SECTION 400 - MATERIALS FOR SANITARY SEWERS

401. GENERAL

All materials used in the work including equipment shall be new and unused materials of a reputable U.S. Manufacturer conforming to the applicable requirements of these Standards, and no materials shall be used in the work until they have been approved by the Authority Any reference to a AWWA, ANSI or other such specification shall mean the latest revision published.

402. GRAVITY SEWER PIPE

All sanitary sewer pipe up through 24-inch diameter must be Polyvinyl Chloride (P.V.C.), Ductile Iron Pipe (D.I.P.), or Steel Pipe, except where D.I.P. or Steel Pipe are required. For pipe larger than 24-inches, the Contractor may have the option of using either High Density Polyethylene (H.D.P.E.), Polyvinyl Chloride (P.V.C.), Reinforced Concrete Pipe (R.C.P.), Ductile Iron Pipe or Steel Pipe, except where Ductile Iron Pipe (D.I.P.) or Steel Pipe are required. All pipe shall be installed with a minimum of Class "C" bedding.

A.) DUCTILE IRON PIPE (D.I.P.)

1.) Scope: Ductile iron sewer pipe shall be required at all utility or storm sewer crossings with less than 2 feet of clearance, in cross country locations where cover is less than 3 feet, in streets where cover is less than 5 feet, in subdivision easements between lots, in fills, and where PVC sewer pipe has more than 16 feet of cover.

Ductile Iron Pipe shall be designed in accordance with AWWA C150. The thickness and class of the pipe shall be governed by AWWA C150. Ductile Iron Pipe shall be manufactured in accordance with AWWA C151, and shall have an outside bitumastic coating per AWWA C151.

The interior lining of the pipe and fittings shall be Protecto 401 ceramic epoxy with a minimum thickness of 40 mils. **Both bare pipe and cement linings conforming to AWWA C104 are NOT allowed for any sanitary sewer pipe.**

2.) Joints: DIP joints shall be of the bell and spigot type with push-on joints, conforming to AWWA C111, unless another type of restrained joint is required by the Authority

3.) Maximum Depth of Cover

The table below indicates the maximum depth of cover for varying thickness classes and laying conditions:

Nominal Pipe Size, Inches	Thickness Class	Maximum Depth of Cover Per Laying Condition In Feet Type 4	Type 5
8”	50	46	64
8”	51	61	81
8”	52	77	99
10”	50	38	55
10”	51	49	66
10”	52	59	79
12”	50	36	52
12”	51	43	60
12”	52	53	71
16”	50	30	47
16”	51	34	51
16”	52	40	57
20”	50	27	38
20”	51	30	44
20”	52	34	50
24”	50	23	31
24”	51	27	36
24”	52	30	41
30”	50	18	25
30”	51	21	29
30”	52	24	33
36”	50	17	25
36”	51	20	28
36”	52	24	32

For further information on larger diameter pipe and thicker walls than those presented in this table, refer to AWWA C150. The laying conditions, Types 4 and 5 are also described in AWWA C150. For clarification, Type

4 is roughly equal to Class C Bedding as described in Section 506.3, and Type 5 is roughly equal to Class B Bedding as described in Section 506.2.

4.) Where transitioning from D.I.P. to P.V.C., solid sleeves are required if the pipe sizes are the same. Where pipe sizes differ, such as when installing 15" P.V.C. and 16" D.I.P., the Developer shall install D.I.P. for the entire length between the two manholes.

B.) POLYVINYL CHLORIDE (PVC) SEWER PIPE

1.) Scope: The Contractor shall provide un-plasticized polyvinyl chloride (P.V.C.) plastic gravity sewer pipe meeting the requirements shown below unless otherwise required by the Authority

2.) Materials: Pipe and fittings shall meet the requirements as specified under ASTM D3034 for PVC pipe through 15" in diameter and ASTM F679 for pipe 18" through 24" in diameter. All pipe and fittings shall be suitable for use as a gravity sewer conduit. Bell joints shall consist of an integral wall section with elastomeric gasket joint which provides a watertight seal. Standard laying lengths shall be 20.0 feet (± 1 inch). The pipe shall be capable of passing all tests which are detailed in this specification. Minimum wall thickness shall be as follows:

