

PART II

SECTION 10. PUMP SYSTEMS AND FORCE MAINS

This section applies to pressurized storm water and sanitary sewer systems.

1.0 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.

Pipe Mains

- A. All pipe fittings and appurtenances intended for conveying or transmitting fluids under pressure shall conform to the requirements for water distribution materials contained in Division 2, of City of Miami Beach Public Works Manual.
- B. The minimum pipe size of any Public Force Main shall be four (4") inches in diameter unless otherwise approved by the Public Works Department, on a case by case basis only.
- C. Ductile Iron Pipe (D.I.P.) shall have a pressure class rating of 250 P.S.I. The interior Of ductile iron pipes and fittings shall be poly-lined in accordance with AWWA/ANSI Standard C104/A21.4 or Protecto 401 Ceramic Epoxy with a minimum dry film thickness (DFT) of 40 mils. Either alternative shall require shop drawings approval prior to construction. Cement mortar lining is NOT acceptable for force mains. The outside coating of the pipe shall be asphaltic, approximately one (1) mil thick, as specified in AWWA C151, latest revision. The polyethelene wrap for ductile iron pipe encasement, shall conform to the requirement of ANSI Standard A21.5 and shall be manufactured from virgin polyethelene material. The lining shall have an eight (8) mil minimum thickness. Wrapping tape shall be of the same material.
- D. PVC Force Mains shall conform to specifications C-900 or C905, PVC Mains may be Allowed in County and State roads subject to their review and approval. The PVC C-900 pipe shall be push-on type, with bells, spigots and elastomeric gaskets, in accordance with AWWA C900 and AWWA C905, latest revisions. Nominal laid length of PVC C900, pipe shall be 20 feet. C900 PVC pipe shall be impregnated with green pigment and double labeled (180 degrees apart) with the following at intervals of not more than five (5) feet: Date of manufacture - Manufacturer's Name & Record Code - Nominal size - "(CI)" - "PVC" – "Dimension Ratio (for example "DR25")" – "AWWA pressure class (for example "PC100") - "AWWA designation number (ANSI/AWWA C900-97)".
- E. Detector Tape shall be green 3" wide with metal foil and the wording 'CAUTION FORCE MAIN BURIED' on the upper side of the pipe and be installed 18" over all pipes.
- F. All PVC Mains shall be installed with a 14 gauge multi-strand copper wire locator System compatible with the Schonstedt MAC-51Bx Pipe and Cable Locator, or City Approved equal. Wire to be strapped to pipe at maximum 10 ft. intervals and the Wire is to be brought up at each valve box, leaving an excess length of four (4) feet Of wire coiled at each valve. At the force main pressure test, a continuity test shall be preformed by the Contractor. The continuity test shall be witnessed and approved by the City's Representative and Engineer-of-Record.
- G. No galvanized pipe is allowed. Use brass or stainless steel or PVC Schedule 80 pipes, for pipes less than four (4) inches in diameter

1.1 Fitting and Specials

- A. Cast gray-iron fittings in the 3-inch through 12-inch size range shall be pressure rated at 250 psi, minimum; and 14-inch through 24-inch size range shall be pressure rated at 150 psi, minimum (except for those fittings such as plugs caps, and sleeves which are normally rated at a higher pressure). Cast ductile-iron fittings in the 3-inch through 24-inch size range shall be pressure rated at 350 psi, minimum (except flange joint fittings shall be rated at 250 psi, minimum).
- B. Fitting and appurtenances for restrained joint pipe shall be interior poly-lined in accordance with AWWA/ANSI standard C104/A21.4, or Protecto 401 Ceramic Epoxy with a minimum dry film thickness (DFT) of 40 mils. The outside coating shall be an asphaltic coating approximately one (1) mil thick per AWWA C151, latest revision. Linings shall be standard thickness. Polyethylene wrap shall also be installed.
- C. Pipe minimum wall thickness shall be Class 52 for 6" diameter lines and larger; and Class 53 for four (4)" diameter pipe.
- D. All fittings and specific pipe joints shall be restrained as outlined below (NO SUBSTITUTIONS):

<u>JOINT</u>	<u>RESTRAINT</u>
Push-On PVC	EBAA Iron Series 2800 Harness
Push-On DIP	TR – Flex by U.S. pipe or Flex Ring by American; or EBAA Iron Series 1700 Megalug
Fittings with DIP pipe	EBAA Iron Series 1100 Megalug
Fittings with PVC pipe	EBAA Iron Series 2000 Megaulg

- E. PVC and DI pipes shall be deflected no more than one half of the Manufacturer's recommendations. If approved by the City Engineer Alignment changes shall be made by primarily with the use of fittings.

