

CHAPTER 13

SANITARY SEWER SYSTEMS

SECTION **GENERAL** **1301**

1301.1 Sanitary Sewer Required. The developer of all developments and subdivisions shall provide a sanitary sewer system designed, approved and installed in accordance with these Regulations. Sanitary sewer systems for subdivisions and developments shall be connected to a public sewer.

The sanitary sewer system shall meet the minimum requirements of the Mississippi Department of Environmental Quality and conform to the applicable standards of the City.

The developer shall be fully responsible for the design, installation, and oversight of any physical improvements necessary to connect to existing public infrastructure.

1301.2 Waiver and Exception. In the event it is determined by the Director of the Water and Sewer Department that it is not possible, or is not feasible, to provide access to the public sanitary sewer system, the developer may request a waiver from providing a public sanitary sewer system. Such request shall be in writing and be presented to the Planning Director prior to Preliminary Plat Approval.

The Board of Aldermen shall have sole authority in granting or denying such a waiver.

Should the Board of Aldermen grant a waiver to the developer from providing a public sanitary sewer system, the developer shall install an individual onsite wastewater system for each lot within the proposed development or subdivision.

1301.2.1 Individual Onsite Wastewater System. Individual onsite wastewater systems shall be designed and installed in accordance with the **Mississippi Department of Health** requirements.

1301.3 Plans and Specifications Approval. Prior to advertising for bids, or prior to beginning construction where bids are not received on a new public sewer system, or for extensions or modifications to an existing public sewer system, plans and specifications shall be provided to the Planning Director.

Plans and specifications shall be prepared, sealed, and signed by a professional engineer registered to practice in Mississippi.

Such plans shall be forwarded to the Mississippi Department of Environmental Quality for review and approval. Such plans shall not be approved by the City, until approved in writing by the Mississippi Department of Environmental Quality, Office of Pollution Control.

1301.4 System Design. Sewer mains shall be of sufficient size to serve all residents of the subdivision but shall not be less than eight inches (8") in diameter. The lines shall be designed and constructed to give mean velocities, when flowing full, of not less than two feet (2') per second, based on Kutter's formula using an "n" value of 0.013. Where velocities of over fifteen feet (15') per second are attained, special provision shall be made to protect against displacement. Sewers shall be laid with straight alignment and uniform slope between manholes.

All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer shall be made because of the width and the depth of trench. Where necessary to withstand extraordinary superimposed loading, special bedding, concrete cradle, or special construction may be used.

Except for street and driveway crossings, sewer lines shall be located outside of paved areas. Exceptions will be considered on a case-by-case basis.

Construction specifications shall contain appropriate requirements based on the criteria, standards and requirements of the City.

1301.5 Materials. Sewer mains and fittings shall be constructed of Rigid Polyvinyl Chloride Pipe (PVC).

1301.6 Installation. The width of the trench shall be ample enough to allow the pipe to be laid and jointed properly and to allow the backfill to be placed and compacted as needed. When wider trenches are dug, appropriate bedding class and pipe strength shall be used.

The installation of joints and the materials used shall be included in the specifications.

Sewer joints shall be designed to minimize infiltration and to prevent the entrance of roots throughout the life of the system.

Manholes shall be installed in accordance with Section 1304 and as follows:

1. at the end of each line;
2. at all changes in grade, size or alignment;
3. at all intersections; and
4. at distances not greater than four hundred feet (400') for sewers fifteen inches (15") or less, and five hundred feet (500') for sewers 18 inches to 30 inches (18" to 30"), except the distances up to six hundred feet (600') may be approved in special cases.

Manholes shall be inspected for water-tightness prior to placing into service.

The minimum diameter of manhole shall be forty eight inches (48"). Manholes shall be of the pre-cast concrete (ASTM C478) or poured-in-place concrete type. Manhole steps shall be provided. Manholes shall be waterproofed on the interior and to twelve inches (12") below grade on the exterior.

The bottom of manholes shall be reinforced concrete and the flow channel (invert) through manholes shall be made to conform in shape and slope to that of the sewers.

Inlet and outlet pipes shall be jointed to the manholes with a gasketed flexible watertight connection that will allow differential settlement of the pipe and manhole wall to take place.

Watertight manhole covers shall be used for manholes (1) located in paved or traveled areas, (2) with tops set flush with the surrounding ground or (3) located in areas subjected to flooding by surface runoff or high water. The tops of manholes with vented covers shall be raised above the surrounding finished grade, three inches (3") minimum and shall not be subjected to surface runoff or flooding. Locked manhole covers may be required in isolated easement locations or where vandalism may be a problem. An access of twenty two inches (22") diameter (minimum) shall be provided.

Stub outs or house laterals (Schedule 40 PVC) shall be laid out and in place ahead of the gas and water lines so that variances in the depth or grade of the line will not be required to accommodate to allow for water or gas lines or stub outs. All sanitary sewer mains shall have stub outs installed, one per lot and be stubbed out to a sufficient distance to insure that the pavement of a street need not be cut in order to connect thereto. Each stub out shall include a service cleanout. Multiple lots may not be serviced by a common service line.

Sewers shall be laid at least ten feet (10') horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot (10') separation, the Water and Sewer Director may allow deviation on a case-by-case basis. Sewers crossing water mains shall be laid to provide a minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main. When it is not possible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to the water pipe, and shall be pressure tested to assure water tightness prior to backfilling.

SECTION 1302

GRAVITY SEWER LINES

1302.1 Materials. PVC Sewer Pipe and fittings shall be rigid polyvinyl chloride pipe in accordance with ASTM D-1784, cell classification 12454 and applicable portions of ASTM D-3034. Wall thickness shall be minimum SDR 26 and be in accordance with ASTM F-679 (PS46). The pipe shall have an integral bell for elastomeric gasket joints per ASTM 3212 with seals per ASTM F-477. All fittings and accessories shall have bell and spigot configurations identical to that of the pipe.

Rubber gasket joints shall be in accordance with ANSI/A21.11. Push-on joint pipe shall be used unless otherwise shown on the plans. Flanged joint pipe shall be in accordance with ANSI/A21.10 and ANSI/21.15.

1302.2 Pipe Material Testing. Each piece of pipe and fitting shall bear the stamp of certification of the manufacturer that the pipe conforms to the standard specifications requirements.