ASTM D3034	ASTM F679
4" - 0.120 inches	18" - 0.536 inches
6" - 0.180 inches	21" - 0.632 inches
8" - 0.240 inches	24" - 0.711 inches
10" - 0.300 inches	
12" - 0.360 inches	
15" - 0.437 inches	

3.) Fittings: All fittings and accessories shall be manufactured and furnished by the pipe supplier. They shall have bell and/or spigot configurations compatible with that of the pipe and shall have an equivalent wall thickness.

4.) Pipe and Fittings Tests: The Contractor will be required to furnish a written outline of the manufacturer's quality control program for the Engineer's approval prior to shipping any pipe to the project. Before installing any pipe the Contractor shall furnish written certification that all pipe through 15" in diameter meets ASTM Specification D3034 and all pipe 18" through 24" in diameter meets ASTM F679. At least one sample from each 100 pieces of pipe furnished shall be subjected to each test outlined under Section 8 of ASTM D3034. The samples will be tested by

an independent laboratory approved by the Authority, and a certified copy of results will be furnished to the Authority. If any test is not met then 9 additional tests of that property will be ordered, and if any of these 9 tests are not met, the manufacturer will not be allowed to furnish materials for the project. The cost of all testing shall be at the Developer's expense.

5.) Pipe Stiffness: Minimum "pipe stiffness" (F/Y) at 5 percent deflection shall be 46 psi for all sizes, when tested in accordance with ASTM Standard Method of Test D2412, to determine the "External Loading Properties of Plastic Pipe by Parallel Plat Loading". There shall be no evidence of splitting, cracking, or breaking at a deflection of up to 30 percent of the original diameter.

6.) Fusion Quality: There shall be no evidence of flaking, swelling, or disintegration when the pipe material is tested in accordance with ASTM D2152, "Quality of Extruded Poly (Vinyl Chloride) pipe by Acetone Immersion".

7.) Joint Tightness: Pipe and fitting joints shall comply with ASTM D3212 for "Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals". Joint assemblies shall not leak when subjected to both an internal and external hydrostatic test at equivalent pressures of 10.8 psi gauge for a period of one hour. Pipes shall be tested in straight alignment, axially deflected position, and by shear load test as otherwise defined in Paragraphs 7.2, 7.3, and 7.4 of ASTM D3212.

8.) Installation: PVC pipe will be installed in accordance with ASTM D2321. In any area where the pipe is below existing ground water level, the contractor will embed PVC pipe in sand or graded gravel. No special compaction requirements will be necessary; however, the sand or gravel must extend from six inches below the pipe to twelve inches above the pipe, and the material must be firmly placed under the pipe haunches. When embedding PVC pipe in friable, compressible soils (Eg. silt, clay, sandy clay, silty clays, etc.), special care must be exercised to provide a uniform (undisturbed or fully compacted) trench bottom. Additionally, the backfill must be compacted to 95% standard proctor in 6" - 8" lifts to twelve inches above the top of the pipe. Initial backfill shall be compacted to the densities outlined in D2321. The Authority may require random compaction tests to insure compliance with D2321. If any material tested is less than the required density, the contractor shall re-compact said material and the Authority shall then have the right to additional compaction tests at the expense of the Developer to insure compliance with D2321.

The Contractor shall use SDR-35 material for pipe with 0-16 feet of fill.

PVC pipe cannot be used at depths exceeding 16 feet.

9.) **Deflection Limit:** Vertical deflection of installed pipe shall not exceed 5 percent of the un-deflected diameter as defined in Table X1.1 of ASTM D3034.

10.) Each segment of line (except service lines) will be tested at the end of each month just prior to inspection on that segment. Upon completion of the pipe laying, and at least 30 days after installation (to allow for settling), the pipe will be tested again for final acceptance. The test shall be performed by the Contractor pulling a mandrel of specified dimensions through the pipeline.

C.) HIGH DENSITY POLYETHYLENE PIPE (H.D.P.E.)

