracy of ± 2 percent.

C. The contractor shall keep records of all test made. Copy of such records will be given to the City. Such records shall show date, line number and stations, operator and such other pertinent information as required by the City.

D. The contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of overpressurizing the sewer line.

E. All visible leaks shall be repaired regardless of whether the air test is within allowable limits. No sewer will be accepted until leakage tests demonstrate compliance with the leakage test method.

20.0 TELEVISING OF GRAVITY SEWERS

It is suggested that the entire sewer system be thoroughly cleaned by jetting or applicable methods prior to filming to avoid possible refilming costs. If conditions found indicate repairs are necessary, refilming may be required.

However, the contractor may avoid refilming by performing all corrective work in the presence of a City Inspector upon the City's discretion. All sanitary sewer mains shall be filmed prior to initial approval and prior to the two (2) year maintenance period ending. All filming shall be done by persons and / or firms qualified in such work. The contractor shall perform all filming (video taping) in accordance with the following requirements:

A. All filming should be in digital format, if digital format is not available then VHS format with speed as required to obtain optimal observation of any defects in the line will be acceptable.

B. Film shall be in good focus with a five-foot minimum depth of field with adequate but not excessive lighting. A footage counter on the film must be provided.

C. The camera dragline shall not obstruct the view of the flow line of the sewer pipe.

D. The film shall be submitted to the City in cd or cassettes complete with a brief report as to the findings. The location and condition of service connections, water, debris, mud, etc., for each section between manholes and any observations of the filmer should be reported. A brief map or sketch on an 8 ½" x 11" sheet of paper of the improvements shall be supplied.
The sketch shall indicate the following:

1. The firm doing the filming
2. Manhole number
3. Distance between manholes
4. Flow direction
5. Street names
6. North arrow
7. Project name
8. Date of filming

Each manhole on the film shall be marked with the following information:

1. Manhole number
2. Manhole to which the camera is traveling
3. Size and material of the pipe
4. Street name
5. Date of the filming

21.0 FORCE MAINS

The contractor shall furnish, install and remove all temporary bulkheads, flanges, or plugs required to perform tests, and furnish all equipment and labor to carry out the tests. The contractor shall pressure test force mains at the pressure specified by the City measured at the lowest point. Tests shall be performed for a minimum of two hours at 200 PSI. Leakage shall not exceed the AWWA standards. If leaks are detected the contractor shall locate, repair and retest the force main. The repair methods must be approved by the City. If the results are not totally satisfactory, the City may require testing for a longer period of time.

22.0 LIFT STATION STANDARDS

A. Drainage basin flow shall be calculated for the natural drainage basin area flowing into the proposed lift station. The flow shall be calculated based upon acre usage for the type zoning or anticipated densities and development type if there is evidence potentially greater wastewater flow being generated in excess of established zoning.

B. Lift Station influent line invert shall be set so that all upstream gravity flow into the lift station can be received. Influent pipe shall be sized at a minimum slope for basin flow with the appropriate peak flow conditions per "10 state standard." This influent pipe shall be stubbed out to a point 20 feet from the pump station.

C. Lift station shall be sized based upon the anticipated upstream flow that will be realized in a ten-year period of basin development. The amount of development in a basin is judgmental and will be determined by the City.

D. Lift station should be sized to pump the peak flow with the largest unit out-of-services.

E. Wet well shall be sized for an appropriate peak flow condition. The allowable number of pump cycles per hour shall be determined by dividing the pump manufacturer recommended pump starts per hour by 1.3. Wet well shall have a plugged stub so that an additional wet well can be installed and interconnected when future flows dictate additional wet well storage. Stub out shall be at least as large as the influent pipe.

F. Pumps of 10 hp or greater shall have an electric hoisting system so that pumps can be removed and lifted into a flat bed truck, others may use a manual hoist. Pump station layout shall be such that a driveway will access the pump

loading point. Pump station access drive can be either paved or gravel as directed. All pump stations driveway slopes shall not be greater than 10%. Drives shall be a minimum of 10 feet wide, eight-inch deep crusher run per Georgia DOT standards. Sub-base shall be compacted to 95% standard proctor per ASTM standards.

G. Pump station layout shall be configured so the station can be expanded to the ultimate size to pump the ultimate upstream flow. Initial and future land requirements including access for the pump station shall be obtained by the developer and donated to the City.

H. Force mains shall be sized for a minimum of two feet per second flow with pump station operating at minimum flow. All force mains inside pump station fence shall be ductile iron pipe, with 401 protecto lined. Force mains outside pump station fence shall be PVC AWWA C900 Class 150. Force mains shall have concrete thrust blocks. All fittings shall be mechanical joint. Ductile iron pipe shall be used inside the pump station fence. Air release valve location and sizes shall be located as required by the City

I. Pump motors shall be sized when possible for the ultimate basin flow. Pumps shall be sized when possible so that ultimate basin flow conditions can be achieved by increasing impeller size.

J. Lift station check valves, plug valves, and surge control valves (if required) shall be housed in a concrete valve pit adjacent to the lift station. Floor drain (3"diameter minimum) for the valve pit shall be provided and connected to the wet well. A P-trap shall be installed in the floor drain to block sewer gases from the wet well. Valve pits must be large enough for easy maintenance operations, with 2' to 3' clearance on all sides and with bottom of piping 2'-0" to 2'-6" off of the concrete floor. Valve pits shall be no deeper than 8' deep. Valve pits must have easy access. A hatch opening must be placed directly over the steps so that the steps are not recessed back away from the hatch opening.

K. Surge valves shall be utilized when force mains surges are in excess of 150 PSI. Surge valves shall be mechanical and shall be field adjustable from 0 to 100% of the rated pressure capacity.

L. Either cushion swing check valve or hydraulic activated pump plug valves shall be used on the pump discharge as directed by the City. Pump check valves shall have an adjustable rapid closure in the event of power failure.

Accumulator system shall be utilized to actuate plug check valve in the event of water pressure failure. Accumulator shall operate all valves through two complete open and closing cycles.

M. Check valves shall be constructed of heavy cast iron with bronze and stainless steel fittings. It shall prevent reverse flow back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating, and must operate without hammer or shock. The seat ring must be renewable and shall be securely held in place by a threaded joint. The valve disc shall be of cast iron and shall be hinged above its seat so that perfect closure is always attained. Check valves for all pump discharge lines shall have outside spring and lever. The high point of the valve shall be tapped and provided with a stopcock for bleeding of air.

N. Plug valves shall be used on pump discharge and shall have an adjustable rapid closure in event of power failure. Valves shall be of the eccentric, non-lubricated resilient seat type, designed for sewage at 125 psi working pressure and shall have mechanical joint or flanged ends. Drilling for flanged ends shall be in accordance with ANSI B 16.1, Class 125. The valve body shall be semi-steel conforming to ASTM A 126, Class B. Seats shall have a welded-in or cast overlay of not less than 90% pure nickel on all surfaces which will contact the rubber seating area. Upper and lower plug stem bushings shall be of stainless steel and permanently lubricated. Valves shall be manufactured by DeZurik, Homestead, Mueller, Kennedy, or equal.

O. Dual electric feeds shall be provided from the utility grid when available. If dual feeders are not available, a generator receptacle shall be required with all motor control centers and shall be compatible with other alike stations. Building architecture shall be per the requirements of the City. Pump station motor starters, motor control center, and miscellaneous electric controls shall be housed in a building. Pump stations shall sense wet well levels for stop-start pumps with transducers. All pump station motors shall have variable frequency drives.

P. Telemetry - Lift Stations shall have telemetry installed to monitor power failure, high wet well pump failure and other sensing points as required by the City.

Q. The minimum requirement for the provision of emergency power for lift stations shall be that each station shall be provided with an emergency

generator capable of starting and running the appropriate number of pumps necessary to meet and/or exceed the maximum daily demand of the pump station and other ancillary devices. The generator shall be natural gas powered with an automatic transfer switch and provisions for an automatic exercise cycle. The Contractor shall set the ATS transfer delay from utility to generator at a 30 second delay. The generator and control panel shall be field located by City authorized personnel. The generator pad shall be installed such that the bottom of the pad is six inches below grade and the top of the pad is six inches above grade.The person responsible for sizing the standby generator (it's KW rating) must supply a letter to the Developer, Contractor and City of West Point, stating that they guarantee the unit will operate the lift station pumps and other electrical demands with no greater than a 20% voltage dip. This letter must be signed and delivered before the day of scheduled start up.

R. A potable water supply line and backflow preventer is required on all lift stations. The water line shall be two (2") inches PVC SDR Class 200 conforming to ASTM D-2241 and recommend the backflow preventer shall be RPZ type.

S. A wet well vent pipe with bird screen is required on all lift stations.

23.0 PROTECTION AND RESTORATION OF WORK AREA

23.1 General: The contractor shall return all items and all areas disturbed, directly or indirectly, by work under these specifications to their original condition or better as quickly as possible after work is started.

23.2 Restoration of Man-made Improvements: The contractor shall protect or remove and replace, with the City's approval, all fences, piers, docks, walkways, mailboxes, pipelines, drain culverts, power and telephone lines and cables and other improvements that may be encountered in the work.

23.3 Cultivated Growth: The contractor shall not disturb cultivated trees or shrubberies unless approved by the City. Any such trees or shrubberies, which must be removed, shall be heeled in and replanted under the direction of an experienced nurseryman.

23.4 Cutting of Trees: The contractor shall not cut trees for the performance of the work except as absolutely necessary. Trees that shall remain in the vicinity of the work area shall be protected from damage from the equipment. The contractor shall remove excavated material stored over the root system of all

trees within 30 days to allow proper natural watering of the root system. All damaged trees over three inches in diameter shall be repaired by an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

23.5 Grassing: The contractor shall replant grass removed or damaged in residential areas using the same variety of grass when the first appropriate season occurs. Outside of developed areas, the contractor shall plant the entire area disturbed by the work in rye, fescue, bermuda, or other suitable ground cover upon the completion of work in the area. In all areas, the contractor shall promptly re-establish successful stands of grass.

23.6 Erosion Control: Erosion sedimentation control shall be per Georgia Environmental Protection Division standards and per the requirements of applicable local government standards. The contractor shall plan excavation work to prevent erosion and washing of soil into adjacent streams. The contractor shall limit the amount of open excavation at any one time. Soil shall be placed in the proper place and all natural water routes shall be kept open.

23.7 Disposal of Rubbish: The contractor shall dispose of all materials cleaned and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate regulatory agencies, county, state and federal.

24.0 EROSION AND SEDIMENTATION CONTROL DEVICES

Any site where land-disturbing activity occurs must be protected from erosion. Typically, the project engineer prepares and Erosion and Sedimentation Control Plan which must be submitted to the City for approval and permitting processes. The City requires all current state manuals for Erosion and Sedimentation Control in Georgia Soil and Erosion and Sedimentation Control Ordinance regulations be strictly adhered to in the field. No land-disturbing activities shall be conducted in the buffer zones, unless required by the City. Discharge of storm water runoff from disturbed property shall not exceed 50 Nephelometric Turbidity Units higher than the level of the receiving stream immediately upstream of the site.

Items required by the state and the City:

A. Silt Fence: Silt fence should be a commercially manufactured fabric approximately 30 inches in height supported vertically by wooden or metal stakes at + three feet on center. Haybales may be utilized directly behind the

silt fence to add an additional sedimentation barrier and support. Under certain applications, haybales may be used as a silt fence; however, for projects lasting over a six-month period a fabric barrier is required. Silt sedimentation build-up behind silt fence must be removed periodically to maintain effective siltation control. A typical silt fence with haybales is shown the appendix.

B. Detention and/or Sedimentation Pond: Any flow that is collected across a land disturbing site should be collected and routed through ditches, flumes or enclosed conduit to a detention and/or sedimentation pond. The pond must be designed to collect the flow and reduce its velocity to a level where the silt will be retained prior to its discharge off the site. The ponds are to be cleaned as sedimentation builds up in order to maintain a properly functioning system.