1302.3 Installation. PVC sewer pipe shall be installed in accordance with ASTM Standard D-2321 as modified herein. PVC pipe shall be installed within one (1) year of the date of manufacture indicated on the pipe.

A. Bedding and Haunching. Crushed stone, or sand shall be used to support the pipe as shown on the drawing of typical trench section in this standard. Prior to pipe installation, the bedding material shall be brought to grade along the entire length of pipe to be installed. For pipe with bells or couplings, bell holes shall be formed at each joint to provide full length support and prevent point loadings.

B. Pipe Laying. The necessary equipment and supports shall be provided to insure installation of the pipe to the proper line and grade. The pipe shall be lowered into the trench so that neither the pipe nor the trench will be damaged. The pipe shall be protected from lateral displacement. The pipe shall not be laid in water. The pipe shall be laid in the finished trench starting at the lowest point and laying the pipe upgrade. The pipe shall be set firmly and accurately, with ends abutting, to line and grade so that the invert will be smooth and uniform. The pipe lines shall be drained as the work progresses so that no water will be trapped in the lines.

C. Making Joints. Joints shall be watertight in accordance with the jointing standards of the manufacturer. All oil, grease, asphalt, mud, and debris shall be cleaned from the joint before it is made. Solvents or lubricant shall be applied as required. The pipes shall be pressed home using mechanical means if necessary so that a full bearing surface is obtained all around the joint. Out-of-round sections shall be culled.

D. Connections. Connections to manholes or other structures shall be watertight and shall conform to a smooth and uniform flow line. Commercial lengths of pipe shall be cut along neat lines as required. All gravity sewer lines shall begin and end at a manhole.

E. Backfilling. Trenching and excavations shall be backfilled immediately after the pipe is laid, in the manner described below:

In unpaved areas, the backfill may be excavated materials except that debris, frozen materials, large clods or stones, organic matter or other unsuitable materials shall not be used for backfill within two feet (2") of the top of the pipe. The initial backfill shall be placed in six inch (6") lifts using materials as for bedding and haunching. Each lift shall be thoroughly and carefully tamped before the next layer is placed. The remainder of the backfill may be accomplished with bulldozers and tampers by dozing twelve inch (12") thick layers into the trench then tamping each layer firmly before placing the next layer. A windrow shall be left over the trench and bladed

and shifted as necessary when settling has occurred. For graveled areas, after maximum settlement has been reached, excess material shall be hauled away and washed gravel or crushed stone added as necessary.

In areas to be paved, the trench soils shall be tested by the Developer's engineer or designee to determine their suitability for use as backfill material. If the trench soils are found to be unsuitable they shall be replaced with suitable materials. Backfill in areas to be paved shall be placed in eight inch (8") lifts and each lift compacted to ninety five percent (95%) Standard Proctor density. Backfill shall extend to the top of the subgrade.

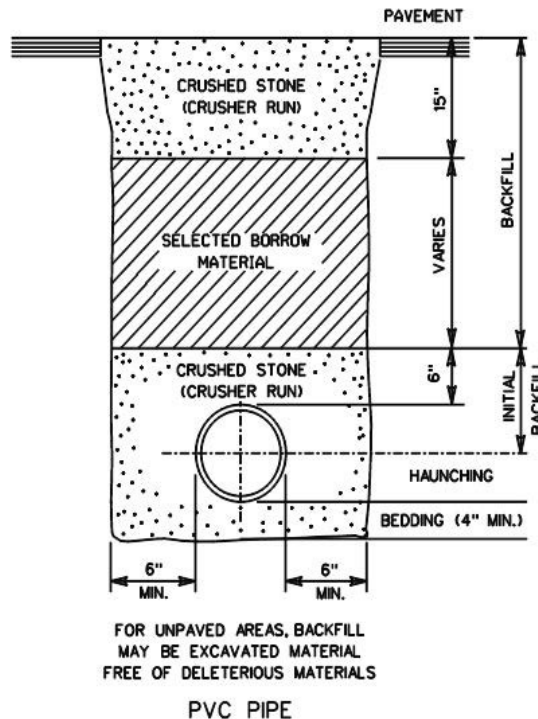


ILLUSTRATION 1302.3.A – SEWER LINE TYPICAL BACKFILL DETAILS

F. Wye or Tee Branches. Wye or Tee Branches shall be of the same material and size as the sewer line. The branch opening shall be either six inches (6") or four inches (4"). Branches shall be installed in the "up 45 degree" position. A watertight plug shall be set in each branch unless a service line is attached at the time of construction. The plug shall be set so that removal will not injure the wye or tee. Each branch without a service line attached shall be permanently marked on top of the curb for ease of future location.

G. Testing. All gravity sewer line piping shall be tested, as follows, at the time of installation:

Deflection Testing: The alignment and grade of sewer pipe intended to be straight shall be so true that a section of laid line will show a full circle of light when viewed from the other end. PVC sewer pipe shall be tested after backfill and trench settlement (but not less than thirty (30) days after

installation) with an approved go/no-go five percent (5%) deflection testing mandrel. The mandrel shall be pulled by hand without mechanical pulling devices.

Leakage Testing: Infiltration/exfiltration shall not exceed fifty (50) gallons per inch of pipe diameter per mile per day for any section of the system. Test all pipe lines for infiltration/exfiltration using the air test method described in ASTM F1417, "Standard Testing Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air."

The air test procedure shall be as follows:

1. Clean the section of pipe to be tested using an approved method.
2. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
3. The seal at one end of the pipe section being tested shall have an orifice through which air can be injected into the pipe. The air supply line shall contain an on-off air valve and a pressure gauge. The pressure gauge shall have minimum division of 0.10 psi and shall have an accuracy of +five percent (+5%).
4. If the pipe section being testing is submerged in water, insert a pipe probe, by boring or jetting, into the backfill material adjacent to the center of the pipe and determine the pressure in the probe when air passes slowly through it, which is the back pressure due to ground water submergence. Increase all gauge pressures in the test by this amount. Alternately, if the depth of pipe submergence below the ground water is known, gauge pressures may be adjusted by adding 0.433 psi for each foot of submergence.
5. Add air slowly to the portion of the pipe installation under test until the internal air pressure is relaxed to four (4.0) psi.
6. Check exposed pipe and plugs for abnormal leakage by coating with a soap solution. If any failures are observed, bleed off air and make necessary repairs.
7. After an internal pressure of four (4.0) psi is obtained, allow at least two (2) minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
8. After the two minute period, disconnect air supply.
9. When pressure decreases to three and a half (3.5) psi, start stopwatch. Determine the time in seconds that it required for the internal air pressure to reach two and a half (2.5) psi. This time interval should then be compared with Table 1302.3.B: Pressure Test Allowances.