1.) **Scope:** This specification covers the requirements of high density polyethylene profile wall gravity sewer and drain pipe fittings in nominal sizes 18 through 96 inches with integral bell and spigot gasketed and welded joints. Note: HDPE pipe is acceptable only for trenchless technology applications and for small diameter (< 4") force mains. The designer shall not specify HDPE pipe for open-cut gravity sewers.

2.) **Classes:** Class selection for high density polyethylene profile wall sewer pipe shall be a minimum of Class 160 for pipe with 0-16 feet of fill. HDPE cannot be used at depths exceeding 16 feet.

3.) **Material:** Pipes and fittings shall be manufactured from high density polyethylene resin compound which shall meet the requirements of Type III, Class C, Category 5, Grade P 34 per ASTM D 1248. Materials meeting the requirements of ASTM D3350 with a cell classification PE 334433C or higher are also suitable. The pipe shall contain a minimum of two percent carbon black as an ultraviolet inhibitor.

4.) **Pipe Dimensions:** The average inside diameter and the minimum wall thickness of the waterway of the pipe shall comply with ASTM F894 for RSC Class 160 pipe.

5.) **Joints:** The pipe shall be produced with bell and spigot end construction. Joining shall be accomplished by use of neoprene rubber gaskets complying with the physical requirements as specified in ASTM F477. Joints shall be in accordance with ASTM D3212 and withstand an internal operating pressure of 50 psi.

6.) **Pipe Stiffness:** The profile wall shall be substantially strong to protect

against any diametrical deformation. All polyethylene profile wall pipe shall have a minimum specific pipe stiffness of 46 psi at a deflection of five percent of the internal diameter when tested and calculated in accordance with ASTM D24212.

7.) **Retest and Rejection:** If the results of any tests do not meet the requirements of this specification, the tests may be conducted again in accordance with agreement between purchaser and seller. In retesting, the product requirements of this specification shall be met and the test methods designated in this specification shall be followed. If upon retest failure occurs, the quantity of product represented by the tests shall be rejected.

8.) **Deflection Limit:** Vertical deflection of installed pipe shall not exceed 5 percent of the undeflected diameter as defined in Table X1.1 of ASTM D3034.

9.) Each segment of line (except service lines) will be tested at the end of each month just prior to inspection on that segment. Upon completion of the pipe installation, and at least 30 days after installation (to allow for settling), the pipe will be tested again for final acceptance. The test shall be performed by the Contractor pulling a mandrel of specified dimensions through the pipeline.

D.) REINFORCED CONCRETE PIPE (R.C.P.)

1.) **Scope:** The work included in this section includes furnishing all labor, equipment, and materials required to install, test, and inspect reinforced concrete (ASTM C-76) pipe sanitary sewers, including all risers, plugs, fittings, and bedding, as shown on the drawings and/or specified herein.

2.) **Quality Assurance:** The Contractor must submit to the Owner and Engineer the concrete pipe manufacturer's evidence of a working Quality Control Program for approval prior to any pipe being manufactured. The program and standards of manufacturing must be established and well defined. The program must include the minimum following requirements:

a.) A full time Quality Control Technician.

b.) A complete and working Quality Control Laboratory capable of testing and recording the requirements set forth in these Specifications for concrete pipe.

c.) Written documentation of the concrete pipe manufacturer's performance on a recent sewer project. The performance results must be from a tested and approved installation of the pipe material set forth in this specification from either the Owner and/or Engineer stating that the pipe tested and met the requirements.

d.) A zero defect program for daily material testing and finished product testing to assure quality control as the pipe is being manufactured and shipped for this particular project.

e.) Provide the services of a competent factory representative of the pipe manufacturer for purposes of supervising and/or inspecting the installation of pipe. This service shall be for the duration of the project.

f.) Provide equipment and labor to air test each joint of pipe (30" dia. and larger) as it is installed. Joint tester shall be "Cherne Large Diameter Joint Tester" or equal. This testing shall in no way relieve the contractor from the responsibility of performing infiltration/exfiltration tests.