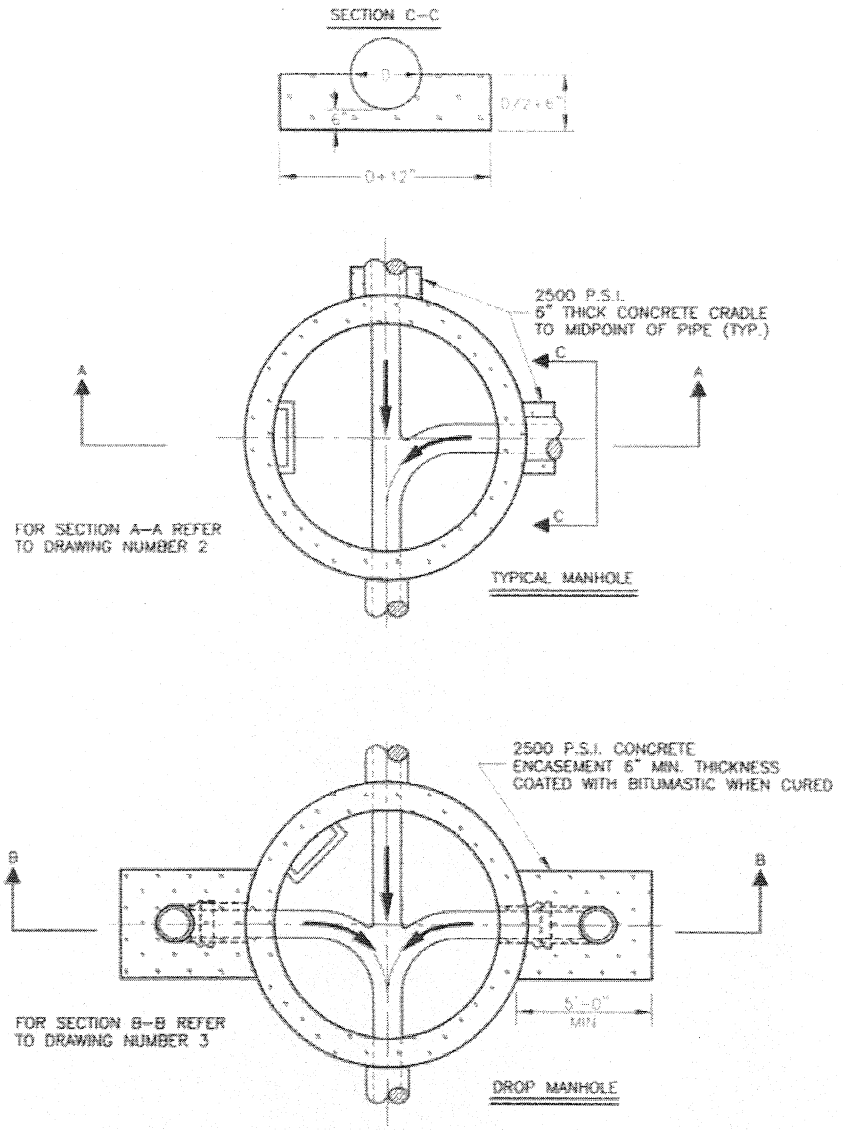
C. Filter Berms: Filter berms at the exit from construction site may be required where land disturbing activities occur. These filter berms consist of a layer of #57 stone six feet to eight feet wide, 12 inches deep and be constructed completely across all egresses from the site. These filter berms must be cleaned regularly so they remain functional during the construction process.

D. Rip-Rapping: Where directed by the City, rip-rapping will be required.

E. Rock Dams: On open cut drainage ditches tributary to rivers, creeks, or reservoirs, rock dams must be placed at specified intervals. Rock dams should be constructed with #75 rip-rap stone and should cover the full width of the ditch from slope to slope. The stone should cover from the top of slope to top of slope.

F. Grassing: Grassing of disturbed areas should be done as soon as possible. The manual for erosion and sedimentation control list the types of grass used for the various times of the year and application rate of grass seeds and the fertilizer to be used on the various types of soil. Additional items such as catch basins, pipes, storm drainage and paved ditches are other items that may be required by the City to minimize erosion on land disturbed sites. Final acceptance of grassing is defined as a full cover, over the seeded area of live and growing grass, when at least 98% of the total areas has no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.

APPENDIX OF STANDARD DETAILS

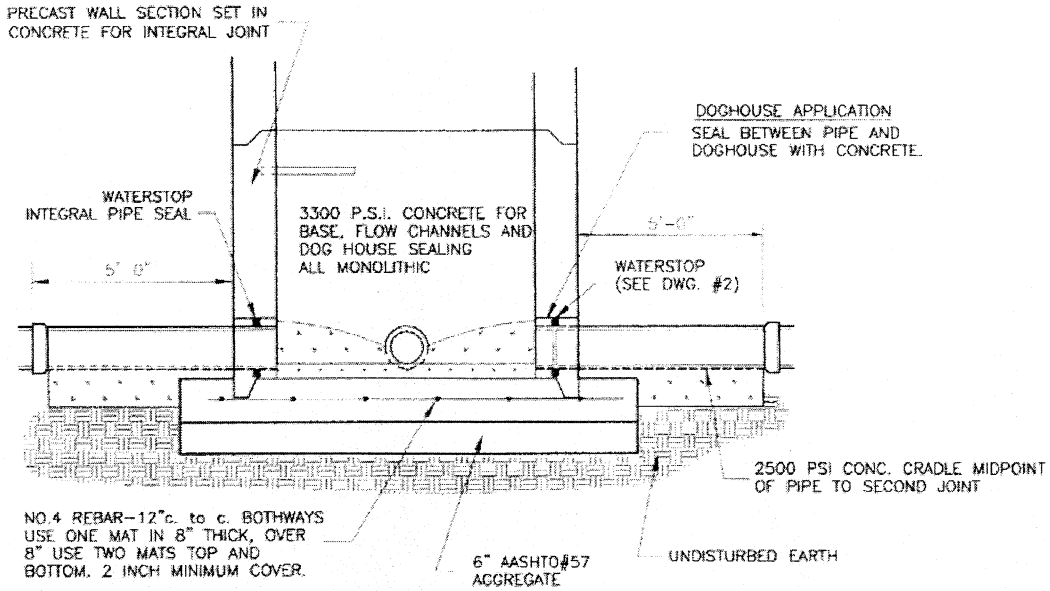


STANDARD DETAIL

SECTIONAL PLAN VIEW OF TYPICAL AND DROP MANHOLES

NOTE:

USE DOG HOUSE APPLICATION WHEN TIEING INTO EXISTING MANHOLE, EXCEPT SEAL BETWEEN MANHOLE WALL AND PIPE WITH WATERPROOF MORTAR WORKED WELL AROUND WATERSTOP. REFER TO SECTION 02605(3.06)



BASE THICKNESS

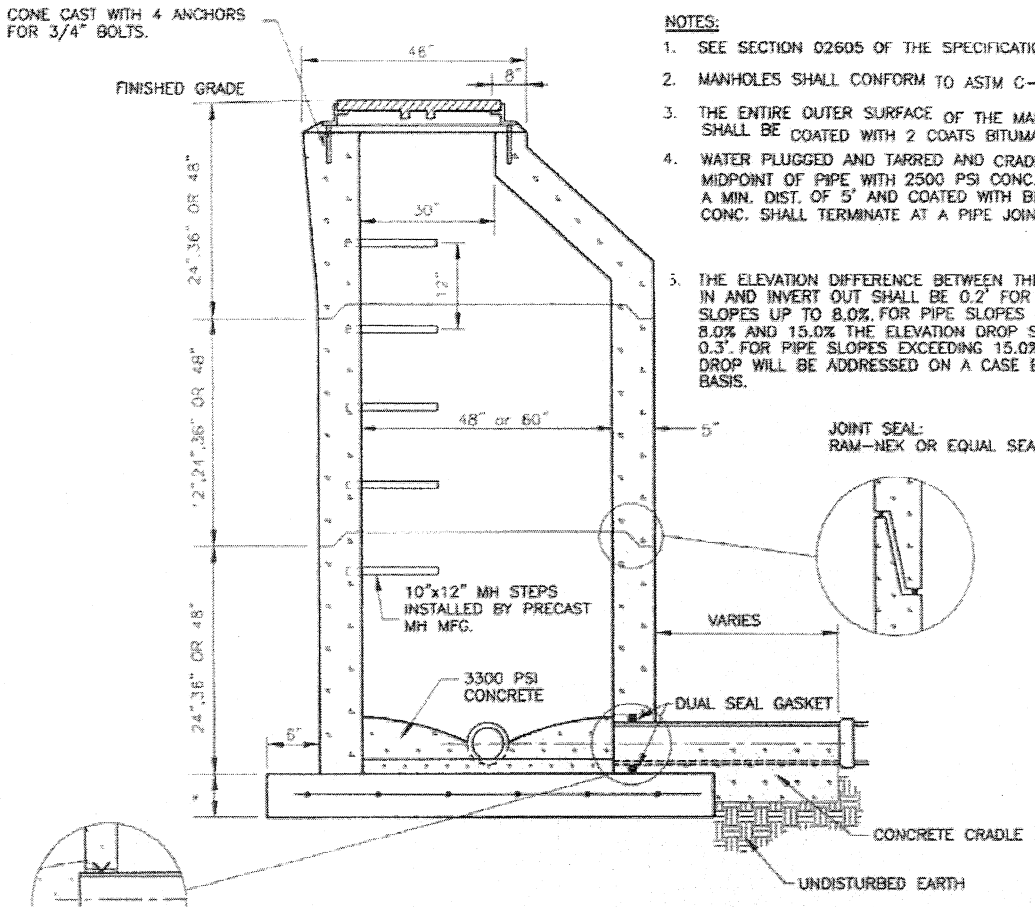
2"-15"PIPE-8"
18"-27"PIPE-12"
30"-UP--DESIGN

STANDARD DETAIL

CAST-IN-PLACE

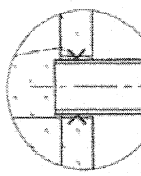
BASE/PRECAST WALL SECTIONS

MANHOLE FRAME AND COVER SHALL CONFORM TO SECTION 02605 (2.13) MANHOLE FRAMES AND COVERS WATERTIGHT COVERS SHALL BE USED IF REQUIRED BY THE AUTHORITY



NOTES:

1. SEE SECTION 02605 OF THE SPECIFICATIONS
2. MANHOLES SHALL CONFORM TO ASTM C-478.
3. THE ENTIRE OUTER SURFACE OF THE MANHOLE SHALL BE COATED WITH 2 COATS BITUMASTIC.
4. WATER PLUGGED AND TARRED AND CRADLED TO MIDPOINT OF PIPE WITH 2500 PSI CONC. FOR A MIN. DIST. OF 5' AND COATED WITH BITUMASTIC. CONC. SHALL TERMINATE AT A PIPE JOINT.
5. THE ELEVATION DIFFERENCE BETWEEN THE INVERT IN AND INVERT OUT SHALL BE 0.2' FOR PIPE SLOPES UP TO 8.0%, FOR PIPE SLOPES BETWEEN 8.0% AND 15.0% THE ELEVATION DROP SHALL BE 0.3'. FOR PIPE SLOPES EXCEEDING 15.0% THE DROP WILL BE ADDRESSED ON A CASE BY CASE BASIS.