10. If the time lapse is greater than that specified in Table 7, then that section has passed the test and the test may be discontinued at that time. However, if the time is less than that specified in Table 7, the line has not passed the test and the Contractor will be required to repair and prepare the line for retest.

11. The Sewer and Water Department Director or designee must be present to witness the tests.

Table 1302.3.B: Pressure Test Allowances
(Minimum Specified Time Required for a 1.0 PSIG Pressure Drop
for Size and Length of Pipe Indicated for Q = 0.0015)

Pipe Diameter (in.)	Minimum Time (min:sec)	Length for Minimum Time (ft.)	Time for Longer Length (sec)	Specification Time (min:sec) for Length L Shown Below in Feet							
				100	150	200	250	300	350	400	450
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	128:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	68	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

NOTE: Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 inches in diameter.

1302.4 Flushing. The completed gravity sewer lines shall be free of all mud, siltation, and other foreign matter deposited or collected during construction. The lines shall be flushed prior to testing. Flushing shall be started at the upstream end of the completed system and shall continue downstream manhole to manhole. Water used in flushing shall not be permitted to enter into the system but shall be collected and disposed of in an approved manner. Also mud and other solids shall be similarly collected and disposed of.

1302.5 Video Inspection and Records. Prior to acceptance of the sewer system, the City shall require video records to prove that the system has been installed in accordance with these guidelines. Closed circuit television or other method shall be used to record the condition of each segment of gravity sewer line. The Planning Director or designee must be present while video scoping takes place. Provide a DVD recording for each segment of gravity sewer line. A camera capable of pan and tilt shall be used to document the location and condition of each sewer connection. The location of service connections shall be indicated by measured distance from the downstream manhole.

SECTION
1303

SEWER SERVICE LINES

1303.1 Materials. Sewer service lines and fittings shall be PVC.

PVC Sewer Pipe and fittings shall be Schedule 40 rigid polyvinyl chloride pipe in accordance with ASTM Specification D-1784, (cell classification 12454) and ASTM D-2665.

1303.2 Installation. Service lines shall be laid to the same requirements as specified for Gravity Sewer Lines. All pipe must be laid to a positive grade; with minimum slope of one foot (1') per one hundred feet (100'). Services lines shall terminate to such an elevation that the abutting premises may be served as intended.

Adapters required to make a watertight connection to the wye or tee branch and elbows as required for proper service shall be installed.

Each service line shall incorporate a cleanout as indicated. Tracer wire shall be installed from the sewer tap to the cleanout. Tracer wire shall also be required on sewer connection service lines.

The end of each new service not connected to a customer service line shall have a watertight plug installed in such a manner that the plug may be removed without injury from the pipe. The plug shall be blocked or secured in such a manner that testing can be completed as specified for Gravity Sewer Lines.

The end of each new service shall be clearly marked by a 4" x 4" x 36" treated post, or a "T" post, which may be removed after the service connection has been completed.