3.) <u>Testing of Concrete Pipe:</u>

a.) Concrete gravity pipe (ASTM C-76) shall meet all materials and testing requirements of ASTM C-76, ASTM C-443, and ASTM C-497 (except where modified herein). Manufacturer shall secure the services of an independent testing laboratory to conduct the tests. Testing laboratory shall be approved by the Authority prior to conducting any tests. All testing costs shall be paid for by the pipe manufacturer.

b.) Testing shall be in Job Lots (a Job Lot is a continuous run of one size of pipe for this project) for a maximum of 6% of pipe quantity or a minimum of 5% of pipe quantity. The test specimen will have a minimum of two (2) joints for pipe of 16 foot laying length. For pipe of 12 foot laying length, the maximum number of joints shall be seven (7) and the minimum number shall be two (2). Bulkheads will be included in this joint count.

c.) A representative of the Developer will be present to witness all tests that are conducted at the manufacturer's site and shall record all results. Manufacturer shall notify the Developer at

least 48 hours prior to conducting any tests.

d.) The following test shall be required:

i.) Pipe barrels shall be subjected to an internal hydrostatic pressure of 10 psi for 10 minutes. Pipe joints shall be subjected to an internal hydrostatic pressure of 13 psi for 10 minutes. The testing of the joints will be in the straight and deflected alignment.

ii.) The manufacturer shall conduct three (3) external load crushing strength tests per Job Lot. This test shall be by the three-edge bearing method. The test may be taken to Ultimate Load.

iii.) Absorption tests shall be conducted as per ASTM C-497. The absorption rate of the sample from the pipe wall shall not exceed 6%.

e.) If any test specimen fails to pass any of the above tests, two (2) additional test specimens shall be chosen at random from the Job Lot and tested. If either of those two specimens fails the test, then the entire Job Lot is subject to rejection. If the manufacturer requests further testing, then every section of pipe in the Job Lot must be tested.

f.) In addition to the above tests, manufacturer shall conduct tests to determine alkalinity of cover concrete as detailed in the material sub-section 5 of this concrete specification.

g.) Each pipe shall be clearly marked as required by the governing ASTM standard specifications to show its class, date of manufacture, and the name of trademark of the manufacturer.

h.) Any pipe or specials 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.) **Guarantee:** The Developer shall provide a guarantee against defective materials and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Standards.

5.) <u>Material:</u>

a.) All concrete pipe and fittings 12 inches in diameter and larger shall be reinforced concrete sewer pipe conforming to the latest requirements of ASTM C-76 with the following modifications: All concrete pipe with 0-20 feet of fill shall be a minimum of Class III with 4500 psi concrete. All pipe with 20-30 feet of fill shall be Class IV with 4500 psi concrete. All pipe with 30 feet of fill and over shall be Class V with 5500 psi concrete.

b.) Pipe shall have circumferential reinforcement as required for the particular class of pipe furnished. The bell and spigot of the joint shall contain circumferential and longitudinal reinforcement. Reinforced concrete pipe shall be centrifugally cast or vibrated, horizontally or vertically cast or made on a Packerhead machine and shall be furnished in lengths not more than 20 feet and not less than 8 feet, except where short lengths are required for construction conditions. Reinforced concrete pipe shall have bell and spigot joints suitable for the use of a rubber gasket to be provided as a part of this item.

c.) Concrete pipe for sanitary sewers shall have bell and spigot joints consisting of self-centering steel joint rings securely attached to the pipe reinforcing steel. The steel joint rings shall be suitable for use with a rubber O-ring type gasket to be provided as part of this item.

d.) Bell and spigot joints consisting of self-centering steel joint rings shall have the joint rings securely attached to the pipe reinforcing steel. The rings which form the joint shall be made so that they will join with a close, sliding fit. The joint surfaces shall be such that the rubber gasket shall be confined on all sides and shall not support the weight of the pipe.

The spigot ring shall have an external groove accurately sized to receive the gasket. Special section steel for spigot rings shall conform to ASTM A-283, Grade A, or ASTM A-306, Grade 50.