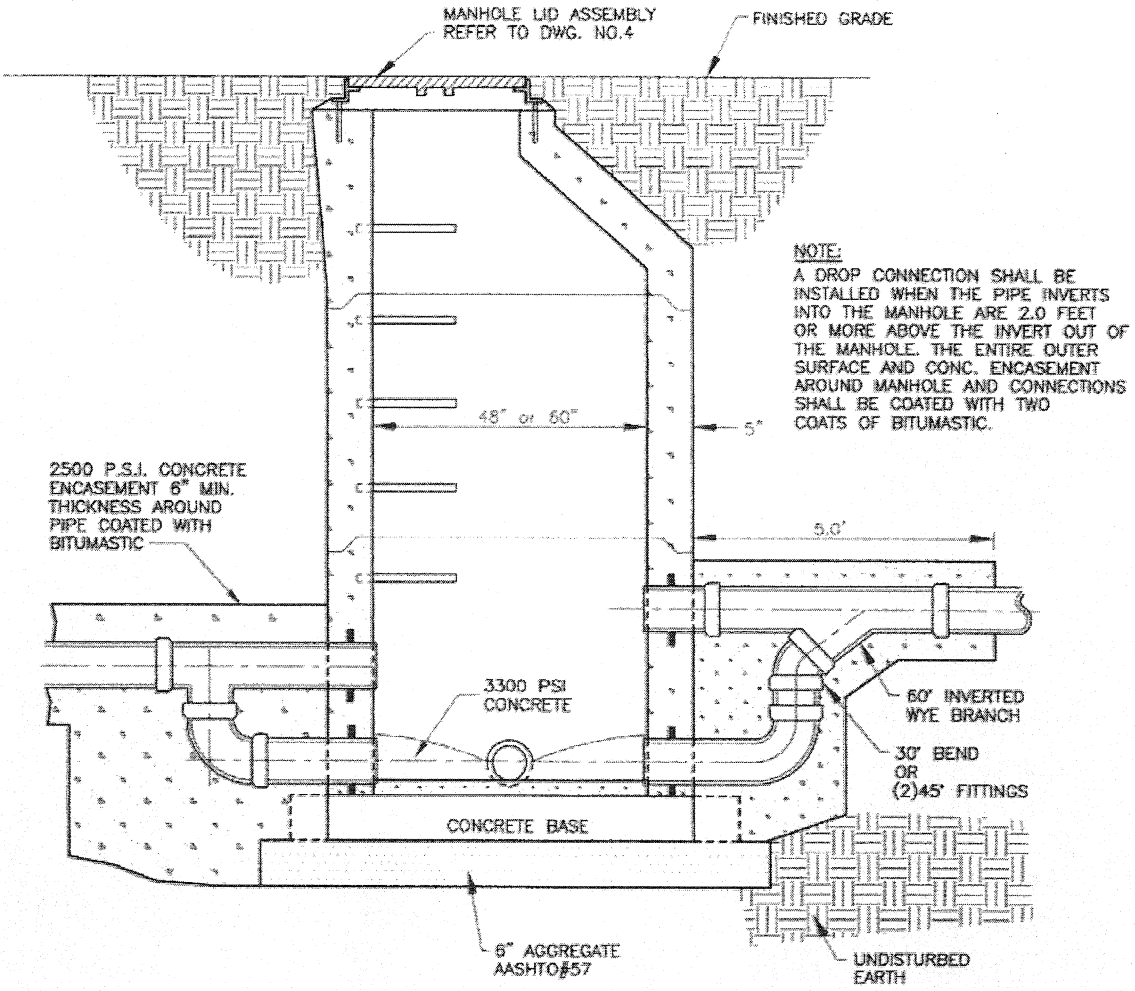


A-LOK GASKET WATERSTOP PER ASTM C923 CAST INTEGRALLY IN MANHOLE WALL JOINT ALLOWS 10° OMNIDIRECTIONAL DEFLECTION

*BASE THICKNESS
2"-15"PIPE--8"
18"-27"PIPE--12"
30"-UP--DESIGN

STANDARD DETAIL

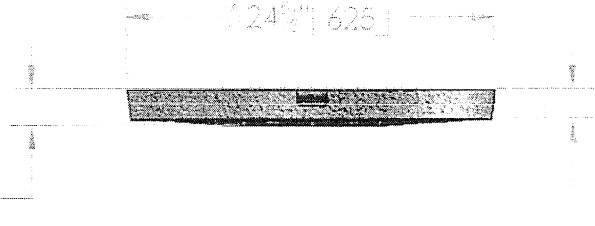
TYPICAL MANHOLE SECTION A-A
PRECAST BASE & WALL SECTIONS

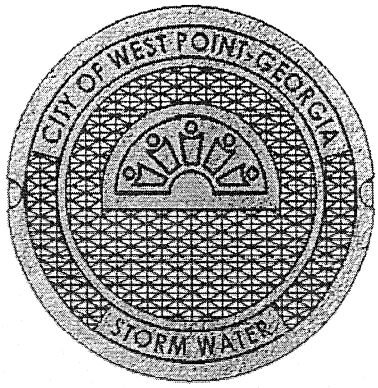


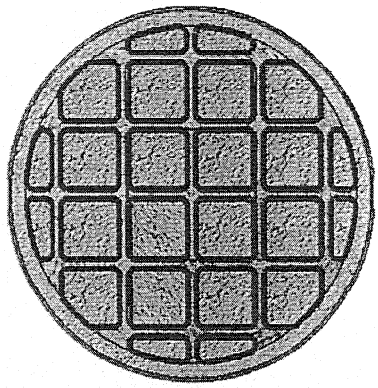
STANDARD DETAIL

TYPICAL DROP MANHOLE
SECTION B–B
PRECAST BASE AND WALL SECTIONS

AJ633C Cover
24 5/8" [624]
150 lbs 68 kg
Gray Iron
ASTM A48 Class 30







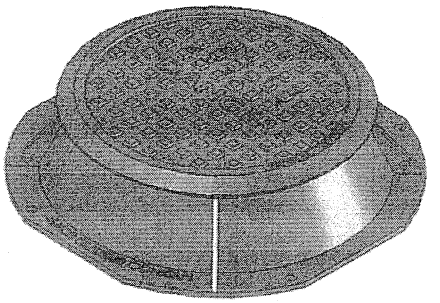
www.muellercanada.com
Certifiée ISO 9001: 2000

Mueller Canada

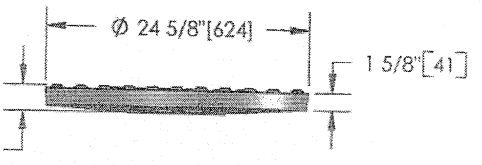
In Pavement Adjustable Manhole Frame & Cover
Note: The words WEST POINT SEWER or
STORM WATER must be on the manhole cover.

The Adjustable
Model AJ633ESR resilient seated
With conical guide
24 5/8 [624 mm]

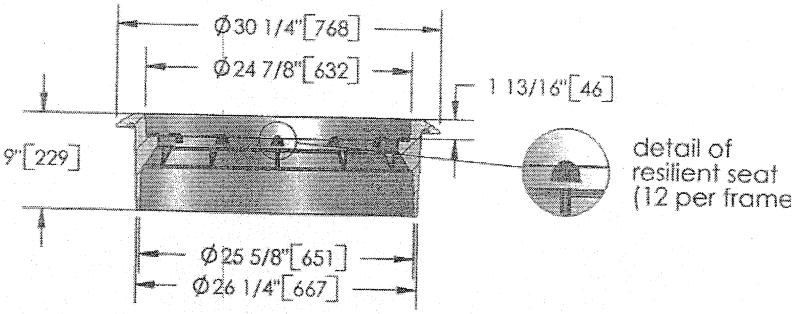
Mueller Co.
www.muellercanada.com
CERTIFIED ISO 9001 : 2000



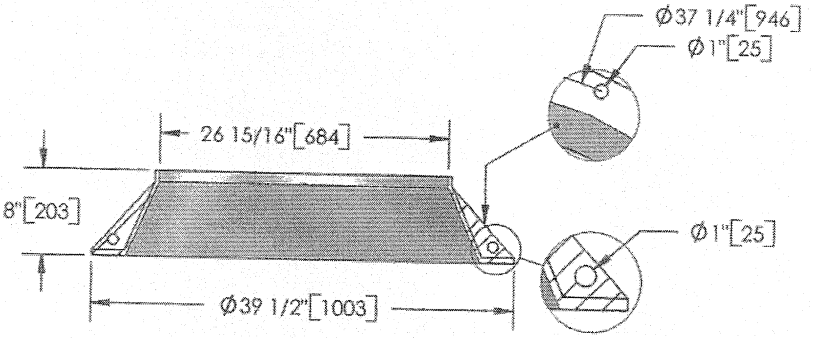
S412 C COVER (OPSD 401.010A)
24 5/8" [624mm]
172 lbs 78 kg
DUCTILE OR GRAY IRON
ASTM A536 65-45-12
ASTM A48 Class 30



AJ633 ESR FRAME
24 5/8" [624mm]
168 lbs 76 kg
DUCTILE IRON
ASTM A536 65-45-12



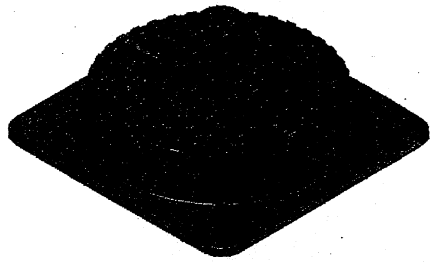
AJ633 CONICAL GUIDE
24 5/8" [624mm]
136 lbs 62 kg
GRAY IRON
ASTM A48 Class 30



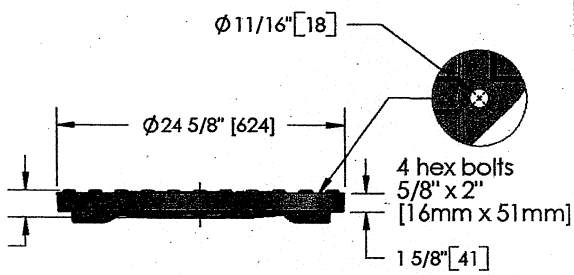
TOTAL WEIGHT 476 lbs 216 ka

Conventional Frame and Cover

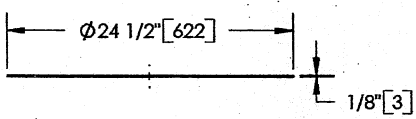
Model S412WT (OPSD 401.030)
Watertight (Ontario)
24 5/8" [624mm]



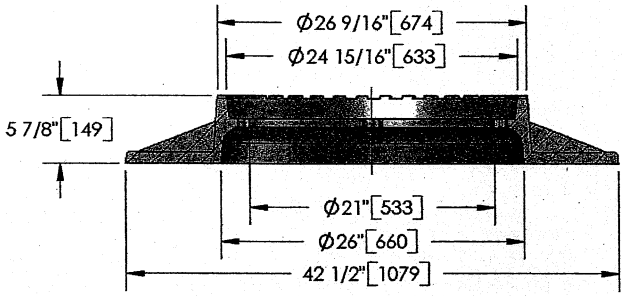
S412 CWTDAN COVER (OPSD 401.030)
24 5/8" [624mm]
164 lbs 74 kg
GRAY IRON
ASTM A48 Class 30



S412 GASKET
24 5/8" [624mm]
2 lbs 1 kg
GASKET
Neoprene 70 Duro



S412 FWT
24 5/8" [624mm]
232 lbs 105 kg
GRAY IRON
ASTM A48 Class 30

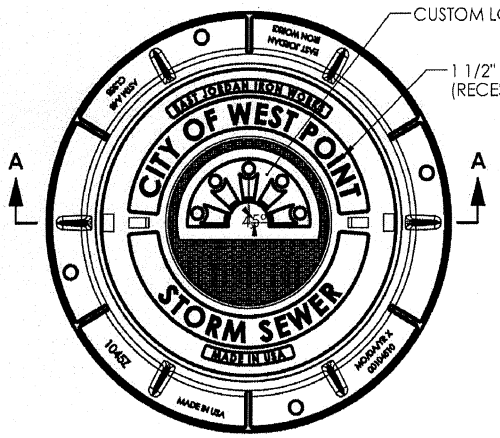


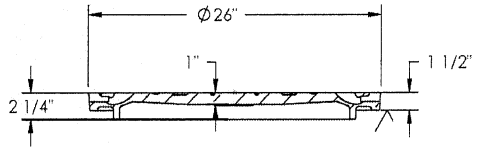
TOTAL WEIGHT 398 lbs 180 kg

www.muellercanada.com
CERTIFIED ISO 9001 : 2000

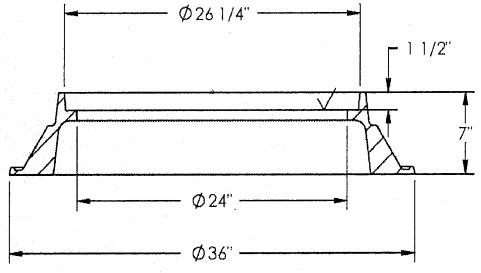
Mueller Canada

INSTALLATION:
OUT OF PAVEMENT





SECTION A-A



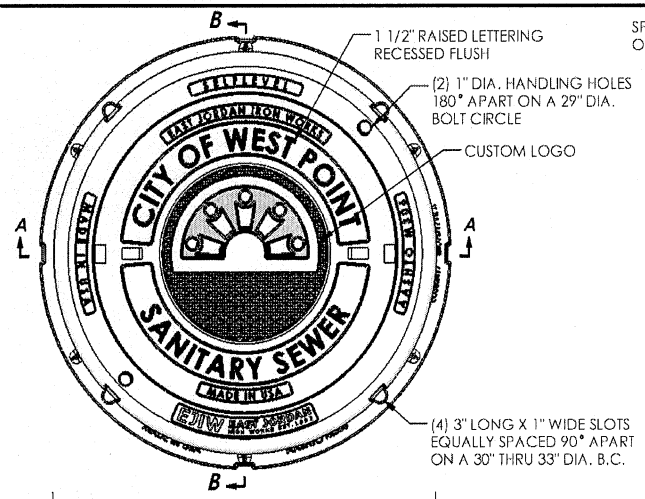
SECTION A-A

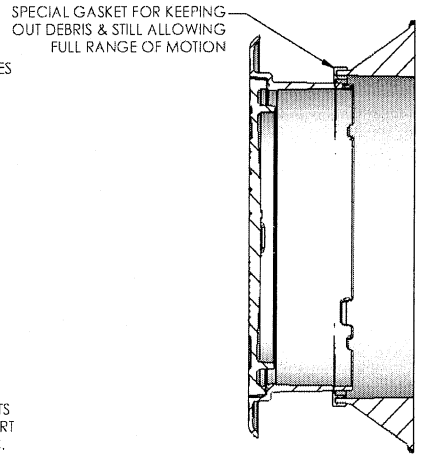
EJIW EAST JORDAN IRON WORKS EST.1883
800-626-4653
www.ejiw.com
MADE IN USA

PRODUCT NUMBER	00104853A01
CATALOG NUMBER	1040
ASSEMBLY	
LOAD RATING	HEAVY DUTY
COATING	UNDIPPED
SPECIFICATION	COVER - GRAY IRON ASTM A48 CL35B FRAME - GRAY IRON ASTM A48 CL35B
OPEN AREA	N/A
√ DESIGNATES	MACHINED SURFACE
DRAWN: JIJ	DATE: 08/26/08
LAST REVISED	DATE
REFERENCE INFORMATION	00104853 00104511

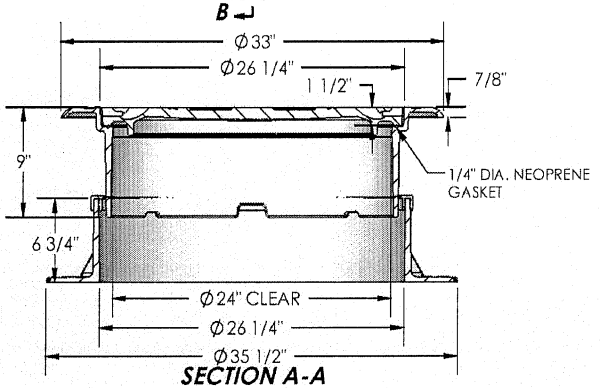
INSTALLATION:

OUT OF PAVEMENT

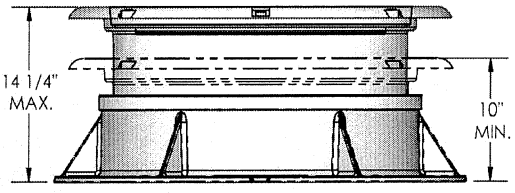




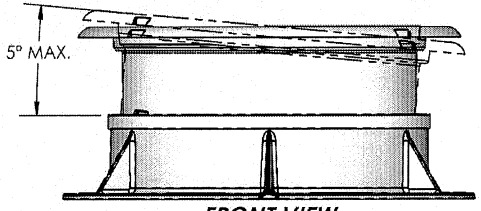
SECTION B-B



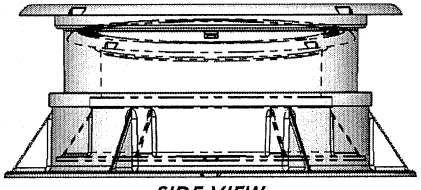
SECTION A-A



SIDE VIEW
(SHOWING TRAVEL OF UPPER FRAME)