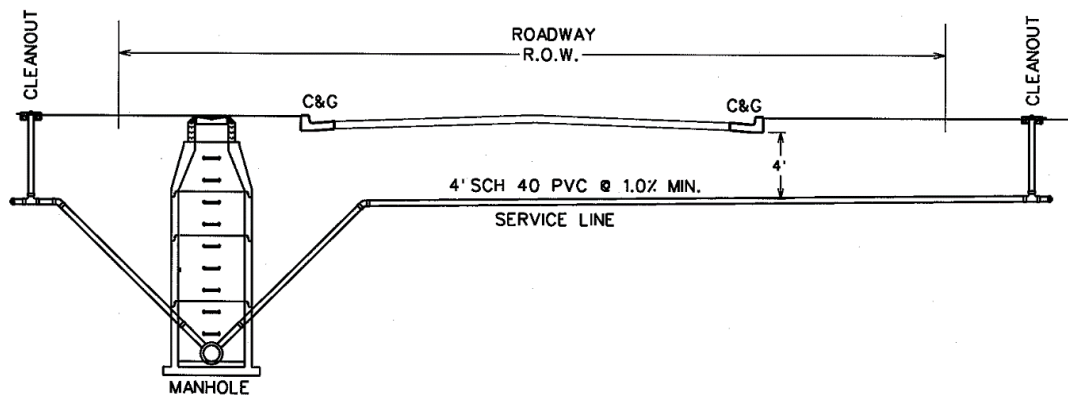


ILLUSTRATION 1303.2 A – SEWER SERVICE LINE DETAIL

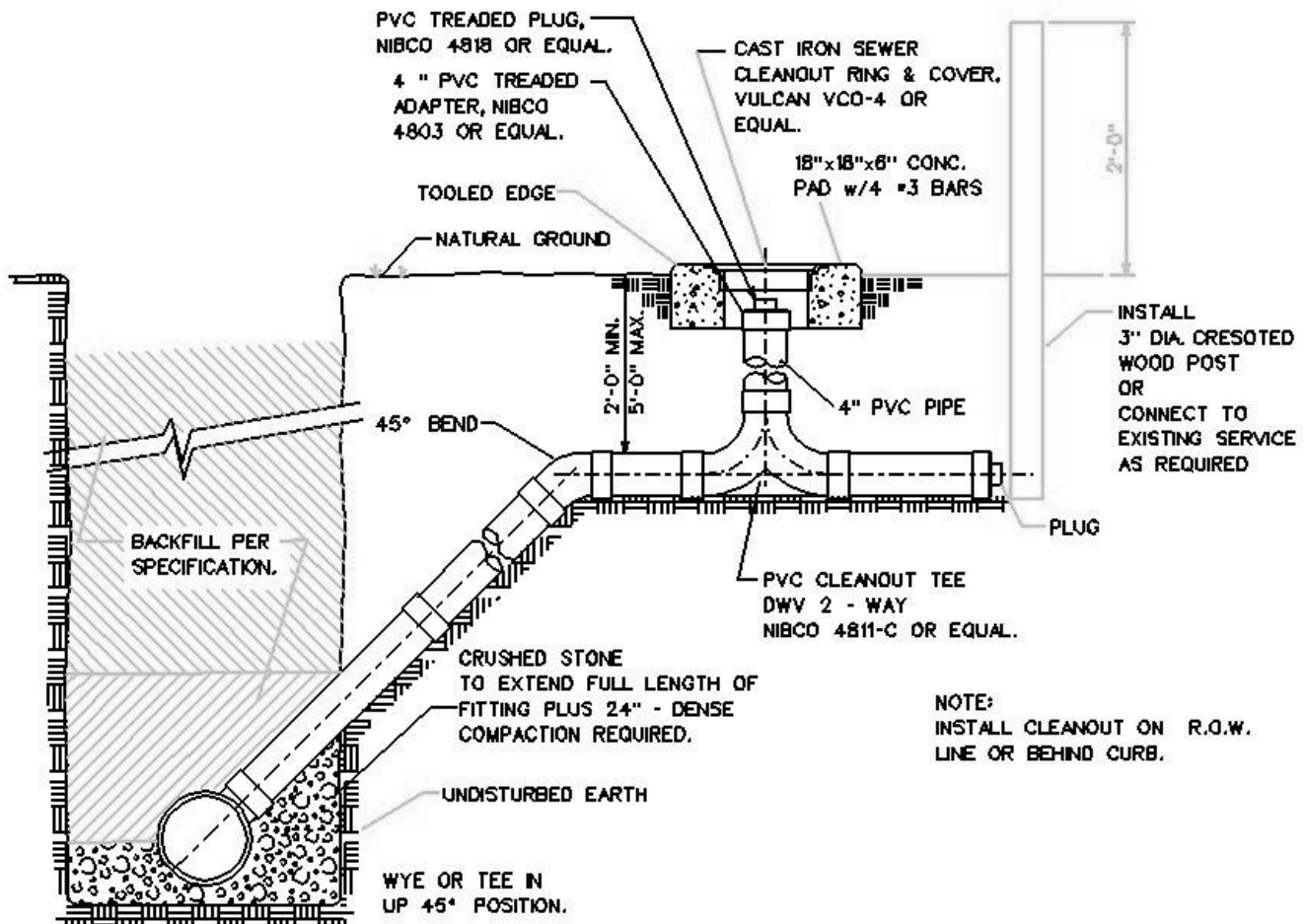


ILLUSTRATION 1303.2 B- TYPICAL CLEANOUT INSTALLATION DETAIL

SECTION **SEWER MANHOLES** 1304

1304.1 Materials. Manhole barrels may be constructed of precast concrete manhole units or concrete poured-in-place. The bottom of all manholes shall be reinforced concrete.

Precast concrete manholes shall conform to the requirements of ASTM C-478 and shall be constructed using concrete with a minimum twenty eight (28)-day compressive strength of four thousand (4000) psi. The mixture shall contain not less than six (6) bags of Portland Cement per cubic yard.

Rubber gaskets shall conform to the requirements of the latest edition of ASTM Specification C-443. Lubricants shall be as recommended by the gasket manufacturer.

Manhole pipe seal gaskets for precast manhole units shall be similar to "Kor-N-Seal" as manufactured by the Kor-N-Seal Co., Milford, NH.

Preformed joint compound shall be a butyl compound similar to "EZ Stik" as manufactured by Concrete Products Supply Co., Fort Wayne, IN. Primer, when required for use with the

preformed joint compound, shall be as recommended by the manufacturer of the joint compound.

Sealer compound shall be similar to "Drycon" as manufactured by IPA Systems, Inc., Philadelphia, PA or Tamm's "Tamoseal".

Patching material shall be similar to "Octocrete" as manufactured by IPA Systems, Inc., Philadelphia, PA or Tamm's "Speed Crete Blue Line".

Manhole steps shall be made of injection molded copolymer polypropylene encapsulating a one half inch ($\frac{1}{2}$ ") diameter grade sixty (60) steel reinforcing rod. The steps shall be of such cross-sectional area and configuration that they will withstand a single concentrated live load of three hundred pounds (300 lbs.). They shall be in conformance with ASTM Standard C-478 Paragraph 11 except as herein modified.

Manhole frames and covers shall be sound gray iron castings (ASTM A48 Class 30B). The castings shall be true to pattern, free from faults, sponginess, cracks, blowholes, and other defects affecting their strength. The minimum clear opening shall be twenty two inches (22") in diameter. The frame and cover shall be machined to a non-rattle fit. The standard manhole frame and cover for installations not subject to flooding, may be non-traffic type weighing approximately three hundred pounds (300 lbs.).

Manhole frames and covers for manholes in streets and paved areas shall be watertight traffic model type; similar to Vulcan Pattern V-2407-2 pattern without vent holes and weighing approximately three hundred fifty pounds (350 lbs.). The cover shall have a rubber "O" ring gasket and be fastened to the ring with four stainless steel hexagonal-head bolts. Covers for areas subjected to runoff shall be watertight. Manhole covers shall have the word "SANITARY SEWER" cast into the face.

1304.2 Installation. Manhole inverts shall be constructed on line and grade of concrete, concrete and split pipe or with invert builder blocks and mortar. The invert shall be formed smoothly and accurately so as to assure the free, unobstructed flow of sewage through the manhole.

Precast manholes shall be constructed of precast units with concrete bottoms. The bottom unit shall be set level on a six inch (6") layer of medium crushed stone bedding. The frame shall be placed on a grout bed or a grout and brick riser. Joints in brick risers shall not exceed five eights inch ($\frac{5}{8}$ ") in thickness. Exterior joints of manhole units shall be wiped with grout and sealed entirely inside and outside with sealer compounds. The exterior surface may be sealed prior to installation.

Form fins shall be removed on the entire interior and, on the exterior, to below one-foot grade. The inside of these manholes shall be sealed with sealer compounds. After installation, the manhole interior shall be coated with two (2) one eighth inch ($\frac{1}{8}$ ") thick coats of sealer compound. The exterior shall be coated in the same manner to twelve inches (12") below finished grade.

"Doghouse" style manholes shall not be allowed.

The cast iron frame and covers shall be installed to grade, set in a grout bed. Grout shall lap up one inch (1") minimum on the frame vertical. In streets, the manhole covers shall be set no more than to one inch (1") above the street grade and parallel to the plane of the street.