The bell ring shall be flared to permit gradual deformation of the gasket when the joint is assembled. Minimum thickness of bell rings shall be 3/16 inch. Bell rings 1/4 inch or thicker shall conform to ASTM A-283, Grade A, or ASTM A-306, Grade 50.

Bells less than 1/4 inch thick shall conform to ASTM A-570, Grade A.

Each ring shall be precisely sized by expansion beyond the elastic limit of the steel and then gauged on an accurate template. All exposed surfaces of both rings shall be protected by a corrosion-resistant coating of zinc applied by an approved metallizing process after proper cleaning.

6.) **Lining:** Acceptable interior linings shall be Koppers Bitumastic 300 M coal tar epoxy, Porter Tarset, Wise Chem CTE 200, Amercoat 78, polyurethane or approved equal.

The interior concrete or mortar surfaces of pipe and fittings are to be sandblasted and coated with the liner in accordance with the manufacturer's recommendations. The dry film thickness of the total system shall be 40 mils minimum of polyurethane or 90 mils of coal tar epoxy on concrete or mortar surfaces and on steel joint ring surfaces.

Sandblasting shall result in a clean dry surface free of oil, grease, or other contaminants. Any air pockets over 1/4 inch in diameter and 1/8 inch deep appearing on the concrete surface after sandblasting will be filled with an epoxy sand patching material such as those sold by Sherwin-Williams, Glidden, or Moran. The epoxy sand patch should be troweled prior to the application of the coal tar epoxy.

Any steel surfaces to be painted should be sandblasted, solvent cleaned, or wire brushed prior to painting. Application of the coal tar epoxy shall be by brush, roller, or spray system using equipment recommended by the manufacturer of the coal tar epoxy system. The temperature during application and curing of coal tar epoxy shall be as recommended by the manufacturer of the coal tar epoxy. Time between coats (if applicable) shall be as recommended by the manufacturer of the liner.

If the inside joint recess will be mortared and painted with coal tar epoxy in the field, the pipe supplier shall not paint the inside vertical surfaces at the ends of the pipe. When the inside joints will not be mortared in the field, the pipe supplier shall paint the inside vertical concrete or mortar surfaces at each end of the pipe.

The liner shall be extended continuously over the front lip of the steel spigot ring and a minimum of 2 inches onto the sealing surface of unrestrained bell rings so that all interior joint surfaces which can be exposed to the fluid inside the pipe are coated.

E.) STEEL PIPE

Steel pipe shall meet the requirements of ASTM A-139 Grade B, AWWA C-200, and shall be lined with 40 mils of polyurethane or 90 mils of coal tar in accordance with AWWA C-203. Acceptable coal tar epoxy interior linings shall be Koppers Bitumastic 300 M coal tar epoxy, Porter Tarset, Wise Chem CTE 200, Amercoat 78, or approved equal. The outer coating shall be sand/grit blasted, primed to Federal Specification TTP-86C. Pipe shall have a minimum wall thickness of 0.250 inches.

403. SANITARY SEWER FORCE MAINS

A.) Force mains 4 inches in diameter or larger shall be ductile iron pipe and shall conform to section 402.A of these specifications. The interior lining of the pipe and fittings shall be Protecto 401 ceramic epoxy with a minimum thickness of 40 mils. **Both bare pipe and cement linings conforming to AWWA C104 are NOT allowed for any sanitary sewer pipe.**

B.) Force mains smaller than 4 inches in diameter shall be CertainTeed, Eslon, Dyka, Vulcan, Class 200 SDR 21 integral bell PVC pressure pipe or approved equal. HDPE pipe is also allowable for these smaller force mains.

C.) See Standard Details for the minimum concrete blocking requirements. Design engineer shall be responsible for design of blocking where more than the minimum is required. For internal pressures in excess of 100 PSI, blocking calculations MUST be submitted to the Cherokee County Water & Sewerage Authority for review.

D.) All non-ferrous pipe shall be marked with the installation of detection wire installed one foot above the pipe and properly connected to valves, fittings and manhole rings so that the sewer line can be located with a pipe detector after burial.

E.) All fittings shall be mechanical joint with retainer glands. All retainer glands shall be EBAA Mega-Lug or approved equal.

