

# CONSTRUCTION OF SEWER SYSTEMS

## 1.0 PIPING

### 1.1 HANDLING

Pipe, fittings and accessories shall be handled with care and shall not be dropped or bumped against pipe or appurtenances or against any other object on the ground. The contractor's methods for installation and handling of pipe, fittings and accessories shall conform to the pipe manufacturer's recommendations.

### 1.2 CLEANING

The interior of all pipe, fittings and accessories shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the jointing is completed.

Every precaution shall be taken to prevent foreign material from entering the pipe during installation.

Groundwater shall not be allowed to rise around the pipe until the trench is backfilled and the grading is completed. Dewatering operations must be continuous for as long as the trench is open.

Whenever pipe laying is stopped, the open end of the pipe shall be closed with a snug-fitting plug.

### 1.3 BEDDING AND PIPE INSTALLATION

Bedding material shall be broken stone, free from silt, clay or organic material and shall conform to the requirements of the New Jersey State Department of Transportation Standards for No. 57 coarse aggregate.

Pipe shall be bedded true to line and grade, and no blocking shall be used to bring the pipe to grade. Class "C" bedding shall be used for all pipes. Class C bedding is defined as that method of bedding sewers in approved granular material with a shaped bottom in undisturbed earth so as to fit the lower part of the pipe, for a width of at least 50% of the sewer diameter; and, in which the remainder of the sewer is surrounded to a height of at least 0.5 feet above its top with approved granular materials, shovel placed and tamped to completely fill all spaces under and adjacent to the sewer. This shall be done under the inspection and approval of the Authority.

PVC sewer pipe shall be laid carefully to the lines and grades shown on the drawings or as directed by the Authority and shall conform accurately to the drawings after the completion of the sewer. Particular care shall be taken that there is no sagging of the spigot at the joint and that a true and even surface of the invert is obtained throughout the entire length of the sewer.

Where the sewer is to be laid without a special foundation, the earth forming the bed shall be free of large stones. The pipe shall then be evenly bedded in the earth with great care being taken to remove only enough of the earth to leave a uniform bed for the entire length of the pipe, except the bell, under which a recess shall be excavated to a sufficient depth to relieve it of any load and to allow ample space for making the joint. In case the bed shaped in the bottom of the trench is too low, earth must be thrown into the bottom and thoroughly compacted and new bed shaped for the pipe. It is unacceptable

to raise the grade of the pipe by ramming earth beneath it. When the pipe has been bedded satisfactorily and the joint made, the recess around the bell shall be refilled with soil and enough soil shall be refilled and tamped on each side of the pipe to hold it securely in place with care being taken not to disturb the position of the pipe during this process.

A concrete cradle, where required, shall be constructed as directed. The concrete for the full width of the foundation shall be deposited continuously to the height of the outside bottom of the pipe. Before this concrete is set, the pipe shall be evenly bedded therein, so as to have a uniform support for its entire length. The remainder of the concrete shall be immediately deposited in such a manner as to avoid changing the position of the pipe.

A concrete cradle shall be allowed to harden sufficiently to prevent consolidation of backfill. Wet concrete cradle shall be allowed to cure 24 hours before vehicle loads can be applied to that area of the trench. Steel plates may be used to cover the trench to protect the cradle from vehicle loads if the 24-hour undisturbed cure period cannot be provided.

Each pipe shall be laid so as to form a close joint with the next adjoining pipe, and bring the inverts continuously to the required line and grade.

Where the sewer is to be laid below groundwater level, it shall be laid on ¾" crushed stone foundation, and the stone shall be deposited for the full width of the trench to the height of the outside bottom of the pipe. The pipe shall then be bedded on this material and the remainder of the crushed stone deposited and carefully tamped so as to avoid disturbing the pipe but at the same time giving a uniform support to its entire length. A 4-foot long/full trench width clay barrier shall be placed at 60 ft. intervals to prevent groundwater from following the pipe for future dewatering application.