1.2 Valves

A. Air Release Valves

- 1. Sewage air release valves shall be specifically designed for use on Sewage Force Mains. Bodies and covers shall be cast iron, trim and float shall be stainless steel and the outlet shall be ½" N.P.T. Valves shall automatically release air gas or vapor under pressure during system operation, NO galvanized pipe allowed.
- 2. Air release valve equipment is to be installed above 1.0 NAVD 88 elevation.

B. Line Valves

- 1. Valves and Valve Boxes are to be installed in accordance with the requirements of Division 2 of the City of Miami Beach Public Works Manual.
- 2. Valves are to be gate valves with resilient wedge seats with non-rising stems.
- 3. The following valves are acceptable:
 - a. M&H
 - b. Muller
 - c. Dezurik
- 4. An isolation valve shall be provided between the emergency bypass stand pipe and the valve pit. All valves for force mains shall be gate valves. Gate valves shall be resilient type and shall meet requirements of AWWA C-504 and C-507.

C. Kamlock

Emergency bypass shall be the same diameter as the receiving force main. Emergency connection shall be four (4) inch diameter "Kamlock" plug and coupler (female end for sanitary sewer) with dust cover which includes a 316 stainless steel chain to secure cover.

D. Check Valves:

1. Check valves shall be spring loaded or weight outside lever installed in valve pit with traffic rated stainless steel access hatch.
2. Check valves for sewage pump stations and force mains shall be one of the following:
 1. M & H Swing
 2. APCO Swing Check
 3. Golden Anderson
 4. Access Pit & Manholes for Valving

E. Access Pits & Manhole for Valving

1. Location of check valves and resilient gate valves inside the pit shall be staggered. Check levers shall be on the inside. Gate valves shall have hand wheels. Provide a minimum of one (1) foot horizontal, one (1) foot vertical distance from piping to bottom interior of pit walls. Install a 2-1/2 inch liquid-filled pressure gauge on each check valve with 1/2" 316 stainless steel isolation valve, diaphragm protection seal and NPT 316 S.S. fittings.
2. Air Release Valves are to be located in manholes or access pits large enough to allow maintenance of the equipment.
3. Valve pit shall have solid concrete bottom with sump to help keep it dry.
4. Access hatches are to be H20-44 traffic rated and water resistant, lift assisted and lockable.

1.3 Pump Stations:

The station will be designed to meet O.S.H.A. requirements and Ten State Standards. The station will be comprised of the major following elements

- 1) Wet well and valve pit
 - 2) Duplex submersible pumps and motors
 - 3) Control Panel
 - 4) Paved parking area and access.
 - 5) Emergency pump out connection (kamlock).
 - 6) Electrical service and meter
 - 7) Security fence with gate
 - 8) Telemetry system and antenna.
- A. Submit pump station, wet well and force main design reports including required pump curve(s). The report shall include the number of individual residential, commercial and/or industrial units served, and/or the size of basin area in acres. The operating pressures on the force main at 25%, 50%, 75% and 100% build-out for sewage. Design for maximum efficiency and normal operational flow not high or low curves.
 - B. The entire pump station parcel is to have a 6" thick concrete pad on top of twelve (12") compacted subgrade, compacted to 98% of the maximum density per AASHTO T-180 method. Subgrade is to have a minimum LBR of 40.
 - C. Re-pump stations are not acceptable. All pump stations shall pump into adequately sized force mains which transmit the flow to the appropriate wastewater treatment facility or storm water facility.