3' AND 4' ADJUSTMENT RINGS

16" MAX.

36" OR 48" ECCENTRIC CONE SECTION

16" RISER SECTION

32" RISER SECTION

48" RISER SECTION

TYPICAL 'O' RING JOINT

16" TYP.

5"

48"

GROUT

2x12

SLOPE

32" OR 48" BASE SECTION

6"

TYPICAL 6" CRUSHED STONE UNDER ALL MANHOLES

1/2 PIPE DIAMETER

NO. 4 BARS AT 6" E.W.

SANITARY SEWER SYSTEMS

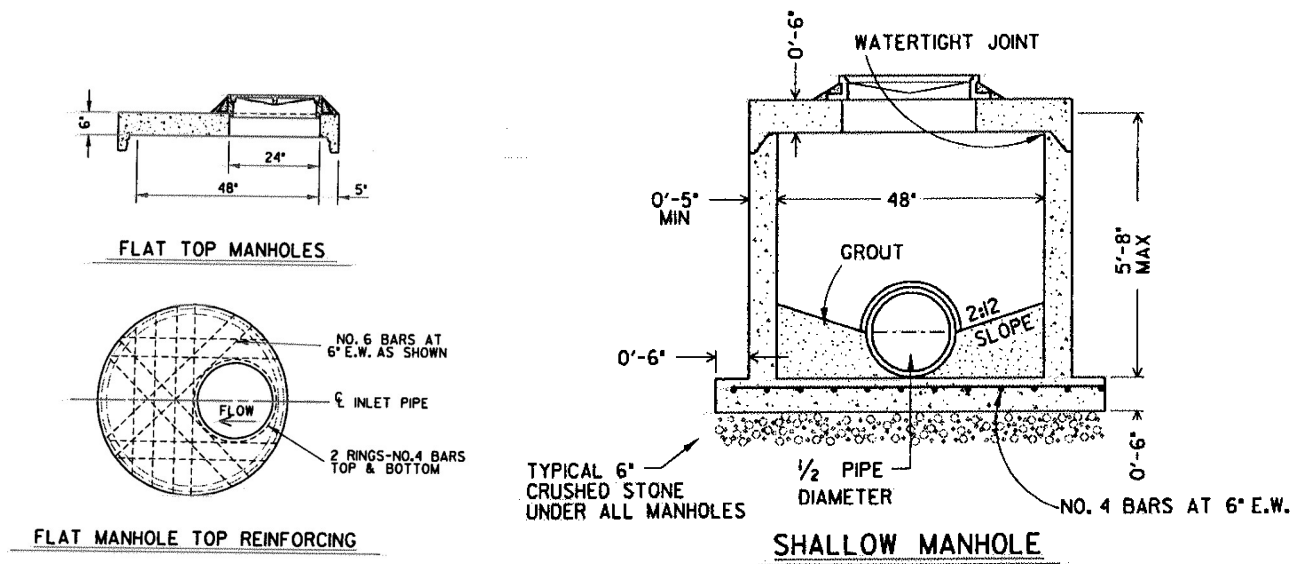


ILLUSTRATION 1304.2 B – SEWER MANHOLE DETAILS

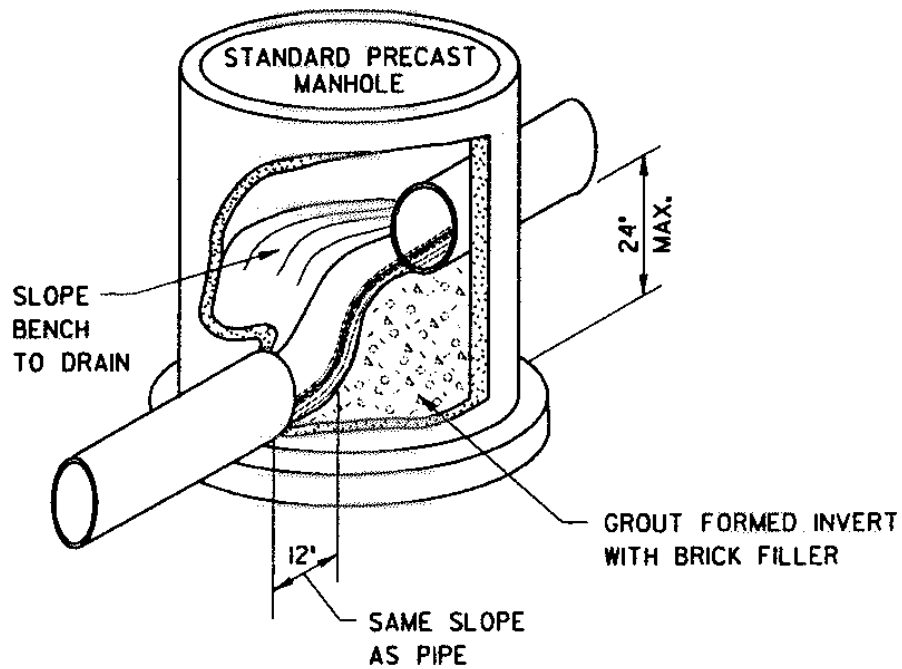


ILLUSTRATION 1304.2 C – SEWER MANHOLE DETAILS

SEWAGE LIFT STATIONS

1305.1 General. Sewage lift stations are not encouraged, but will be permitted where gravity sewer options are unavailable. The burden of proof shall be on the developer to show that all other options have been reviewed and that a station is necessary. Where lift stations are proposed, the applicant must consider future development of city infrastructure and expansion options of adjacent properties when specifying the proposed system.

Sewage lift stations shall be factory built and tested as complete units and shall meet the requirements of the Mississippi Department of Environmental Quality Guidelines as modified herein.

The discharge from the Sewage lift station shall be routed to a point on the City's collection system that is acceptable to the City.

Sewage lift stations shall be designed for above ground suction lift pumps where hydraulically feasible. Other types of pumps will be considered on a case-by-case basis only.

Sewage lift stations shall be prefabricated stations manufactured by the Gorman-Rupp Company of Mansfield, Ohio and must have a secondary (backup) pump that is equipped with an alarm to notify officials in the event of failure.

Design calculations shall be provided for all Sewer Lift Stations.

Sewage lift stations serving a single unit structure may be privately owned and maintained, provided the lift station is designed and installed in accordance with section 705.1 and shall be approved by the Sewer and Water Department Director, in writing, prior to connecting to the City's collection system. All sewage lift stations serving multiple properties, or one or more multi-tenant properties shall be dedicated as public infrastructure.