The installation of PVC sanitary sewer pipe shall conform to the requirements of ASTM Specification D2321, or latest revision, for "Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

Extreme care is to be exercised in the placement of backfill around PVC sewer pipe. The most important factor affecting pipe performance and deflection is the placement of backfill between the invert of the pipeline and a level 12" above the top of the pipe. Material shall be placed and consolidated in this area to provide adequate side support to the pipe while avoiding both vertical and lateral displacement of the pipe from proper alignment.

The developer is required to perform a soils analysis of the project area to determine the corrosiveness of the soils and the need for external corrosion protection of the metal piping system shall be evaluated. If required, polyethylene encasement or other approved corrosion control methods shall be employed.

#### **1.4 CLEANUPS AND RESTORATION**

All excess material, trash, wood forms and other debris will be cleaned up and disposed of properly. All areas shall be restored to their original condition or as required by the Ocean County Soil Conservation District.

## **2.0 SEWER PIPE**

Materials used in the construction of gravity sewers shall be polyvinyl chloride (PVC) or ductile iron pipe (DIP). Inverted siphons and force mains shall be constructed of ductile iron pipe unless otherwise permitted by the Authority. Inverted siphons shall consist of a minimum of two (2) parallel pipes with provision for flushing and flow control gates provided.

All sewer pipes installed with less than three (3) feet of cover, or greater than twenty (20) feet of cover, or within 18 inches of water main, or within ten (10) feet of an open stream, culvert or crossing a stream must be of ductile iron.

All standard specifications referred to herein, such as ASA, ASTM, AWWA and the like, shall be the latest revision at the time of application for final approval.

### **2.1 DUCTILE IRON PIPE AND FITTINGS**

Ductile iron pipe shall be manufactured in accordance with ANSI A21.51 and shall be thickness Class 52 except where otherwise specified. Mechanical joints or push-on type joints shall conform to ANSI A21.11.

All fittings shall be mechanical joint type and shall conform to ANSI A21.10. Fittings shall conform to pressure ratings of 250 psi.

All mechanical joints shall be installed with meg-a-lugs (or equal) or thrust rods, where required. The pipe shall be furnished with the necessary rubber gaskets.

All exposed sewage piping and fittings at the pump station, in the wet well or valve pit, shall have flanged joints conforming to ANSI B16.1, and be painted with epoxy green paint.

All ductile iron pipe and fittings for use in force mains shall be delivered with a ceramic epoxy lining. The ceramic epoxy lining shall be Protecto 401 or equal.

### **2.2 POLYVINYL CHLORIDE PIPE (PVC)**

Polyvinyl chloride (PVC) pipe shall conform to the requirements of ASTM Specification D3034, "Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings." All pipes shall be minimum strength Class SDR-35.

All pipes shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. Each pipe shall not vary in length more than 1.0 inch in a length of 12.5 feet measured as mid-ordinate.

Material properties shall meet the test requirements of ASTM Specification D1784, latest revision, for "Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds."

### **2.3 JOINTS**

Joints for sewer pipes shall be as specified below:

Ductile Iron Pipe – Rubber gasket equal to Tyton or mechanical joint.

PVC Pipe – Bell and Spigot with rubber ring.

## **3.0 MANHOLES**

### **3.1 PRECAST CONCRETE CONSTRUCTION**

Precast concrete manholes shall consist of precast reinforced concrete section, a conical or flat slab top section and a base section conforming to the typical manhole details.

Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.

Precast manhole sections shall be manufactured in accordance with ASTM Designation C478. The minimum compressive strength of the concrete for all sections shall be 4,000 psi. The circumferential steel reinforcement for rise pipe, cone sections and base walls shall be a minimum of 0.12/sq. in. per linear foot. Reinforcing in both layers of steel of the flat slab top sections and in the bottoms of bases shall be a minimum of 0.12/sq. in. per linear foot in both directions.