F.) Ductile iron force mains shall be encased in green polyethylene tubing. Polyethylene encasement tubing shall be manufactured of virgin polyethylene material conforming to the requirements specified in AWWA C105, Section 4.1.1 for linear, low density polyethylene film. The polyethylene film shall have a minimum thickness of 8 mil.

404. PRECAST CONCRETE MANHOLES

A.) MANHOLES

Precast manholes shall be constructed of Portland Cement concrete with a compressive strength of not less than 4,000 pounds per square inch at an age of 28 days. The wall thickness shall not be less than 5 inches. Manholes over 12' deep shall also be placed on a reinforced slab as shown on the detail sheet. Precast concrete manholes shall consist of precast reinforced concrete sections with eccentric top section, or flat slab for shallow manholes, and a base section conforming with the typical manhole details as shown on the Standard Detail Drawings. Flat top manholes will be approved only if a real need for such can be demonstrated by the design engineer. All manholes shall be water tight when completely built. Safety platforms shall be constructed in manholes in accordance with OSHA regulations and the details in these specifications.

B.) MANHOLE SECTIONS

The design, the materials used in, the manufacturing process, the testing and the transportation of precast manhole sections shall be subject to inspection at any time by the Engineer. Materials found defective by the Engineer will not be delivered to the job site. Material on the job site that is found defective shall be moved immediately after being notified that such materials are unacceptable. Precast manhole shall conform to ASTM C478.
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C.) MANHOLE SECTION JOINTS

Joints of the manhole sections shall be of the tongue-and-groove type, sections shall be joined using O-ring rubber gaskets, flexible plastic gaskets conforming to the applicable provisions of ASTM Standard Specification, Serial Designation C 433, or an approved bituminous mastic joint material.

D.) LIFT HOLES

Each section of the pre-cast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be sealed with cement mortar using one part Portland cement to two parts clean sand, meeting ASTM Standard Specifications, Serial Designation C144.

E.) MANHOLE STEPS

Manhole steps conforming to the applicable provisions of ASTM Specification C478, shall be of #4 steel reinforcing bars covered with Polypropylene Plastic or rubber and shall be supplied with depth rings and

other necessary appurtenances. Steps shall be similar to and of an equal quality to the "PS-1-PF" by M. A. Industries, Inc. of Peachtree City, Ga. The step shall be factory built into the precast sections.

F.) PIPE HOLES

Holes in precast bases to receive sewer pipe shall be precast at the factory at the required locations and heights. Knocking out of holes in the field will not be permitted, however, holes can be cored in the field with a coring machine. Pre-molded rubber boots with stainless steel bands shall be used for connecting sewer pipe to manholes. These may be either the lock-in "Kor-N-Seal" type as manufactured by National Pollution Control Systems, Inc. or the cast-in type as manufactured by Interpace Division of Ball Rubber, Inc. In all cases the boot shall be sized to suit the outside diameter of the type pipe being used.

G.) BASES AND INVERTS

Manhole bases and inverts shall be constructed of 4000 psi concrete or brick in accordance with details on Standard Detail Drawings and the trough shall have the same cross-section as the sewers to which it connects. The manhole base and invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. The minimum drop through a manhole shall be 0.1 foot.

H.) MANHOLE FOUNDATION

The manhole base shall be set upon a 6 inch compacted (minimum thickness) mat of Size #57 crushed stone. Manholes over 12' deep shall also be placed on a reinforced slab as shown on the detail sheet.

I.) BRICK

Brickwork required to complete the precast concrete manhole shall be constructed using 1 part portland cement to 2 parts clean sand, meeting ASTM Specifications, Serial Designation C 144, thoroughly mixed to a workable plastic mixture. Brickwork shall be constructed in a neat and workmanlike manner. Cement mortar shall be used to grout interior exposed brick joints and faces. No more than 3 courses of brick with 9 inch maximum total depth of bricks may be used to adjust manhole covers.