FRONT VIEW
(SHOWING MAXIMUM TIP @ 5° ANGLE)



SIDE VIEW
(SHOWING MAXIMUM TIP @ 5° ANGLE)

EJIW EAST JORDAN IRON WORKS EST.1883
800-626-4653
www.ejiw.com
MADE IN USA

PRODUCT NUMBER
00104843SL1

CATALOG NUMBER
24" SELFLEVEL

ASSEMBLY

LOAD RATING
HEAVY DUTY

COATING
UNDIPPED

SPECIFICATION

COVER - GRAY IRON
ASTM A48 CL35B

UPPER FRAME - DUCTILE IRON
ASTM A536

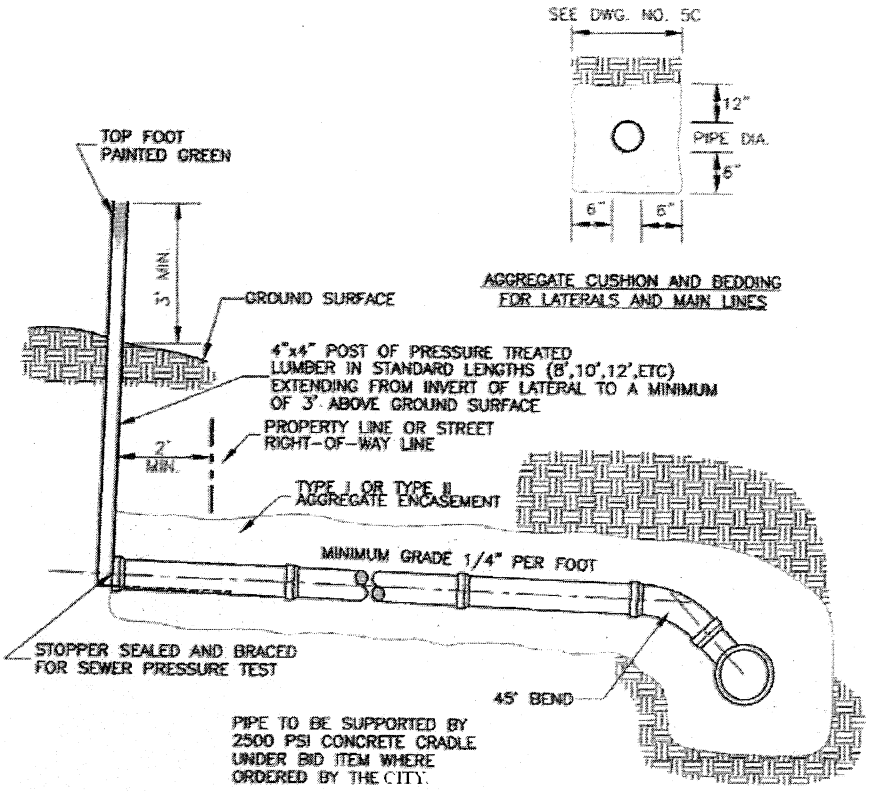
LOWER FRAME - DUCTILE IRON
ASTM A536

OPEN AREA
N/A

√ DESIGNATES MACHINED SURFACE

DRAWN	DATE
JIJ	08/15/08
LAST REVISED	DATE

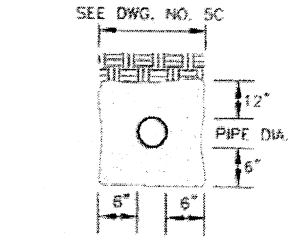
REFERENCE INFORMATION
00104843
00302411
00302417



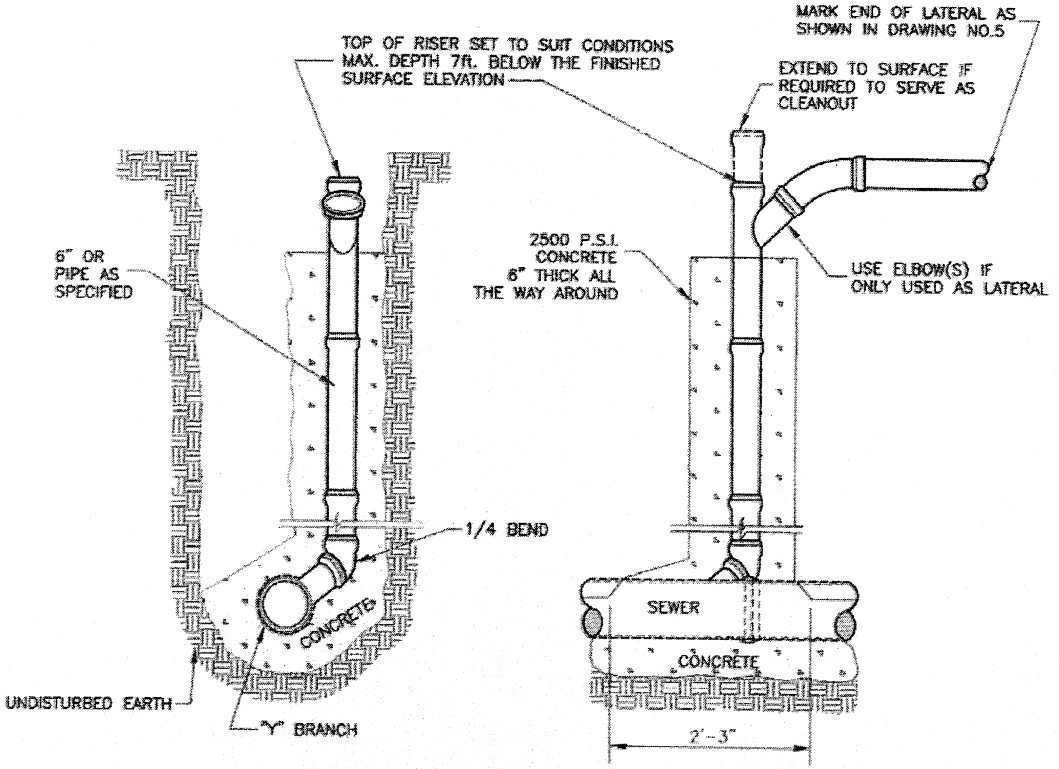
NOTE:
IN THE CONSTRUCTION OF LATERALS, THE CONTRACTOR MUST COORDINATE HIS EFFORTS WITH THE CITY SO AS TO PROVIDE THE PROPER SERVICE TO THE PROPERTY OWNERS. IF IN THE JUDGEMENT OF THE AUTHORITY THE LATERAL CONSTRUCTED BY THE CONTRACTOR DOES NOT PROVIDE ADEQUATE SERVICE TO THE PROPERTY OWNERS, THE CONTRACTOR SHALL RECONSTRUCT THE LATERAL TO THE PROPER GRADE AT THE CONTRACTOR'S EXPENSE. IT IS THE POLICY OF THE CITY TO PROVIDE BASEMENT SERVICE (LOWEST ELEVATION) TO ALL LOTS.

STANDARD DETAIL

LATERAL
AND
MARKER

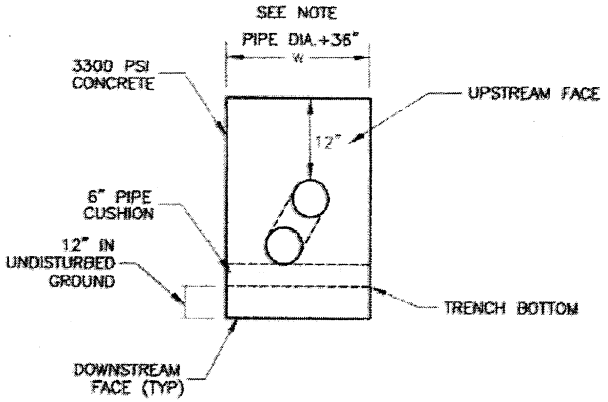


AGGREGATE CUSHION AND BEDDING
FOR LATERALS AND MAIN LINES

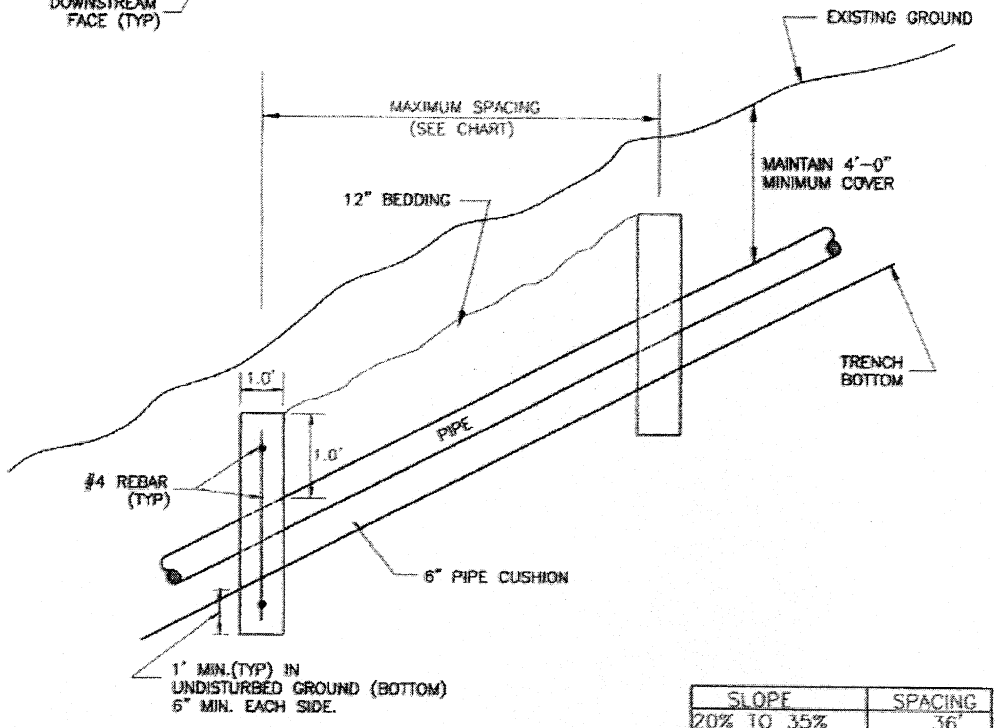


STANDARD DETAIL

DEEP
CUT
LATERAL



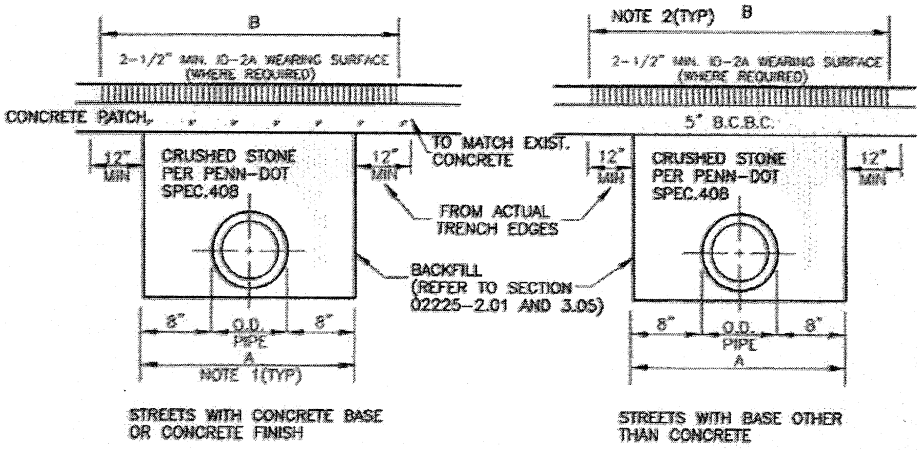
NOTE:
ANCHOR WIDTH INCLUDES A 6" NOTCH INTO UNDISTURBED GROUND ON BOTH SIDES. ANCHOR WIDTH EQUALS TRENCH WIDTH PLUS 12".



