

## PART II

### SECTION 8. STORM WATER DRAINAGE SYSTEM

#### I. MATERIALS

Shop drawings for all materials to be used on the job shall be submitted to the City's Public Works Department for review and approval prior to fabrication and/or delivery.

##### A. Pipe and Fittings:

1. Polyvinyl Chloride (PVC) Pipe and Fittings: The PVC pipe shall be push-on type, with bells, spigots and elastomeric gaskets, in accordance with ASTM Standard D 3034, and in accordance with ASTM Standard D 3212, latest revisions. Joints using solvent cement will not be permitted. Nominal laid length of pipes shall be 20 feet for C-900 and 13 feet for SDR-35. Type PSM SDR-35 PVC sewer pipe shall be impregnated with green pigment and be double labeled (180 degrees apart) as follows at intervals of five (5) feet or less: Date of manufacture - Manufacturer's name & Code - Nominal size - Cell classification - "Type PSM SDR-35 PVC Sewer Pipe" - "Specification D 3034"

2. Concrete Pipe: Reinforced concrete pipes to conform to ASTM Specification C-76.

3. High density polyethylene corrugated pipe: shall be either AASHTO Type 'S' or Type 'D' as follows. Sizes 100 - 1500 mm (4 - 60 inch) designated as AASHTO Type 'S' (N-12) shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway). Corrugations for Type 'S' sizes 100 - 1500 mm (4 - 60 inch) shall be annular (N-12). Sizes 1050 -1500 mm (42 thru 60 inch) designated as AASHTO Type 'D' (N-12HC) shall consist of an essentially smooth waterway braced circumferentially with circular ribs which are formed simultaneously with an essentially smooth outer wall. The 1050- 1500 mm (42 thru 60 inch) (N-12HC) sizes shall conform to AASHTO Type 'D' (which describes dual wall pipe with a smooth waterway). Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252, and M294. Pipe and fittings shall be made from virgin PE compounds which conform to the latest revision of the AASHTO Material Specifications for cell classification as defined and described in ASTM D3350.

##### B. Pipe Joints:

1. PVC Pipe and Fittings: Elastomeric gasket joints providing a watertight seal, conforming to ASTM D3212 and F477.

2. Concrete Pipes: Rubber gaskets, joint rings, castings and plates for fittings shall meet the requirements of ASTM C-361, with the additional requirement that the gasket used shall be of such cross sectional area and perimeter as to properly fit the space provided in the pipe joint in which it is to be used. Prior to use, the gasket shall be stored in as cool a place as practicable.

##### C. Drainage Structures:

1. (including but not limited to: Manholes, Catch Basins, Retention Boxes, Well Boxes, Pump Stations etc.) shall be of precast, reinforced concrete unless otherwise approved. All precast concrete structures shall meet the requirements of ASTM Standard No. C478, with Type II acid resistant cement. Concrete shall maintain a minimum compressive strength of 4000 psi in 28 days, and all reinforcing bars shall be ASTM A615 grade 60

steel with minimum of 3 inch cover. Walls shall be not less than 6" thick and top & bottom slabs shall be not less than 8" thick. Walls and floor slabs shall be fully doweled together and top slabs shall have an approved anchorage to prevent displacement. Walls shall extend a minimum of 6" above top of the highest pipe hole, 3' minimum each side of each opening and, for inlets, 12" minimum below the invert of the lowest pipe, unless otherwise approved. All concrete structures shall be delivered to the job site bearing the stamp of an independent Florida certified engineering testing laboratory, signed and dated by the laboratory's inspector unless certified by the manufacturer as meeting F.D.O.T. standards. These structures shall be unpatched and uncoated and shall remain so until approved by the Engineering Division inspector. Manholes shall have a minimum dimension of 4'-0' between opposing walls.

2. Manhole built-in sections shall be joined with a mastic compound or a round compression ring of neoprene material set in annular spaces cast into the spigot end of a bell and spigot type joint. The mastic compound or ring shall be uniformly compressed between the positioned sections so as to form a watertight joint. After the sections are assembled, the remaining space in the joint shall be pointed up and filled with dense cement mortar and finished so as to make a smooth, continuous surface inside and outside the wall sections.

D. Mortar: Standard premixed mortar conforming to ASTM C387, Type S, or proportion 1 part Portland cement to 2 parts clean, well graded sand which will pass a 1/8 inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to concrete.