Joints of the manhole sections shall be formed entirely of concrete employing a round rubber gasket and, when assembled, shall be self-centering and make a uniform watertight joint. Except for those surfaces within the gasket groove, all inside surfaces of the bell or outside surfaces of the spigot, or both, on which the rubber gasket may bear during the closure of the joint and at any degree of partial closure shall be parallel within one degree and have an angle of not more than two degrees with the longitudinal axis of the pipe.

In joints formed entirely of concrete, the distance from either side of the gasket to the end of the bell or spigot shall not be less than  $\frac{3}{4}$ ". The gasket spaces between the bell and spigot shall be so shaped as to provide either grooves or shoulders that will prevent the gasket from disengaging from its compression surface or being blown out by hydrostatic pressures. The gasket shall be the sole element utilized in sealing the joint from either internal or external hydrostatic pressure.

Precast base sections may be supplied by the manufacturer with inverts precast, or the inverts may be cast in the field by the contractor. Inverts shall be smooth and accurately shaped to a semi-circular bottom conforming to the inside of the adjacent sewer sections. Changes in direction of the sewer and entering branches shall have a circular curve of as large a radius as the manhole will permit.

Precast base sections shall be installed on a firm stabilized foundation or on crushed stone as directed by the Engineer.

### **3.2 MANHOLE STEPS**

Manhole steps shall be of 6061-T6 aluminum drop front type as manufactured by Alcoa Aluminum Co., or polymer manhole steps, or equal. All steps shall be built into walls of the precast sections to set in straight alignment so as to form a continuous ladder with a maximum distance of 12" between steps. The minimum distance between the first step and the rim of the manhole shall be 16" and the maximum distance 24".

#### **3.2.1 PRECAST CONCRETE CONSTRUCTION MANHOLE STEPS**

Steps shall be of copolymer polypropylene plastic with a minimum  $\frac{1}{2}$ " diameter grade 60 steel reinforcement encased within. Steps shall be a minimum of 12  $\frac{1}{8}$ " inches wide, possess a non slip contact surface, protrude into manhole wall a minimum of three inches and extend a minimum of 5  $\frac{3}{4}$ "

inches from the face of the manhole wall. Steps shall be spaced a maximum distance apart of 12 inches. Steps shall comply with ASTM C-478.

Steps shall be model PS4-B by M.A. Industries or equal.

### **3.3 MANHOLE FRAMES AND COVERS**

All manhole castings shall conform to ASTM A-48 Class 30 and be suitable for H-20 loading capacity. Standard manhole frames and covers shall be Pattern #1202B as manufactured by Campbell Foundry Company, Flockhart Foundry or equal. The only locking type of manhole permissible is the bolt-down type; cam-locking manholes will not be allowed.

Watertight manhole frames and covers shall be Pattern #1502 B&G as manufactured by Campbell Foundry Company, or Flockhart Foundry or equal. Frames shall weigh 275 pounds, minimum, and covers shall weigh 145 pounds, minimum. The letters "JTMUA" shall be cast integrally into the cover.

All casting for manhole frames and covers shall be close-grained, tough gray iron, free from cracks, holes, swells and shrinkage distortion. All manhole castings shall be made accurately to the pattern and to the dimensions specified with carefully machine-milled bearing surfaces. Allowances shall be made in the patterns so that specified thicknesses shall not be reduced. All covers, which "rock" and do not lie solid after construction is finished will be rejected and shall be replaced by adequate covers at no additional cost to the Authority. No plugging, burning-in or filling will be allowed.

Watertight manhole covers shall be installed on manholes in easements, outside of paved areas, road shoulders and gutter lines.