SLOPE	SPACING
20% TO 35%	36'
35% TO 50%	24'
50% AND OVER	16'

STANDARD DETAIL

PIPE ANCHOR FOR STEEP SLOPE SEWERS



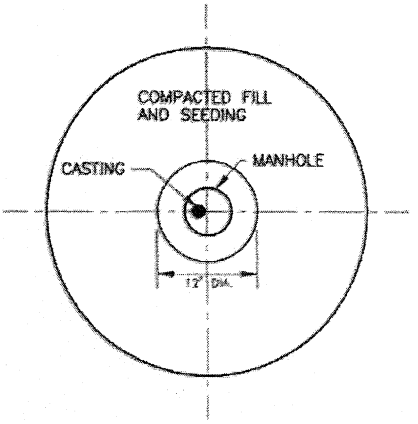
NOTES:

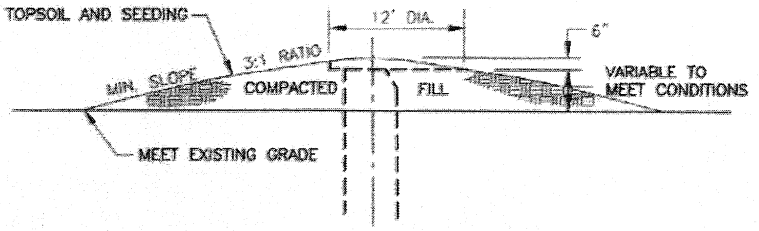
1. TRENCH WIDTHS FOR PIPES IN LOCAL (TOWNSHIP, BOROUGH, PRIVATE) RIGHT OF WAYS SHALL BE PIPE DIAMETER AT THE BELL/FLANGE PLUS 1.33 FEET.(A) THIS SHALL BE THE PAYMENT WIDTH WHEN ROCK EXCAVATION IS CLASSIFIED.
2. PAYMENT RESTORATION PAY WIDTHS SHALL BE PIPE DIAMETER AT THE BELL/FLANGE PLUS 3.33 FEET.(B)
3. REFER TO PROJECT CONSTRUCTION DRAWINGS AND SECTION 02500 FOR DETAILS NOT SHOWN ON THIS DRAWING.
4. THE PAY WIDTH FOR STREET REPAVING ALSO APPLIES TO DRIVEWAY REPAVING

STANDARD DETAIL

LOCAL

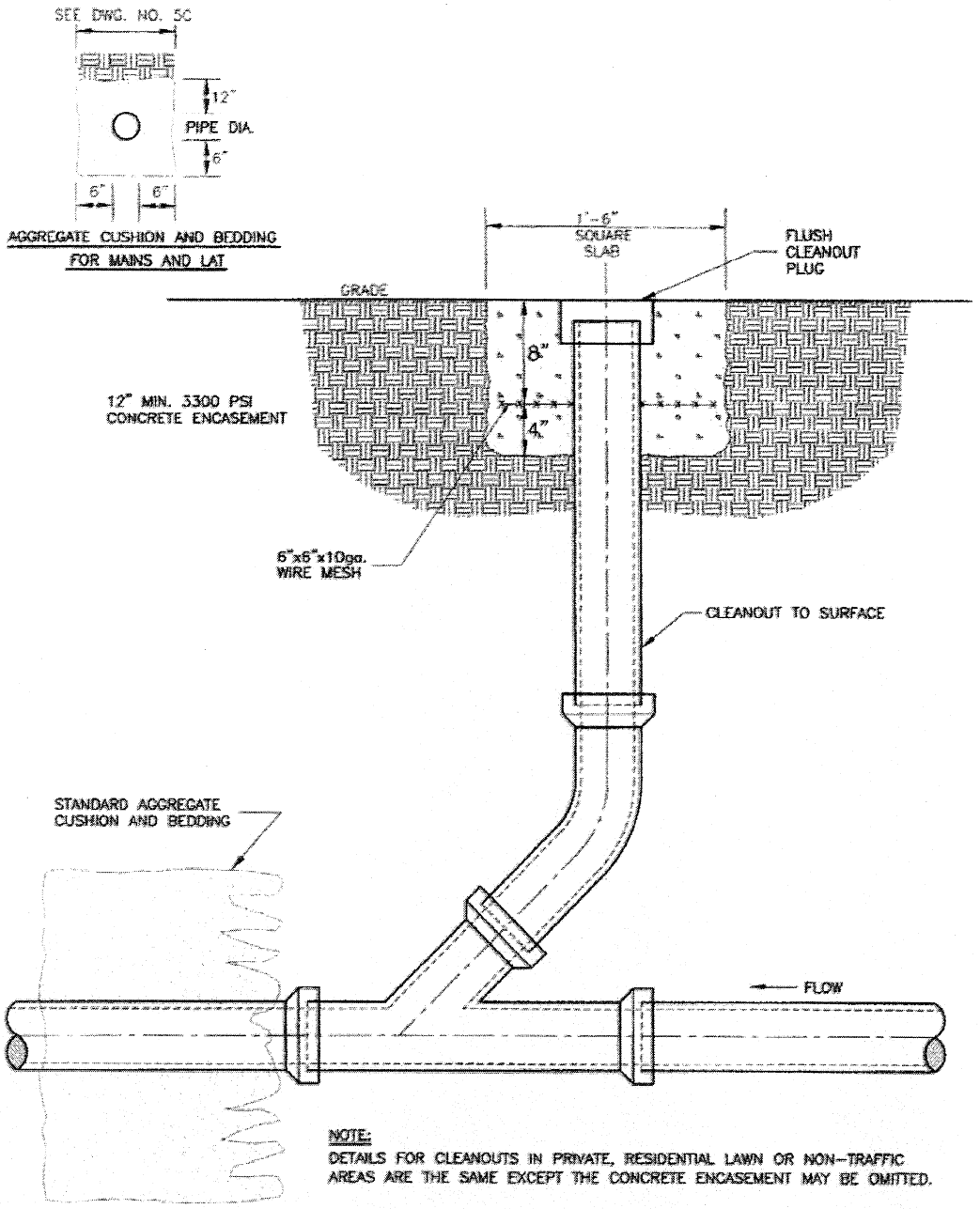
REPAVING REQUIREMENTS AND PAY WIDTHS FOR ROCK EXCAVATION AND PAVEMENT RESTORATION





STANDARD DETAIL

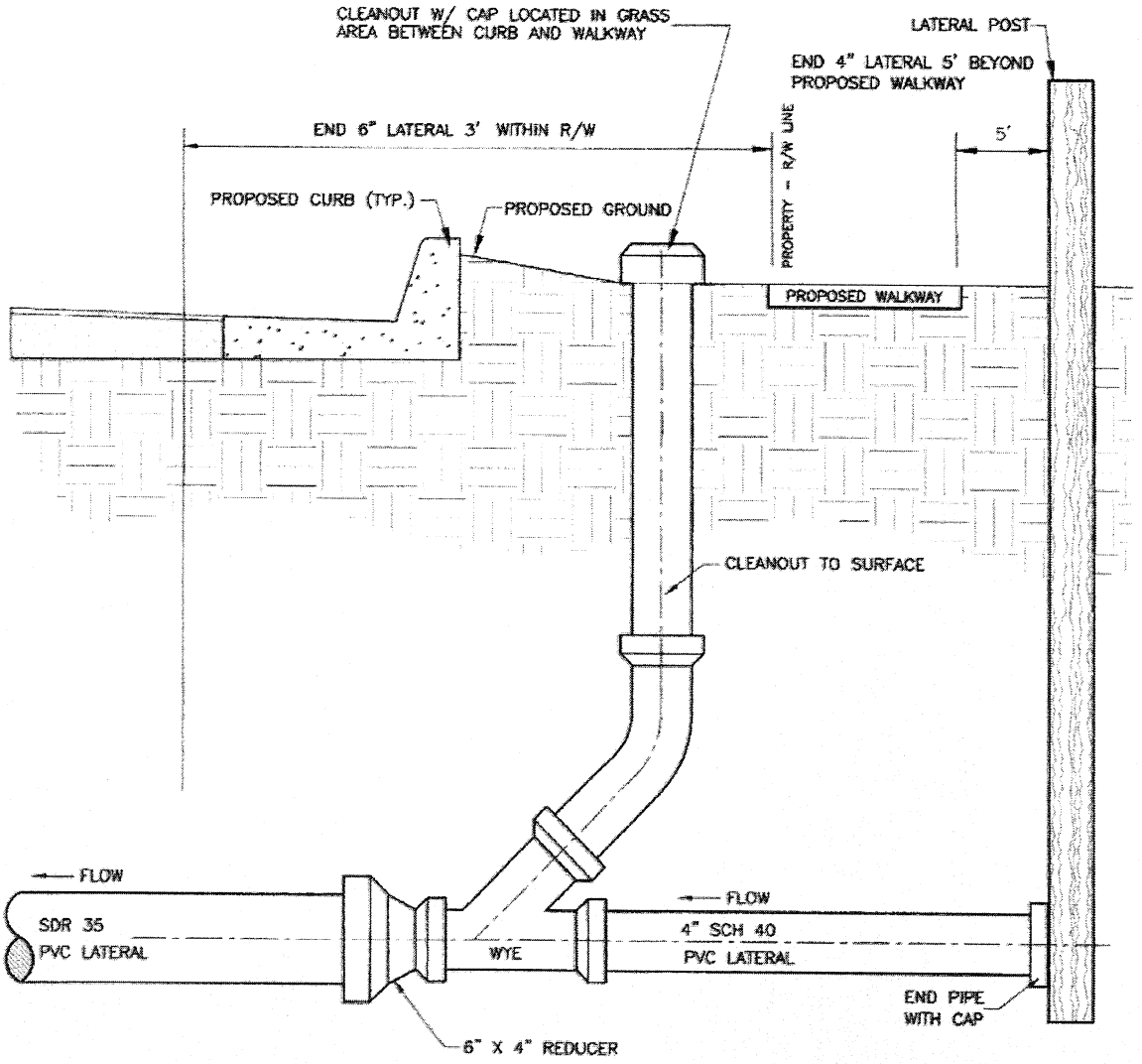
TYPICAL MANHOLE
ISLAND



NOTE:
DETAILS FOR CLEANOUTS IN PRIVATE, RESIDENTIAL LAWN OR NON-TRAFFIC AREAS ARE THE SAME EXCEPT THE CONCRETE ENCASEMENT MAY BE OMITTED.

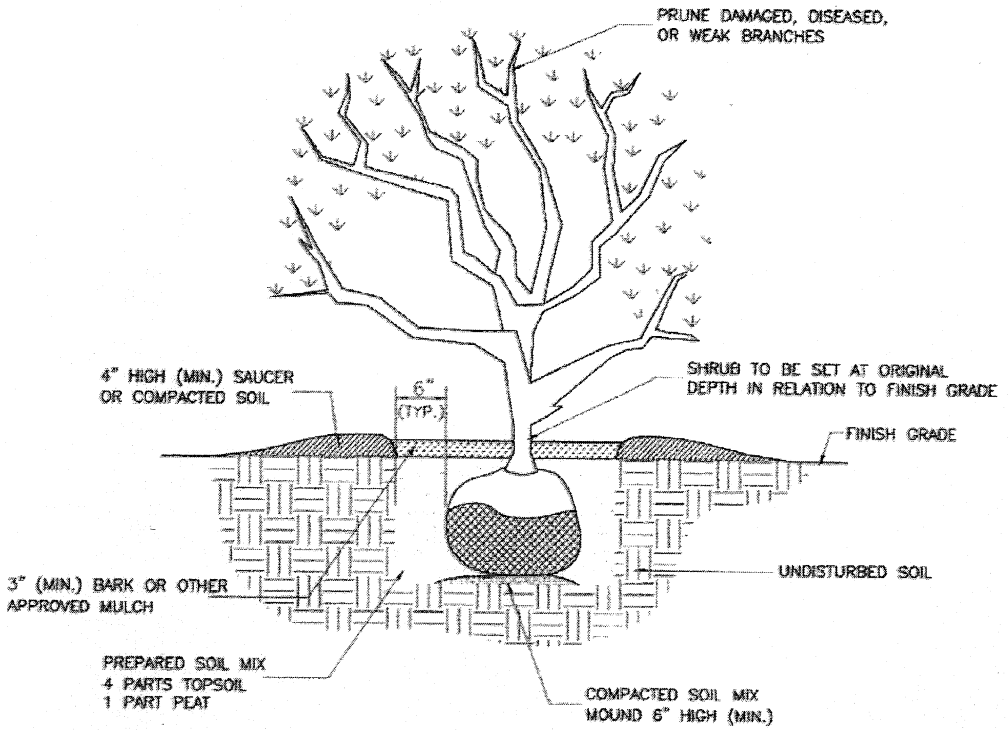
STANDARD DETAIL

CLEANOUT CONSTRUCTION DETAIL FOR PRIVATE COLLECTION SYSTEM IN COMMERCIAL AREAS



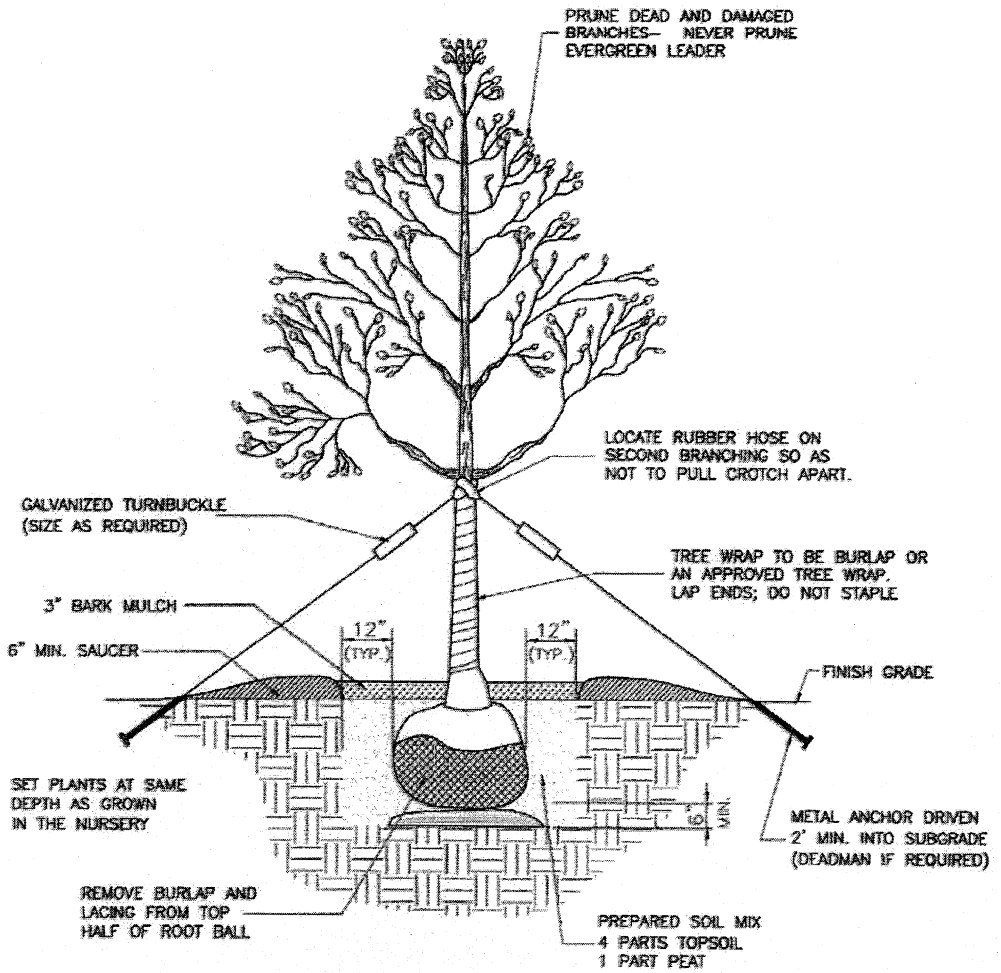
STANDARD DETAIL

SANITARY SEWER LATERAL DETAIL
(FOR SIDEWALK ON PROPERTY OUT OF R.O.W.)