1305.2 Features. Control panels shall be fabricated by the Lift Station manufacturer. Control Panels shall be equipped with City approved electric surge protection for main and branch circuits. An automatic pump alternator shall be provided with a manual lead/lag selection switch. A run light and elapsed time meter for each pump shall be included in the control panel. An adjustable high water visual/audible alarm with silencing switch shall be provided.

Wet wells shall be constructed of reinforced concrete pipe ASTM C-76, Class III, Wall B. Station piping shall be SDR-26 PVC with flanged connections.

If submersible pumps are approved, discharge valve arrangements shall be installed in a separate vault accessible from ground level. Valve vaults shall have bottoms sloped to drain and the drain (if routed to the wet well) shall be fitted with a pinch type check valve to prevent water from entering the vault from the wet well. Separate conduits with seal fitting are required for each power conductor and float switch cable. Conduits shall be extended from the control panel to the wet well and shall be fitted with seal fitting on the inside of

the wet well. Conduit ends in the wet well shall be set within easy reach from above ground but in no case more than eighteen inches (18") below the top of the wet well.

1305.3 Lift Station Startup. The developer shall arrange for a factory trained representative to perform field-testing and to instruct City operating personnel in the operation and maintenance of the sewage lift station.

A manufacturer's O & M Manual shall be provided for each sewage lift station.

1305.4 Access. Access to within ten feet (10') of the lift station shall be by paved access road. Access roadways shall be constructed as set out for local streets, except that access roads widths shall be twelve feet (12'). Curb and gutter are not required for the access road.

1305.5 Security. All lift stations shall be fenced for security. Landscaping, shrubs, and/or architectural treatments for concealing lift station equipment are encouraged, but shall not be set closer than ten feet (10') to the station enclosure and shall not obscure access. Structures to enclose pumping equipment shall be considered for approval on a case-by-case basis. Security fencing must be dark colored, vinyl-coated chain link, or approved equal with a minimum height of six feet (6').

1305.6 Structures. Permanent structures for lift stations should match adjacent architecture styles, or character, or must be fully screened by an evergreen buffer with a minimum height of six feet (6') at the time of installation.

SECTION 1306

PRESSURE SEWER LINES

1306.1 Materials. Pressure sanitary sewer lines shall be of either PVC, or restrained joint pipe and shall meet the requirements of this section.

Plastic Pipe shall be rigid polyvinyl chloride pipe in accordance with ASTM Specification D1784 (Cell Classification 12454). Pipe shall be Class 200 (SDR 21) per ASTM D-2241 with gasketed slip joints. "O"-ring joints will not be accepted. Gasket joints shall be in accordance with ASTM D-3139.

Rubber gasket joints shall be in accordance with ANSI/A21.11. Push-on joint pipe shall be used unless otherwise shown on the plans. Flanged joint pipe shall be in accordance with ANSI/A21.10 and ANSI/21.15.

Restrained Joint Pipe shall be rated for 250-PSI minimum. The joints, gaskets, and accessories for restrained joints shall meet applicable requirements of ANSI/A21.11. Retainer glands for mechanical joint pipe shall be Megalug Ebba Iron or Uni-Flange Series 1400 restrained joint devices.

Restraint Devices for PVC Pipe shall be manufactured of ductile iron conforming to ASTM A-536. Bolts and connecting hardware shall be in accordance with ASNI A21.11. All restraint devices shall have a pressure rating equal to that of the pipe on which it is used.

Restraint devices shall be Uni-Flange Block Buster Series 1300, Ebaa Iron Series 2000PV, or City approved equal.

1306.2 Installation.

A. Jointing. Joints in plastic pipe shall be rubber gasket push-on type. Make push-on joints in accordance with the manufacturer's instructions. The resulting joint shall be clean and watertight.

B. Pipe Laying. The pipe shall be lowered into the trench in such a manner as to prevent damage to the pipe or pipe coating. It shall not be dropped or dumped during unloading or laying. Foreign mater and dirt shall be prevented from entering the pipe. A minimum cover of thirty-six inches (36"), measured from the top of the pipe shall be provided. Plastic pipes not encased and under vehicular grade paved streets shall be covered at least forty-eight inches (48").

C. Concrete Thrust Block. Concrete thrust blocks shall be provided at all bends in pipe lines greater than twenty two and a half (22-1/2) degrees. Concrete thrust blocks are to be installed according to the plan dimensions and details, placed between the fitting s and undisturbed soil.

D. Tracer Wire. Twelve-gauge minimum insulated solid single-strand copper tracer wire shall be installed with all plastic mains and service lines to facilitate location with a pipe locator. The tracer wire shall be laid in the trench with the plastic pipe.

The tracer wire shall be brought up and terminated in a tracer wire test station at each air release valve and at intervals along pipe lines not to exceed five hundred feet (500'). Tracer wire test stations shall be Rhino TriView Flex with internal test station as manufactured by REPNET, Inc. or equal. The tracer wire station shall be installed by sliding it over a six feet (6') long 1-1/2 lb. per foot U-channel post driven eighteen to twenty four inches (18"-24") into the ground and securing it with a bolt or rivet as recommended by the manufacturer. Identification decals shall be affixed to all three sides of the post.

E. Underground Warning Tape. Warning tape shall be installed in the trench above the pressure sewer lines after the initial backfill is placed and compacted. Underground warning tape shall be manufactured of polyethylene, green in color, and imprinted with the words "CAUTION - BURIED SEWER LINE BELOW". Underground warning tape shall be four (4) mils thick and three inches (3") wide as manufactured by SETON Identification Products, Branford, CT or approved equal.

F. Backfilling. Trenching and excavations shall be backfilled immediately after the pipes are laid. The initial backfill shall extend to twelve inches (12") above the pipe. The initial backfill shall be thoroughly and carefully tamped before the next layer is placed. The remainder of the backfill shall be as follows:

In areas not to be paved the backfill maybe fine, loose soil, free from large clods, stones, frozen earth, debris, or any material with an exceptionally high void

content. The backfill may be accomplished by dozing in layers of approximately one foot (1') each. A windrow shall be left over the trench and bladed and shifted as necessary when settling has occurred. For graveled areas, after maximum settlement has been reached, excess material shall be hauled away and washed gravel or crushed stone added as necessary.