### **3.4 MANHOLE COATINGS AND LINERS**

- A. All new Standard, Watertight, and Doghouse Manholes shall be coated as follows:
- Interior: After each channel has cured for a minimum 30-day period, prepare the surface for painting as recommended by the paint manufacturer.
    - The walls, channels and benches shall receive two coats of an epoxy coating, for a total dry film thickness of 15 mils.
    - The benches shall receive an additive for non-skid. The coating shall be "Ceramic White" as manufactured by Atlantic Concrete", Epoxide as manufactured by Con-Lux, Sikagard 667 as manufactured by Sika Chemical Corporation or equal.
  - Exterior: The outside of each manhole/structure shall be coated with two coats of Enviro-Green as manufactured by Atlantic Concrete, Bitumastic No. 300-M coal tar epoxy as manufactured by Kop-Coat or equal, with a minimum total dry fill thickness of 12 mils.
- B. All new Drop Manholes and Force Main Discharge Manholes shall be vented and coated as follows:
- Interior: The new drop or force main discharge manhole walls shall be PVC lined with Dura-Plate 100 PVC as manufactured by Atlantic Concrete or equal. After each channel has cured for a minimum 30-day period, prepare the surface for painting as recommended by the paint manufacturer.
    - The channels and benches shall receive two coats of an epoxy coating, for a total dry film thickness of 15 mils.

- The benches shall receive an additive for non-skid. The coating shall be “Ceramic White” as manufactured by Atlantic Concrete”, Epoxide as manufactured by Con-Lux, Sikagard 667 as manufactured by Sika Chemical Corporation or equal.

- Exterior: The outside of each manhole/structure shall be coated with two coats of Enviro-Green as manufactured by Atlantic Concrete, Bitumastic No. 300-M coal tar epoxy as manufactured by Kop-Coat or equal, with a minimum total dry fill thickness of 12 mils.

C. All existing manholes, which will be connected to by means of a drop connection or a force main, shall be vented and coated as follows:

- The existing manhole walls shall have both a calcium aluminate mortar coat and an epoxy finish coat.
  - The aluminate mortar shall have a coat of a ½” and shall be SRP –CA 12500 as manufactured by Structural Rehab products or equal.
  - The epoxy shall have a finish coat of 8 mils and shall be Sauereisen Sewergard 210 as manufactured by Sauereisen or equal.
  - The manhole channels and benches shall receive two coats of an epoxy coating, for a total dry film thickness of 15 mils.
  - The benches shall receive an additive for non-skid. The coating shall be Sauereisen Sewergard 210 as manufactured by Sauereisen, or equal.

### **3.5 DOGHOUSE MANHOLES**

Doghouse manholes shall be constructed as shown in the details and conform to the section, “Precast concrete Construction,” with the following exceptions:

- The manhole riser section shall be placed on a pre-constructed concrete slab placed under the existing sewer pipe. The base slab shall be 6” thick (minimum) and shall be 1’ in diameter larger than the manhole to be constructed.
- The existing pipe shall be saw-cut to expose the channel only after new-sloped bench has been constructed.

### **3.6 DROP MANHOLES**

Where the influent pipe invert is greater than two (2) feet higher than the manhole invert, an outside drop shall be required. An outside drop connection shall be constructed in accordance with the details.

An inside drop connection may be accepted subject to Authority approval for unusual situations.

### **3.7 CONNECTIONS TO AN EXISTING MANHOLE**

The following requirements shall be met when connecting to an existing manhole, whether the Authority or the Ocean County Utilities Authority owns it:

- During installation of the gravity sanitary sewer, the contractor shall allow no debris to enter the pipe. Flushing of the collection system into the existing pipe shall not be permitted.
- The owner of the manhole shall have the final say as to the approval or disapproval of any work done by the contractor when making the connection.

- ❑ Any settlement occurring over the connection made to the manhole shall be the responsibility of the contractor.
- ❑ The owner of the manhole shall receive at least two (2) business days notice prior to any work done on the connection. No work shall be covered until the Authority owning the manhole has approved it.
- ❑ If a stub or knockout bulkhead has not been provided at the manhole, the connection shall be made with a coring machine.
- ❑ The use of pneumatic hammers, chipping guns, sledgehammers, or other means of providing a connection shall not be permitted under any circumstances.
- ❑ A watertight neoprene gasket suitable for use with sanitary sewage, with stainless steel clamps, shall be used.