STANDARD DETAIL

SHRUB PLANTING DETAIL

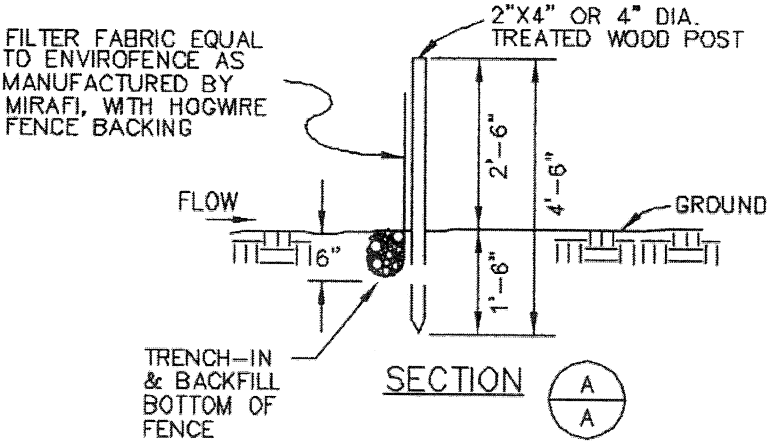


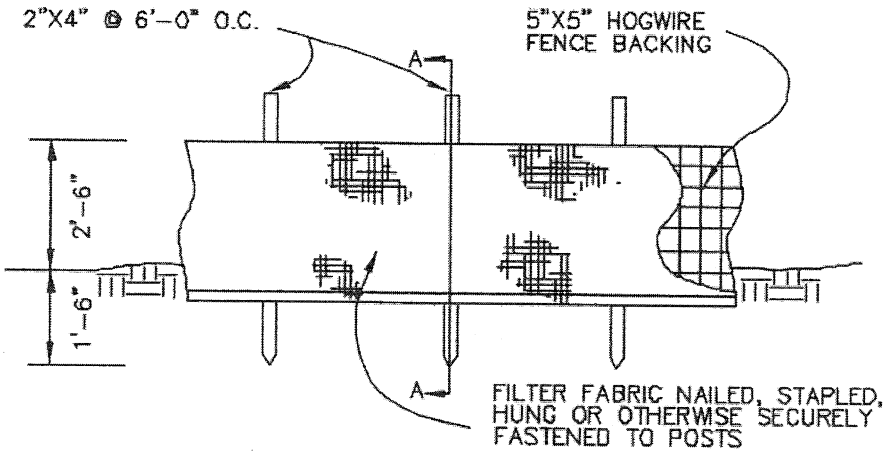
NOTES:

1. IN PAVED AREAS– STONE SAUCER IN A SQUARE
2. IN GRASS AREAS– MULCH SAUCER IN A CIRCLE
3. AFTER PLANTING– THE SAUCER SHOULD BE FLOODED WITH WATER TWICE IN THE FIRST 4 HOURS.

STANDARD DETAIL

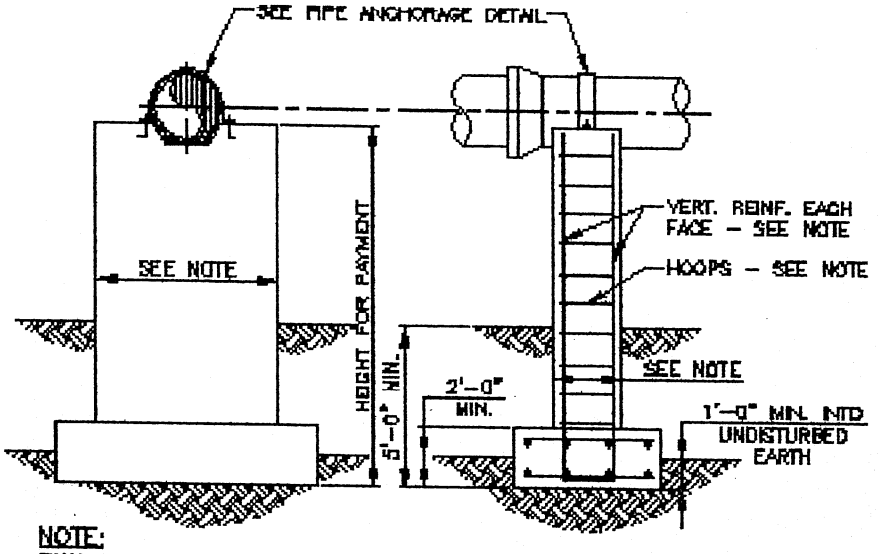
TREE PLANTING AND GUYING





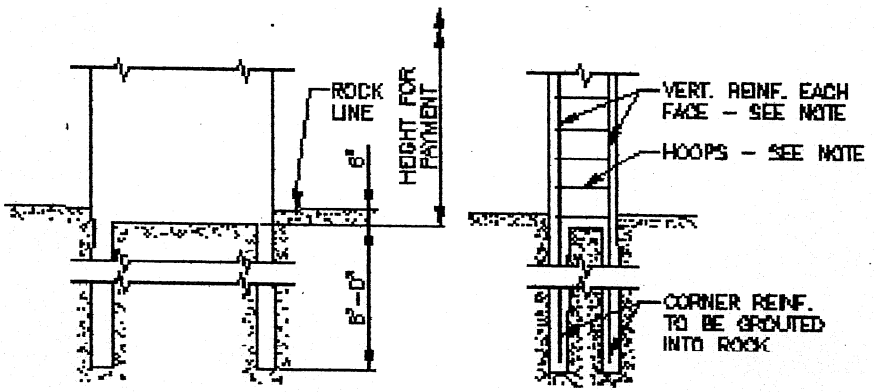
ELEVATION

SILT FENCE DETAIL



NOTE:
FINAL DIMENSIONS OF 4,000 PSI REINFORCED CONCRETE SUPPORTS AND REBAR SIZING TO BE DESIGNED BY REGISTERED STRUCTURAL ENGINEER DEPENDING ON FINAL HEIGHT AND LOCATION OF PIPE SUPPORTS.

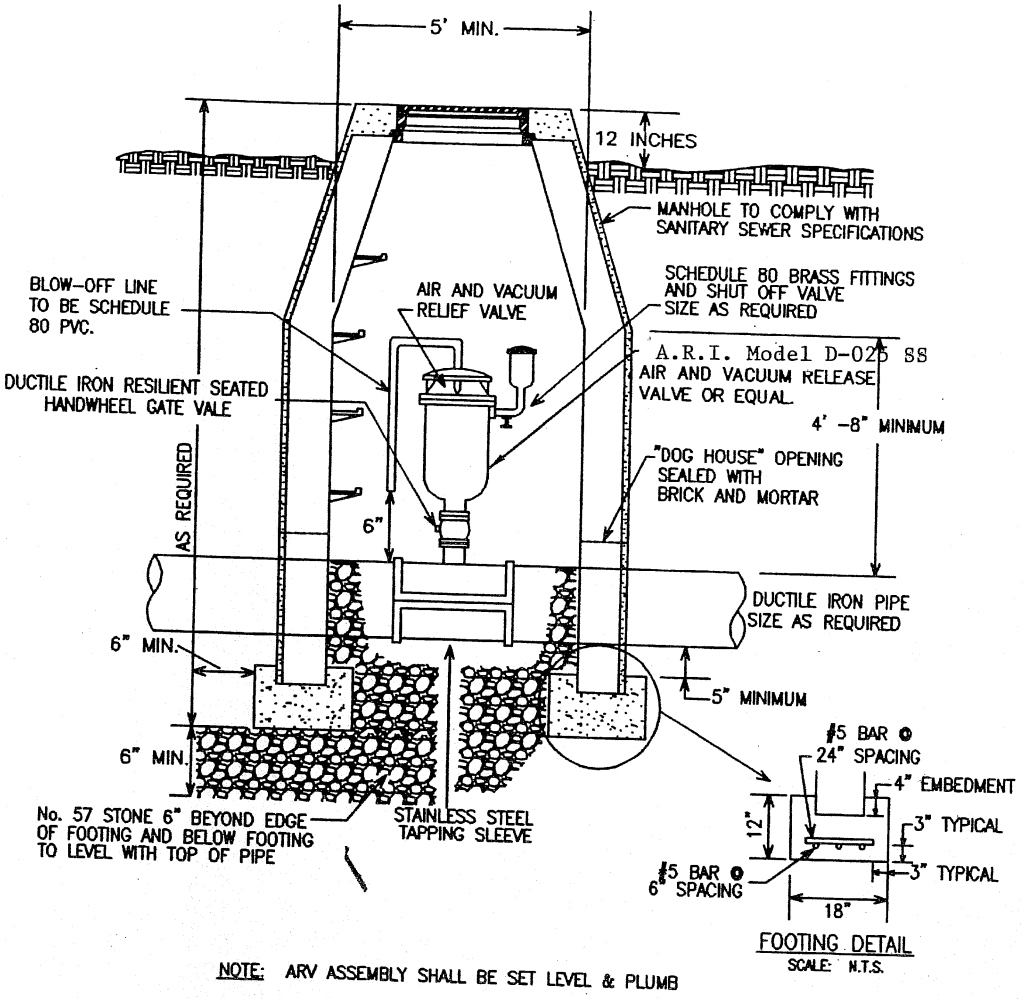
FOOTING IN EARTH



FOUNDATION IN ROCK

CONCRETE PIER DETAILS

NOT TO SCALE

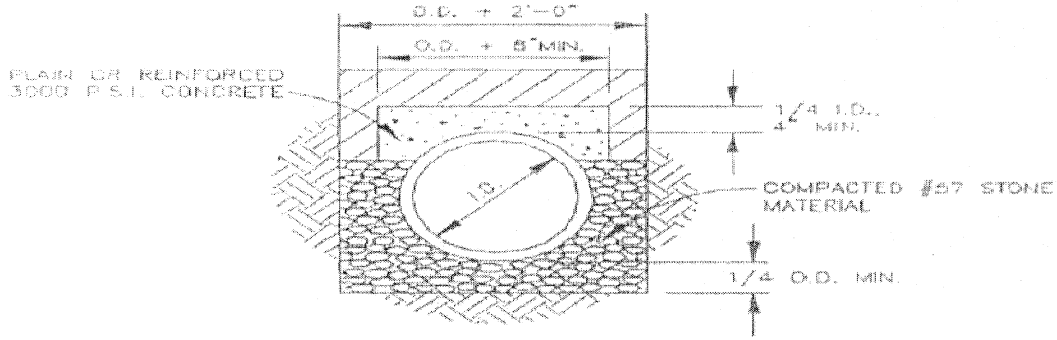


NOTE: ARV ASSEMBLY SHALL BE SET LEVEL & PLUMB

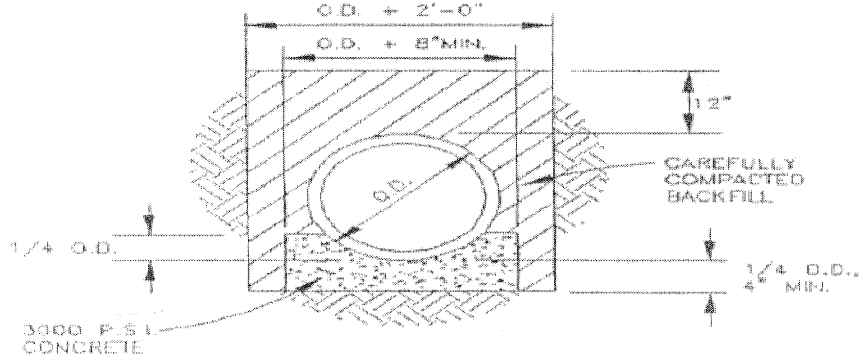
SECTION

AIR RELEASE VALVE AND M.H. DET

N.T.S.