J.) FRAME AND COVER

Manhole covers shall be of cast iron with a coat of asphaltic paint applied at the foundry. The weight of the frame and cover shall be approximately 315 lbs. The clear opening shall be 21 1/2". The frame and cover shall be equal and similar to Neenah R-1776.

Where waterproof covers are required, the weight of the frame and cover shall be approximately 375 lbs. The clear opening shall be 24". The frame and cover shall be equal and similar to Neenah R-1915-H2 with a "bolted-down" lid.

The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry. Frames and covers shall be in compliance with the latest edition of ASTM 48. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted, if necessary, to conform to the exact slope, crown and grade of the existing adjacent pavement. All covers shall have "SEWER" printed on them.

K.) MASONRY WORK

Masonry work shall be allowed to set for a period of not less than 24 hours. All loose or waste material shall be removed from the interior of the manhole. The manhole cover then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

405. STEEL CASINGS

Steel casing pipe shall be used for all cased piping where the carrier pipe is eight inches (8") or greater in size. Steel casing pipe shall have a minimum yield strength of 35,000 psi and shall conform to the requirements of ASTM A139, Grade B, electric fusion welded steel pipe. It shall be fully coated on the exterior and interior with a coal tar varnish coating. The casing pipe diameter shall be six to eight inches greater than the "bell" diameter of the carrier pipe. Minimum wall thickness shall be as follows:

Nominal Diameter (Inches)	Nominal Thickness (Inches)
Under 14	0.250
16	0.250
18	0.250
20	0.281
22	0.312
24	0.344
28	0.406
30	0.406
36	0.469
42	0.500
48	0.625
54	0.750

406. STONE AND GRAVEL MATERIALS

All rip-rap, construction exit stone, subgrade stabilizer stone, graded aggregate base and drainage stone shall meet the requirements set forth in the **Manual For Erosion and Sediment Control In Georgia**, Appendix C - Construction Materials, latest edition.

407. AIR RELEASE AND VACUUM BREAK VALVES FOR FORCE MAINS

A.) The Sewerage Air Release and Vacuum Break Valve shall consist of a compact tubular all stainless steel fabricated body, hollow direct acting float and solid large orifice float in HDPE – stainless steel nozzle and woven dirt inhibitor screen, nitrile rubber seals and natural rubber seat.

B.) The intake orifice area shall be equal to the nominal size of the valve, i.e., a 6” valve shall have a 6” intake orifice. Large orifice sealing shall be effected

by the flat face of the control float seating against a nitrile rubber “O” ring housed in a dovetail groove circumferentially surrounding the orifice.

C.) The valve shall have an integral “Anti-Surge” Orifice mechanism which shall operate automatically to limit surge pressures or shock induced by liquid oscillation and/or rapid air/gas discharge to less than 1.5 x valve rated working pressure.

D.) Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural rubber seal affixed into the control float. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seal is prevented.

E.) The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

F.) Connection to the valve inlet shall be facilitated by flanged ends conforming to PN10,16 or 25 ratings of BS 4504 or SABS 1123 Standards or, ANSI B16.1 Class 125 and Class 250 and ANSI B 16.5 Class150 and Class 300 Standards.

G.) Flanged ends shall be supplied with the requisite number of stainless steel screwed studs inserted for alignment to the specified standard. **Nuts, washers or jointing gaskets shall be excluded.**

H.) Prior to the ingress of liquid into the valve chamber, as when the pipeline is being filled, valves shall vent through the “Anti-Surge” orifice when sewage approaches velocities relative to a transient pressure rise, on valve closure, of less than 1.5 x valve rated pressure.

I.) Valves shall not respond to the presence of air/gas by discharging it through the small orifice at pressures within a specified design range, i.e., 0.5 bar to 10 bar and shall remain leak tight in the absence of air.

J.) Valves shall not exhibit leaks or weeping of liquid past the large orifice seal at operating pressures of 0.5 bar to 1.5 x rated working pressure.

K.) Valves shall react immediately to pipeline drainage or water column separation by the full opening of the large orifice so as to allow unobstructed air intake at the lowest possible negative internal pipeline pressure.

L.) The valve shall be Vent-O-Mat Series RGXb-DN50, or approved alternate.