In areas to be paved, the trench soils shall be tested by the design engineer to determine their suitability for use as backfill material. If the trench soils are found to be unsuitable, they shall be replaced with suitable materials. Backfill in areas to be paved shall be placed in twelve inch (12") lifts and each lift compacted to ninety five percent (95%) Standard Proctor density. Backfill shall extend to the top of the subgrade.

G. Testing. Pressure sewer lines shall be hydrostatically tested to a pressure of one hundred fifty (150) psi. The duration of the test at the test pressure shall be at least one (1) hour. Pipe lines showing any leakage as evidenced by a reduction in pressure will not be accepted. Defective pipe or fittings shall be removed and replaced with sound material and the test repeated until satisfactory results are obtained.

Before applying the specified test pressure, all air shall be expelled from the pipe. If blow-offs are not available at high places, taps shall be made at points of highest elevation before the test is made. Each section of pipe shall be slowly filled with water to the specified test pressure, based on the elevation of the lowest point of the line or lowest point of the section under test and corrected to the elevation of the test gauge. Pressure shall be applied by means of a test pump connected to the pipe in an approved manner. Make arrangements for metering the amount of water used during the testing.

All testing must be conducted in the supervision of the Sewer and Water Department Director or designee.

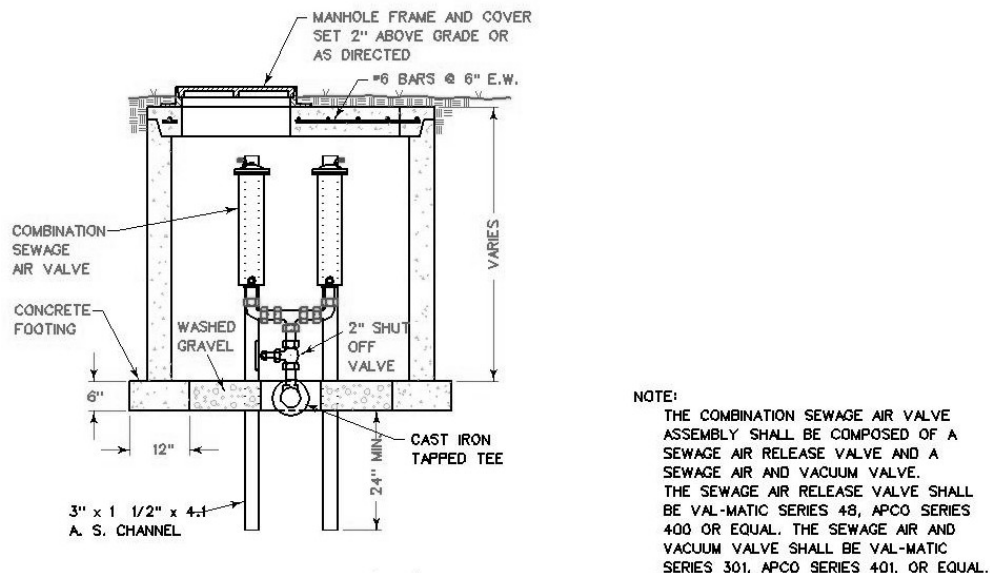


ILLUSTRATION 1306.2 A - PRESSURE SEWER AIR RELEASE VALVE

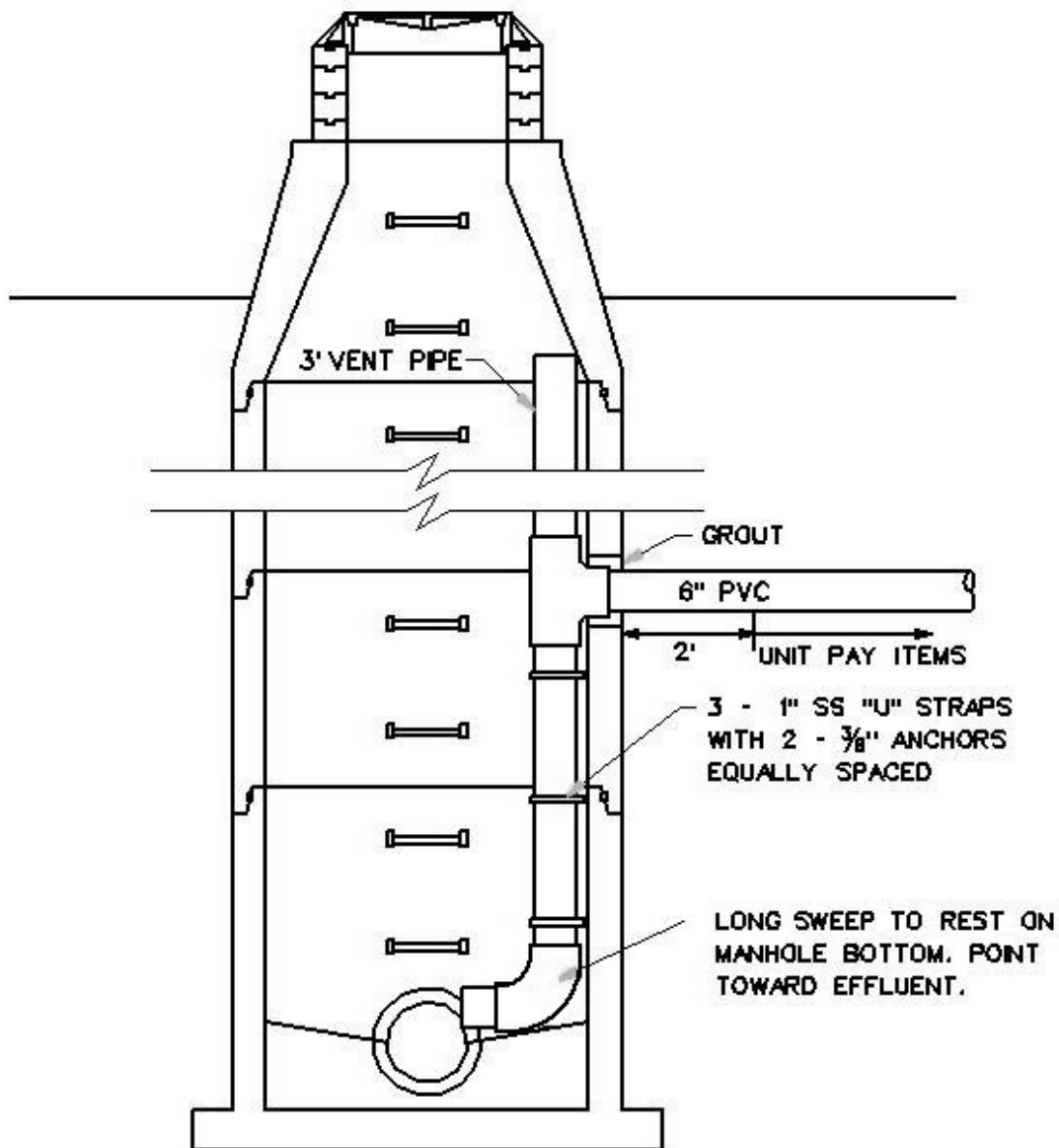


ILLUSTRATION 1306.2 B - PRESSURE SEWER CONNECTION TO EXISTING MANHOLE

SECTION 1307

GRANULAR MATERIALS

1307.1 General. The City shall be furnished certified test reports of the materials and gradations prior to incorporation into the work.

1307.2 Materials.

A. Crushed Stone. Crushed stone shall consist of fragments of sound, durable limestone, free from disintegrated stone, salt, alkali, vegetable matter, or adherent coatings and other deleterious substances; and shall be reasonably free from thin or elongated pieces. The percentage of wear shall not exceed fifty percent (50%). Crushed stone shall have a gradation as specified in Table 1307.2 A.

Table 1307.2 A: Crushed Stone Gradation

Sieve Size (Square Opening)	% Passing (by weight)			
	Fine	Medium	Coarse	Crusher Run
3 inch	---	---	100	---
2 inch	---	---	60-70	---
1 ½ inch	---	---	---	100
1 ¼ inch	---	100	5-40	---
1 inch	---	90-100	0-10	90-100
¾ inch	100	20-60	---	---
½ inch	95-100	0-10	---	---
3/8 inch	45-90	---	---	45-74
No. 4	0-15	0.3	---	30-55
No. 16	0-3	---	---	---
No. 100	---	---	---	4-15

B. Select Borrow Material. Selected Borrow Material shall be a mixture of sand and clay and shall contain sufficient binder material, natural or processed, to produce a uniform mixture complying with the requirements of these specifications. The materials shall be uniform and free of organic matter such as leaves, grass, roots, and other objectionable or foreign substances. The gradation of the natural or processed material shall be in accordance with Table 1307.2 B.

Table 1307.2 B: Natural or Processed Material Gradation

Sieve Size (square opening)	% Passing (by weight)
No.10	100
No.40	20-100
No.60	15-85
No. 200	6-40

The material shall have a plasticity index not more than six (6) and have a liquid limit of not more than twenty-five (25). (Local clean pit run topping-like material will normally meet this specification.)

C. Washed Gravel. Washed Gravel shall be composed of hard, tough, durable particles reasonably free of injurious or deleterious substances. The percentage of wear shall not exceed fifty percent (50%). The gradation of the washed gravel shall be as specified in Table 1307.2 C.