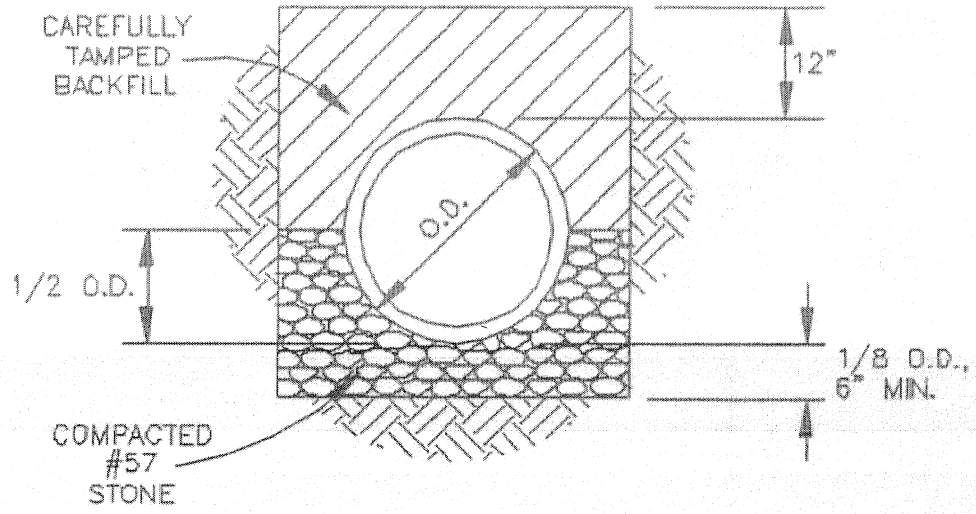


CONCRETE ARCH



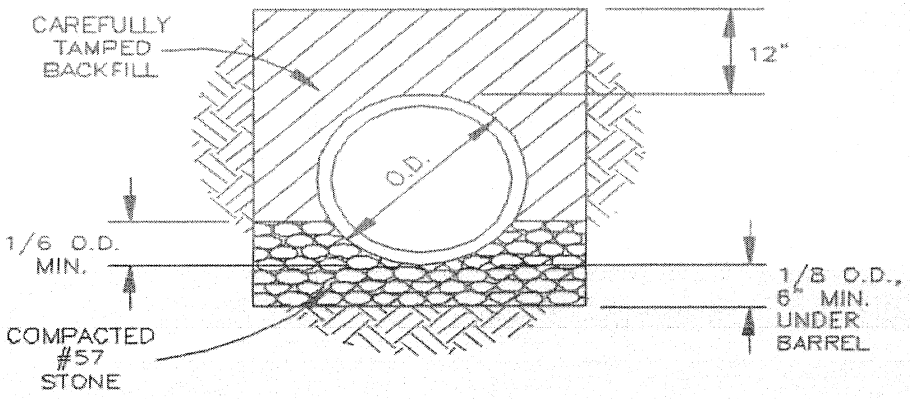
CONCRETE CRADLE

PIPE CLASS 'A' BEDDING



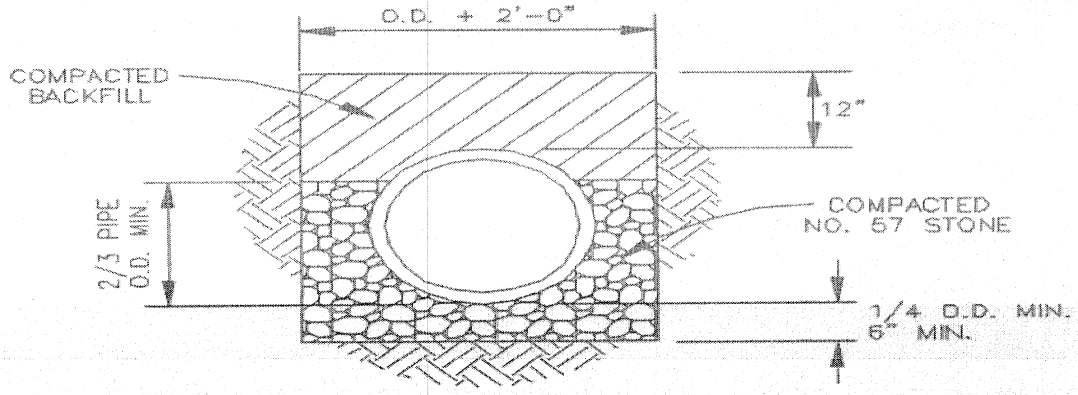
COMPACTED GRANULAR BEDDING
LOAD FACTOR 1.9

PIPE CLASS 'B' BEDDING



GRANULAR BEDDING
LOAD FACTOR 1.5

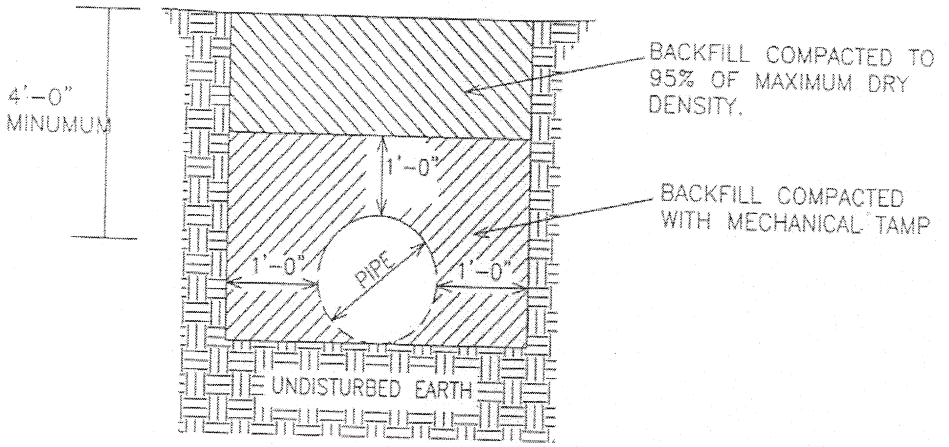
PIPE CLASS 'C' BEDDING



MINIMUM P.V.C. PIPE BEDDING DETAIL

NOT TO SCALE

TE: IF PVC SANITARY SEWER LINE IS CONSTRUCTED IN 100 YEAR FLOOD PLAIN OR BELOW GROUNDWATER TABLE, COMPACTED CLASS 1 MATERIAL IS REQUIRED TO THE TOP OF THE PIPE.



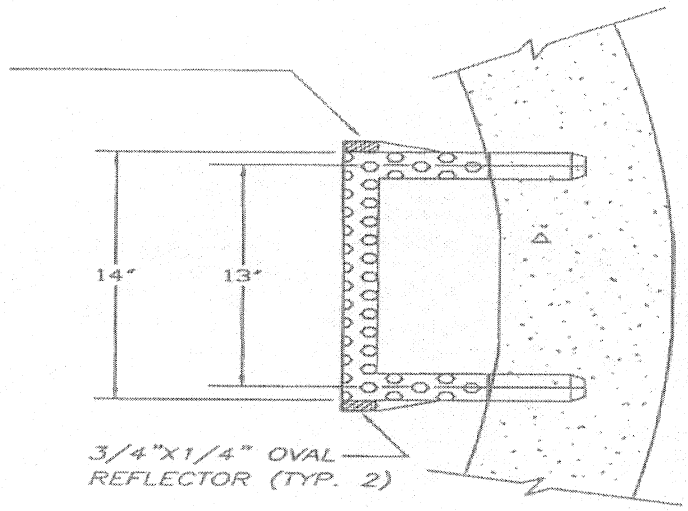
NOTES: UNSUITABLE SOILS ENCOUNTERED IN BOTTOM OF EXCAVATED TRENCH SHALL BE EXCAVATED & REPLACED WITH NO. 57 STONE.

ONLY SUITABLE SOIL SHALL BE USED AS BACKFILL.

DUCTILE IRON PIPE BEDDING

N.T.S.

LANE INTERNATIONAL CORPORATION
POLYPROPYLENE MANHOLE SAFETY
STEP P-14850 WITH REFLECTORS.



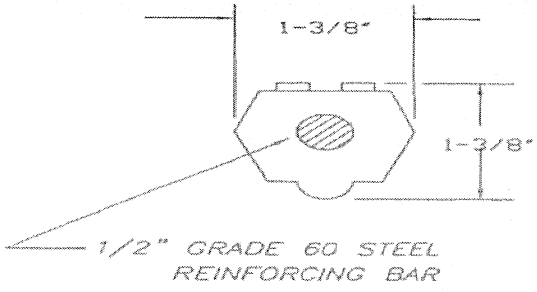
PLAN

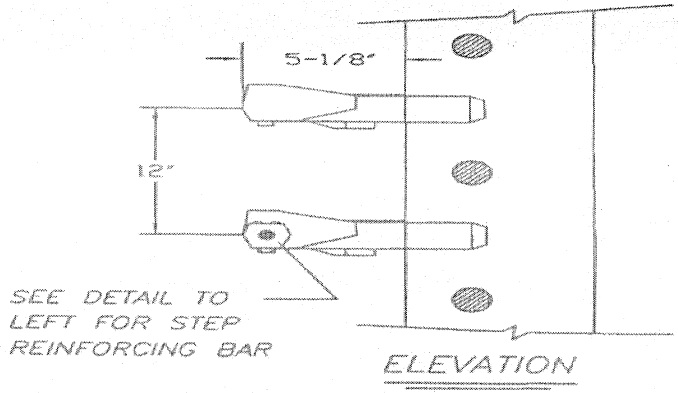
NOTES:

All steps must meet ASTM C-478 and AASHTO M-199 Specifications, polypropylene ASTM D-4104, the 1/2" Grade 60 deformed reinforcing bar ASTM-A--615.

Installation method must resist 1,500 lb. horizontal pull out force and 500 lb. vertical load.

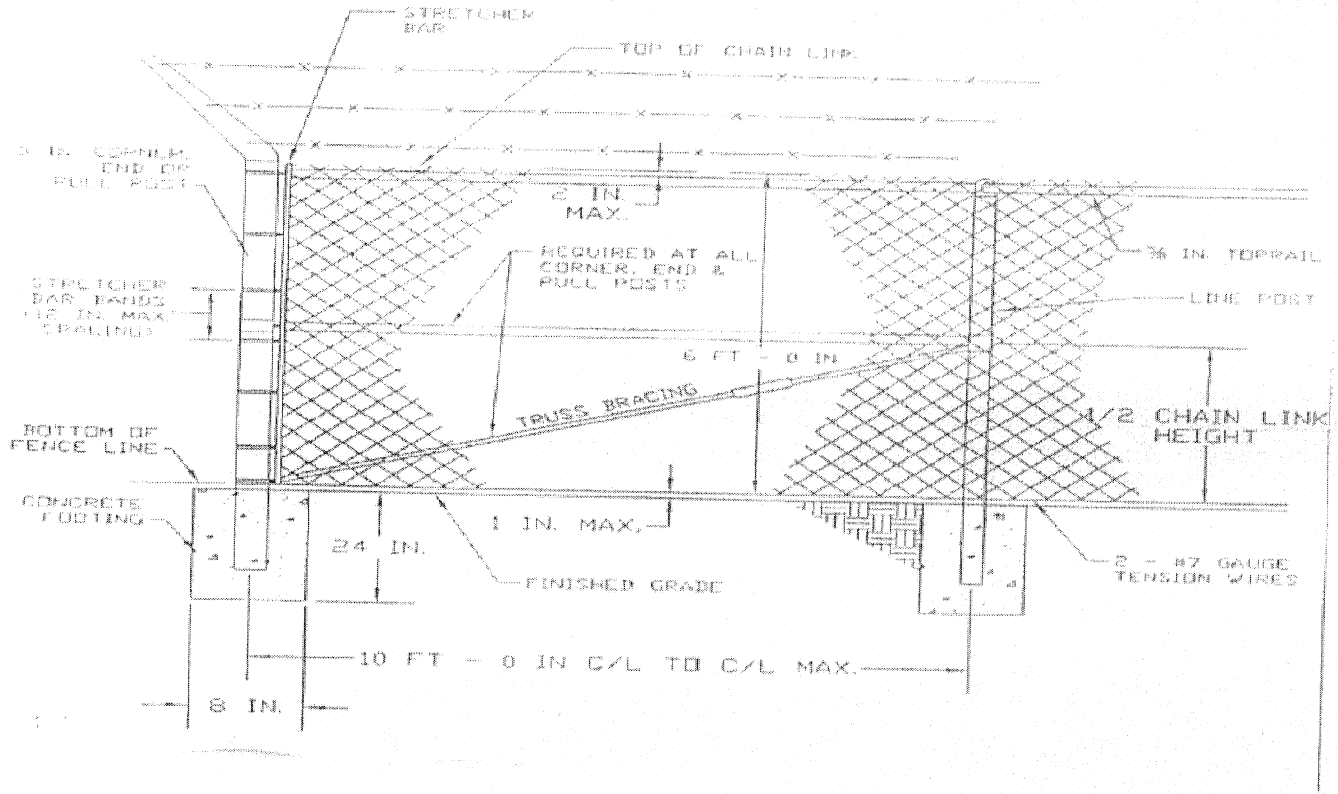
Locate steps over bench whenever possible (not over the main).