E. Conflict Structures shall have not less than 2'-0' clearance between penetrating pipes & parallel concrete walls and shall measure not less than 4'-0' between other opposing walls. They shall have a minimum wall thickness of 6' unless otherwise approved. Where a semi-cylindrical baffle is to be installed in a drainage structure, the minimum distance between the baffle and the opposing wall shall be two feet, and the minimum distance between the baffle and the adjacent wall shall be a minimum of one foot or three-fourths of the radius of the baffles whichever is greater.

F. Top frames, grates & covers for all drainage structures shall be of traffic bearing design and shall be cast of close-ground grey iron conforming to ASTM Standard A-48, Class 30 with a minimum lid weight of 165 lbs. and a minimum combined weight of 410 lbs., unless otherwise approved by the Engineering Division.

G. Castings shall be the following types, as manufactured by United States Foundry & Manufacturing Corp., or approved equal.

H. Brick for Manholes: Clay Brick: Bricks for manhole construction shall be dense, hard burned, common clay brick conforming to ASTM Standard C62, "Building Brick (Solid Masonry Units made from Clay or Shale)". All bricks shall have true edges and sharp comers and shall have been cured for at least 14 days before being placed.

I. Manhole covers shall be cast iron and shall have "Sanitary Sewer" and City of Miami Beach cast into the cover casting. All lids shall be provided with a polyethylene watertight manhole Insert, as manufactured by Southwestern packing & Seals, "Rainstopper" model, or approved equal to reduce storm water inflow.

J. Headwalls and Revetments: Unless otherwise approved, where embankment slopes at culvert ends and outfalls are steeper than 1:3, approved concrete end walls shall be installed. Where embankment slopes are 1:3 or flatter, approved revetments shall be installed. This preferred type

of revetment is the poured concrete-in-fabric form type, with a quilted appearance.

## **2 INSTALLATION**

- A. Proper and suitable tools and appliances for the safe convenient handling and laying of pipe shall be used and, in general, conform to manufacturer's recommendations. At the time of laying, the pipe shall be examined carefully for defects, and should any pipe be discovered to be defective after being laid, it shall be removed and replaced with sound pipe by the Contractor at his expense.
- B. Excavation and backfill for trenches and manholes shall be as specified in Section 5, Site and Road work.
- C. Where location of sewer is not clearly defined, install the sewer so it shall not be closer horizontally than 6 feet (10ft. preferable) to a water supply main or service line. When the bottom of the water pipe will be at least 18 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet.
- D. Where gravity-flow sewers cross above waterlines, the sewer pipe for a distance of 10 feet on each side of the crossing shall be fully encased in concrete or shall be acceptable pressure pipe with no joint closer horizontally than 3 feet to the crossing.
- E. Bedding and initial backfill (12 inches) over sewer mains and services shall be sand with no rock larger than 1 " in diameter. Pea rock or 3/4" washed rock will be used in water or where unsuitable bedding exists at the discretion of the City Engineer or his designee. All other fill shall not have rock larger than 6" in diameter
- F. Shape the bottom of the trench by hand to give substantially uniform circumferential support to the lower fourth of each pipe. When applicable, pipe laying shall proceed upgrade with the tongue or spigot ends pointing in the direction of the flow.
- G. Each pipe to be laid true to line and grade indicated on the drawings and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line. As the work progresses, clean the interior of the sewer of all dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the joining had been completed
- H. Do not lay pipe when the condition of the trench or the weather is unsuitable for such work. When work is not in progress, keep open ends of pipes and fittings securely closed. Provide adequate support to retain pipe against uplift due to water in trench. When other conditions are such that the pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase the pipe in concrete or support it on a concrete cradle
- I. Upon satisfactory completion of the pipe bedding, a continuous trough for the pipe barrel and recesses for the pipe bells, or couplings, shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support with no pressure being exerted on the pipe joints from the trench bottom.
- J. Polyvinyl Chloride (PVC) Pipe: installation: Install joints in accordance with ASTM D3212 and F477 recommendations and approved manufacturer's installation recommendations.
- K. Manholes shall be constructed as indicated on drawings or according to the City of Miami Beach Standard Detail. Manhole openings are to be sealed with anti-hydro cement or approved equal. No molding plaster will be allowed.
- L. Frames and Covers: Set the cast iron frames and covers in a bed of mortar and carefully adjust to elevation shown on the drawings. Provide a minimum of 3 and maximum of 5 courses of brick under frames for adjusting manhole cover elevations.