Table 1307.2 C: Washed Gravel Gradation

Sieve Size (square opening)	% Passing (by weight)
2 inch	100
1 ½ inch	90-100
1 inch	80-100
¾ inch	55-100
½ inch	35-80
3/8 inch	12-65
No. 4	5-30
No. 10	0-8

D. Clay Gravel. Clay Gravel shall be composed of natural or artificial mixtures of aggregates and soil mortar so proportioned as to meet all the requirements as hereinafter specified and with gradation as specified in Table 1307.2 D.

The coarse aggregate (material retained on the No. 10 sieve) shall consist of hard, durable particles of uncrushed gravel and shall be free from vegetable or other deleterious substances. The percentage of wear shall not exceed fifty percent (50%).

The binder portion of the surface material (that portion passing the No. 10 sieve) shall be composed of a natural or artificial mixture of natural quartz sand combined with silt and clay.

Table 1307.2 D: Clay Gravel (Aggregate and Binder) Gradation

Sieve Size (square opening)	% Passing (by weight)	
	Coarse Aggregate	Binder
3 inch	100	---
1 ½ inch	85-100	---
1 inch	65-100	---
½ inch	35-90	---
No. 4	90-75	---
No.10	30-55	100
No. 40	---	20-90
No. 60	---	15-80
No. 200	---	8-40

The binder material shall have a plasticity index of not more than six (6) and have a liquid limit of not more than twenty-five (25).

1307.3 Tests. Sampling and testing shall be in accordance with the following standard methods of the AASHTO: Sampling, T-2; Sieve Analysis, T-27; Liquid Limit, T-89; Plasticity Index, T-90.

The loss by abrasion test shall be as specified under *AASHTO Test T-96*.

**SECTION
1308**

SEWER SYSTEM CONSTRUCTION RECORDS

1308.1 Requirements. The following records must be provided prior to approval of the Final Plat or release of the Construction Bond:

- A.** A copy of the Mississippi Department of Environmental Quality's final approval letter.
- B.** A certification letter from the developer's engineer that the improvements were constructed in substantial conformance with the approved construction plans and specifications, accompanied by inspection documentation records and construction inspection photographs. The developer, or his designee, is responsible for maintaining inspection records to ensure that all improvements were constructed according to approved plans.
- C.** RECORD DRAWINGS shall accurately represent the completed construction including locations of service stub outs and appurtenances. Provide four (4) printed sets and two (2) sets on CD or other media in PDF or other acceptable machine-readable file format.
- D.** Two (2) copies of the manufacturer's literature necessary for reference in operating and maintaining the facilities including but not limited to manufacturer's product descriptive literature for materials incorporated into the work, operation and maintenance manuals for equipment, warranty related information, etc.
- E.** Contact information for the source of supply of basic materials and equipment.
- F.** Test results including pressure test, mandrel pull results, and other tests.
- G.** Prior to acceptance of the sewer system, the City shall require video records to prove that the system has been installed in accordance with these guidelines. Video recording shall be on DVD format for each manhole-to-manhole segment of gravity sewer keyed to the RECORD DRAWINGS with the location and interior condition or each service connection documented by use of a pan and tilt camera and located by measurement from the downstream manhole. A city representative should be present during all video scoping activity.
- H.** Other information as may be requested by the Planning Director.