### **3.8 MANHOLE ACCESSIBILITY**

All manholes located in easements or off the paved right-of-way shall be accessible for servicing by the Authority's Jet-Vac vehicle.

- ❖ The applicant shall submit a procedure for stabilizing the access way for approval.

## **4.0 HOUSE LATERAL CONNECTIONS**

No lateral connections past the curb or property line shall be made before the sewer has been tested and approved.

House connections shall be made as shown on the detail. The connection shall be made by use of a sanitary tee wye or a wye and 1/8 bend at the sewer pipe, thence in a horizontal direction to the lateral.

Most lateral diameters are six (6) inch; however, a larger size may be required where the larger flows are anticipated.

A minimum slope of 1/8" per foot shall be used on six-inch laterals.

Lateral material shall be SDR-35 with double gasket type push-on coupling. Brass cleanout plugs shall be used at the curb cleanout riser cap so that the plug may be located with a metal detector. Flexible rubber couplings between the sewer pipe and the cleanout at the curb are not acceptable.

The inspection of the installation of the house lateral from the curb cleanout to the building is under the jurisdiction of the Township of Jackson Plumbing Department.

- ❖ The location of the sewer lateral is to be shown by cutting an "H" into the top of the curb.

Deep-house connections and encasement chimneys shall be used where the invert of the sewer is greater than ten (10) feet below the finished grade.

## **5.0 EJECTOR PUMPS**

If it is determined that a sewage ejector system is required the Jackson Township Plumbing Department will provide information regarding the systems approved under the National Plumbing Code.

## **6.0 SANITARY SEWER TESTING**

Testing shall not be conducted until as-builts have been approved and punch list items corrected.

The pressure test may be either a low-pressure pneumatic test or a low-pressure hydrostatic infiltration/ex-filtration test.

The contractor shall be required to furnish all labor, weirs, pumps, valves, gauges, testing materials and equipment.

### **6.1 MANHOLE VACUUM TESTING**

All manholes in wet areas shall be tested by the vacuum method.

All incoming and outgoing sewer and service lines shall be plugged, the plugs restrained and the vacuum tester head placed on the manhole frame and sealed. A vacuum of 10 inches HG shall be drawn on the manhole and the time measured for the vacuum to drop to 9 inches HG. This time shall not be less than 40, 50 or 60 seconds per manhole with diameters of 48, 60 and 72 inches respectively. For manholes deeper than 20 feet, the test times shall be increased by 2 seconds per foot of additional manhole depth.

### **6.2 LOW PRESSURE HYDROSTATIC TEST**

If the ground water level is at or above the top of the pipe, the contractor shall dewater the sewer and conduct a satisfactory test to measure infiltration for at least 24 hours.

The rate of infiltration shall not exceed 50 gallons per inch of inside diameter per mile of pipe per 24 hours. The test shall be conducted from manhole to manhole.

If leakage exceeds the specified amount:

- The contractor shall make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit; and
- The test shall be repeated until the infiltration conforms to the requirements specified herein.

In the event that the ground water level is lower than the top of the pipe, the contractor shall conduct an ex-filtration test.

- The test shall be conducted from manhole to manhole.
- The pipe shall be filled and additional water introduced into the manhole to raise the level two (2) feet above the top of the pipe in the upstream manhole.
- The contractor shall furnish all water required for the tests.
- The quantity of water to maintain this level is to be measured.
- The test shall be maintained for a 48-hour period.

The rate of ex-filtration shall not exceed 50 gallons per inch of inside diameter per mile of pipe per 24 hours.

If leakage exceeds the specified amount, the contractor shall make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit and the test shall be repeated until the ex-filtration conforms to the requirements specified herein.

### 6.3 LOW PRESSURE PNEUMATIC TEST

The test shall be performed from manhole to manhole and subsequent to completion of backfill but prior to replacement of pavements.