## **3. TESTING AND CERTIFICATION**

All drainage installations shall be tested for leakage prior to backfilling. Tests shall be conducted by contractor in the presence of the engineer or his representative and a representative of the Engineering

Division. Any portion with leakage exceeding the allowable shall be corrected at the contractor's expense and retested. This shall be repeated until all portions of the installation meet the leakage requirements.

#### A. Leakage Tests

1. Prior to testing for leakage, the trench shall be completely backfilled and compacted properly. Test shall be performed just prior to final paving over trench.
2. Test lines for leakage by exfiltration tests. In areas where pipe is laid below groundwater level, assure that there is no infiltration prior to performing the exfiltration tests.
3. Visible leaks into the system shall be corrected regardless of the amount of leakage.
4. The infiltration test procedure shall be used when the water table is 2 feet or more above the top of the pipe at the upper end of the pipe line section to be tested. Infiltration shall be measured using a suitable weir or other acceptable device.
5. An exfiltration test shall be performed, when an infiltration test cannot be properly performed. Exfiltration test shall be performed during low tide.
6. The exfiltration test procedure shall be performed by filling the manhole, line and laterals with clean water. The filled lines shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24 hours. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and system retested. Correction and retesting shall be made at Contractor's expense.
7. Manhole exfiltration leakage shall not exceed 4 gallons per day per manhole tested.
8. An air test may be substituted for the water exfiltration test, upon approval of the City Engineer

Prior to scheduling final inspection for acceptance of drainage systems, the Engineer shall provide to the Engineering Division one (1) set of certified as-built drawings signed and sealed by a Professional Land Surveyor registered in the State of Florida together with the Engineer's certification.

In every case, when the design drawings have been produced using a CAD system, the 'as-built' or 'record' drawings shall also be produced on the CAD system and the Engineer shall also submit a copy of the magnetic medium containing the information from which the as-built drawings were produced.

#### **4 SPECIAL CONSIDERATIONS**

- A. All existing and proposed utilities in the public right-of-way shall be shown on the paving, grading and drainage plans. All utilities shall be identified and located by dimension, horizontally and by elevation, and their materials of construction shall be noted to the extent determinable without excavation.
- B. Cross-section(s) and/or typical section(s) of proposed road and drainage construction, shall show dimensions, materials and purposes of all existing (to remain) facilities as well as all proposed facilities within the right-of-way.
- C. Work shall be performed in accordance with contract documents, drawings and/or City of Miami Beach Standard Details, in a neat and accurate manner. It is the intent of the City to obtain a complete and working installation according to these Specifications, and any Items of labor, equipment or materials which may reasonably be assumed as necessary to accomplish this end shall be supplied whether or not they are specifically shown on the project plans or stated herein. Properly identified product data for review including data on pipe and all other materials used shall be submitted to the City for review and approval.

- D. The Contractor shall be in compliance with all applicable provisions of the Occupational Safety and Health Act of 1970, in general, and any subsequent amendments and revisions thereto and specifically to the provisions concerning confined space entry.
- E. The Contractor shall conduct his operations in such a manner, utilizing warning devices such as traffic cones, barricades and warning lights, and personnel such as flagmen and uniformed police officers, that the public is given adequate warning of hazards of the work site as may be deemed necessary by the City Engineer.
- F. Storm sewer flows shall be controlled through the pipeline sections and pump stations where work is being performed. Under no circumstances, can portions of the system be removed from service for periods of time in excess of that approved by the City. The CONTRACTOR shall be responsible to assess conditions and capacities of the existing sewer lines and pump stations, in coordination with the City of Miami Beach Public Works Department and accommodate it in the project work-plan in order to implement an acceptable bypass plan at no additional cost to the City. Bypass pumping will be required for all sewers and pump station reconstruction that would result in shutdown of existing facilities. The CONTRACTOR shall supply the necessary pumps, conduits, and other equipment to not only divert flow around the pump station, manhole or pipe section in which work is to be performed, but also to transmit the flow in downstream sewer lines and/or pump stations without surcharge. The bypass systems shall be of sufficient capacity to handle existing flows plus additional flows that may occur during periods of high tide or rainfall. Emergency backup pumping capability must be available in addition to the primary bypass system. The CONTRACTOR will be responsible for furnishing the necessary labor, power, and supervision to set up and operate the pumping and bypass systems. When pumping is in operation, all engines shall be equipped in a manner to keep the pump noise to a minimum and comply with the City noise ordinances.