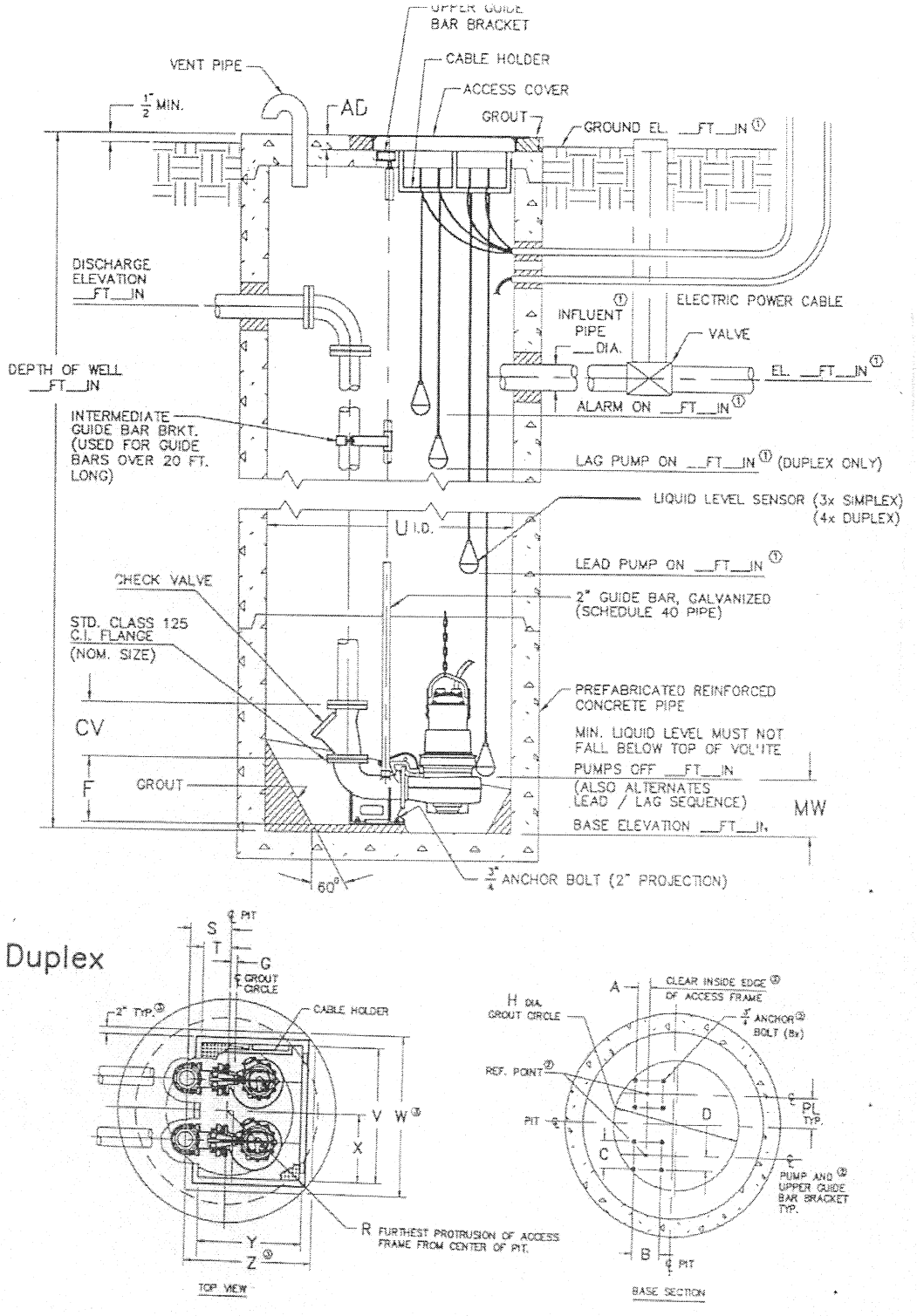


ELEVATION

STANDARD MANHOLE STEPS

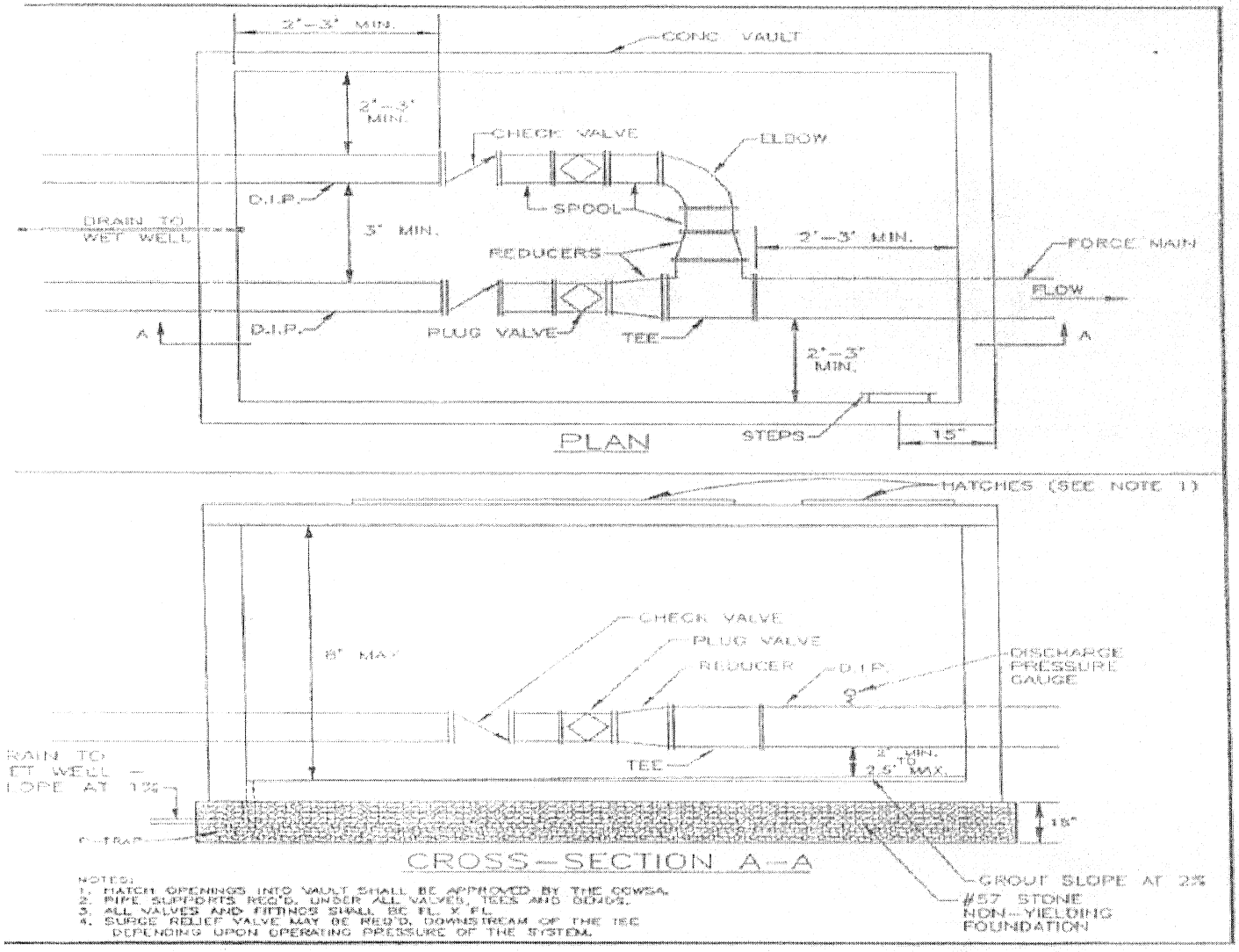


SECURITY FENCE DETAIL
N.T.S.



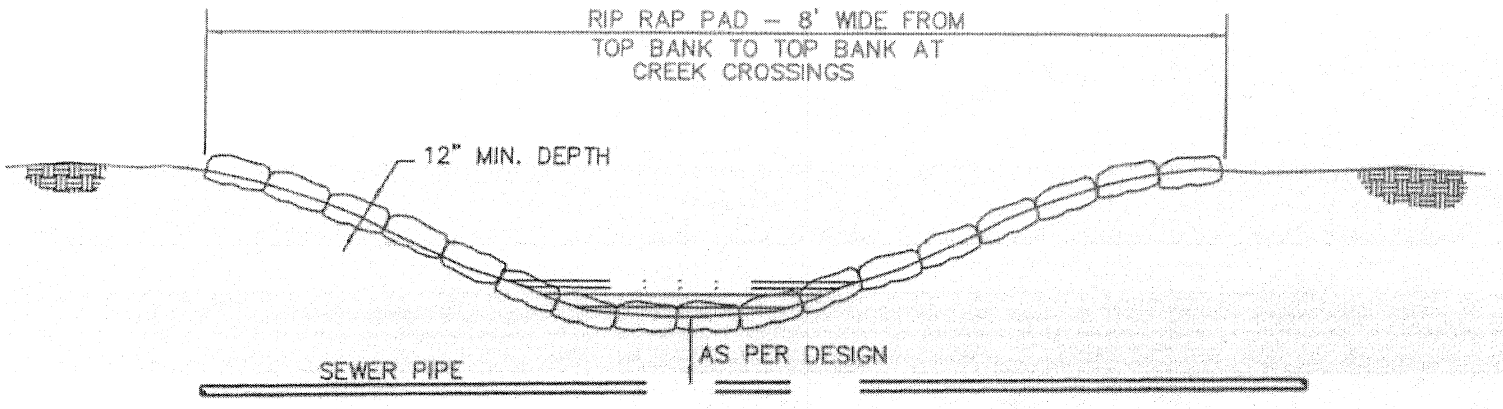
TYPICAL WETWELL DETAIL

N.T.S.



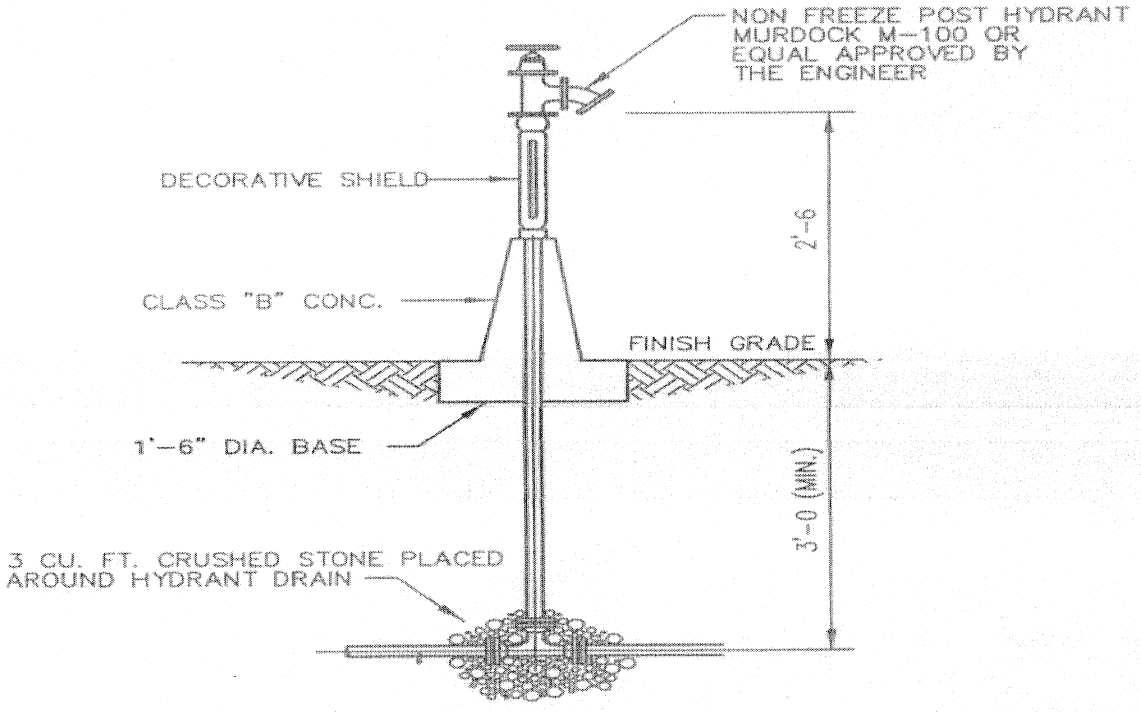
TYPICAL VALVE PIT DETAIL

N.T.S.



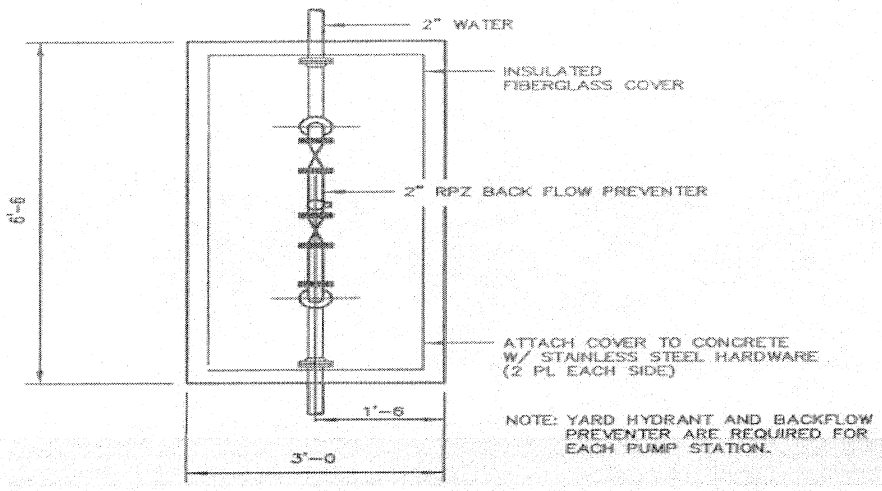
TYPICAL CREEK CROSSING DETAIL

N.T.S.

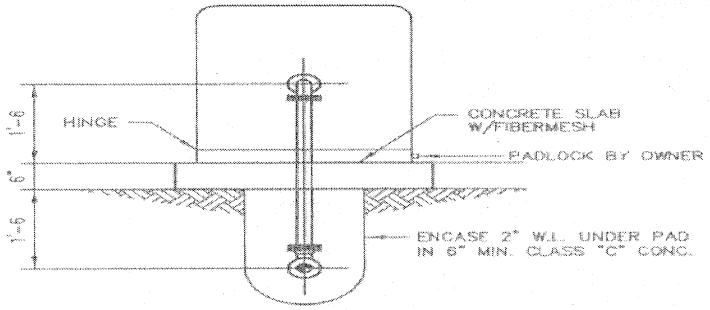


YARD HYDRANT DETAIL

N.T.S.



PLAN



SECTION

NOTE: INSULATE ALL PIPING ABOVE GRADE.

BACK FLOW PREVENTER DETAIL

N.T.S.