The following procedure shall be implemented as a method of test:

- ❑ Each length of pipe shall be cleaned by passing a snug fitting ball or mandrel through it.
- ❑ Plug all pipe outlets with suitable test plugs and brace all plugs securely to prevent blowout.
- ❑ If the pipe to be tested is submerged in ground water, a test pressure probe shall be inserted by boring or jetting into the backfill to the level of the center of the pipe and the backpressure determined, while passing air through the probe. (The amount of backpressure determined shall be added to all gauge pressures required for testing the submerged line.)
- ❑ Add air slowly to the plugged pipe under test until the internal pressure is raised to 4.0 psi above backpressure.
- ❑ Check exposed pipe and plugs for abnormal leakage by coating with a soap solution or by means of an approved smoke device. If failures are observed, bleed off the air, make repairs and re-pressurize.
- ❑ After an internal pressure of 4.0 psig above backpressure is obtained, allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain 4.0 psig above backpressure.
- ❑ After the two-minute period, disconnect the air supply by valve action.
- ❑ When the pressure decreases to 3.5 psig above backpressure, start a stopwatch. Determine the time in seconds, for the interval during which the internal pressure drops to 2.5 psig above backpressure. The time interval shall not be less than the following tabulated values:

**TIME IN MINUTES AND SECONDS:**

TEST LENGTH:	100	150	200	250	300	350	400	450
Diameter:								
8	3-47	3-47	3-47	3-47	3-47	4-26	5-04	5-4
10	4-43	4-43	4-43	4-57	5-56	6-55	7-54	8-54
12	5-40	5-40	5-42	7-08	8-33	9-48	11-24	12-5
15	7-05	7-05	8-54	11-08	13-21	15-35	17-48	20-0

If the observed interval is less than the required interval, the leaks shall be located repaired and the line retested.

### 6.4 DEFLECTION TEST FOR PVC SEWER PIPE

Upon completion of the pipe installation and backfill to grade, the pipe shall be tested for diametric deflection. The maximum allowable deflection shall be performed by using a “mandrel”.

Any pipe in which the deflection exceeds 5% of the internal diameter of the pipe shall be removed and replaced.

## **6.5 TELEVISIONING SEWER MAINS AND LATERALS**

The Authority will require the applicant's contractor to televise the line if the hydrostatic test, pneumatic test or the deflection test continues to fail after a series of re-testing.

In addition, one (1) year after the Developer receives the permit to operate the sanitary sewer system, all mains and laterals shall be televised.

Hydraulic cleaning should be performed as necessary or as directed by the Authority, to enable a clear and accurate viewing of the entire inside periphery of the pipes.

The color video camera used for the inspection shall be:

- ❑ A pan and tilt camera with lighting suitable to allow a clear picture of the entire inside periphery of the pipes.
- ❑ Shall be operable in 100% humidity conditions.

Voice message descriptions shall be used for all points of significance or as directed by the Authority.

The view seen by the television camera shall be transmitted to the monitor of not less than 14", measured diagonally.

- ❑ The monitor shall display the manhole sections' reference number being televised and the lineal foot counter.
- ❑ The display shall be reproduced onto the videotape with the television inspection report.

Television inspection log reports are required to locate and describe any defects in sufficient detail to determine the condition of the pipe without having to review the video recording.

Two (2) copies shall be submitted to the Authority on a DVD diskette.

- ❖ A representative from the Authority must be present during the video recordings.

## **7.0 PUMPING STATIONS**

The use of pumping stations in new developments is strongly discouraged by the Authority. Should the need for a pumping station present itself, the Authority will make a determination as to the acceptance of such a facility on a case-by-case basis. Operation and Maintenance fees are required for all approved pump stations, in accordance with the Authority Pump Station Standard Manual.

Specifications for pumping stations will be provided when the need for a facility has been demonstrated and accepted by the Authority.