- D. A six (6) foot high chain link site perimeter fence with three strands of barbed wire shall be provided. The mesh shall be green vinyl fusion-bonded chain link with green aluminum slats each way, pursuant to City specifications. Alternate screening methodologies may be submitted for review and approval.
- E. Fence access gate into the site shall be 14 feet wide roll gate with locking hasp suitable for padlock. Driveway between Pump Station and road to be 16 feet wide.
- F. Pump station shall be provided with a 12" wide x 18" high identification sign using the three (3") inch high reflective letters futura Font, and should be designed to resist fading with the following information:
 - G. City of Miami Beach (Green Blue)
Pump Station No. ____ (Red)
Emergency Call: 305-673-7625
- H. All pipe and fittings on the pump station site shall be ductile iron conforming to the same specifications as above for force mains except that flanged ductile iron pipe and fittings shall be used inside the valve pits and wet wells. Flanged pipe and fittings shall conform to ANSI/AWWA C115/A21.15 and ANSI/AWWA C110/A21.10.
- I. Pump stations shall be designed for ultimate conditions. If present conditions warrant different pumps, motor, and/or impellers, the ultimate condition equipment shall also be provided.
- J. All concrete associated with the pump station shall be acid resistance marine environment 4000 psi or greater, at 28 days.
- K. Wet well to be a minimum of eight (8) feet in diameter and conform to ASTM C-478 for precast concrete manholes with eight (8) inch thick walls (minimum).
- L. Use 316 stainless steel for specials inside in the valve pit and wet well.
- M. Interior of wet well shall be lined with a gas impervious Agru Suregrip Polypropylene (PR-P), or GU manhole liner, or the wet well shall be manufactured fiberglass/concrete composite wet well utilizing two layers of 20-25 mils thick gel coat of contrasting colors and two (2) layers of 20-30 mils thick fiberglass reinforced resin in contrasting colors to be integrated with all interior surfaces and interior of all joints and boot openings. Paint interior of the valve pit and wet well with two (2) coats of Koopers Bitumastic No. 300M alternate color. (Dry thickness of eight (8) mils thick per coat.)
- N. The emergency power receptacle shall be 100 amp 3PHW Meltric 37-99043 for stations with 100 amp or less main breaker, and 200 amp 3PHW Meltric 37-29043 for stations with main breaker greater than 100 amp. Locate the receptacle facing toward the gate for easy access. Receptacle end shall be female with water tight cap.
- O. Security light shall be mounted on a ten (10) foot corrosion proof metal pole with a red alarm light on top. Mounted on the pole shall be an on-off switch enclosed in a NEMA 4X enclosure located 42 inches above grade.
- P. Provided a lightning arrester for the control panels as required.
- Q. Provide four (4") inch diameter D.I.P. vent with bug screen with the end above flood elevation.
- R. Provide two (2) inch diameter water service with one (1) inch hose bib and back flow preventer to pump station.

1.4 Submersible Pumps:

- A. The pump stations shall be designed as submersible duplex minimum centrifugal pumps using an eight (8) ft minimum diameter equivalent wet well. Pump operations are to be based on septic and cycling time of pump. Cycling time of pump will determine the layout of the controls.
- B. Each pump shall generally start no more than three (3) times.
- C. Building Department is to review, approve and inspect electrical portion of the pump and controls.
- D. Top slab shall be 12" thick reinforced with Stainless Steel H20-44 traffic rated hatch. Hatch is to be locking and lift-assisted.
- E. Pump Stations are to be designed to have a primary pump on generator operation and to alternate the start between pump.

1.5 Control Panel and Equipment:

- A. Panel to be free-standing NEMA 4x, Type 316 stainless steel enclosure for outdoor duty.
- B. Panel to be post mounted on U channels above flood elevation, or forty two (42") inches above finished slab, whichever is higher.
- C. Control panel shall include:
 - 1. Main circuit breaker disconnect interlocked with panel door.
 - 2. Combination circuit breaker type
 - 3. NEMA rated motor starters, 240 volt, 3 phase
 - 4. Wireless telemetry system
- D. Provide wireless telemetry system for remote indication of:
 - 1. High water level alarm.
 - 2. Pump failure (temperature and moisture) alarm.
 - 3. All required telemetry conduits shall be installed on PVC conduit 2" diameter schedule 40.
 - 4. Telemetry to have UPS System
- E. 120V ground fault receptacle.
- F. Control system shall be float operated with a minimum of four (4) floats and one spare.

1.6 Operation of Pump Stations:

The operation of the pump stations will be based on a four point float control. In ascending order the four float elevation points are:

- A. Low water cut off point elevation
- B. Lead pump start point elevation
- C. Lag pump start point elevation
- D. High water alarm point elevation

1.7 Installation of Pump Station

- A. The installation of all new force mains or modifications to existing force mains shall be in accordance with the requirements for Division 2 of the City of Miami Beach Public Works Manual as applicable, except as hereinafter provided.
- B. Install pumps and equipment in accordance with manufacturer's printed specification.
- C. Valve pits that are adjacent to wet wells shall be drained to wet well with a two (2) inch PVC 1120 pipe with rubber ring compression joints. PVC shall be sloped, with a "P" trap inside the wet well.
- D. The last run of sewer main between the collection manhole and the wet well shall be DIP.
- E. Valves shall have pipe supports underneath.
- F. All wall openings around pipes are to be sealed with elastomeric Grout.

1.8 Flushing and Testing

- A. Force-mains shall be pressure tested in accordance with AWWA Standard C-600, latest revision and the provisions of the City of Miami Beach Public Works Manual. The minimum pressure for testing shall be two (2) hours @ 100 PSI.
- B. Force mains shall be cleaned and flushed after completion of testing, with sufficient pressure to displace all test water and to remove sand, mud or other deposits. If necessary, other approved methods must be used to ensure the removal of all such deposits. Water used shall be metered and paid for by the contractor.
- C. Pressure tests are to be witnessed by City and the Engineer of Record.

2.0 As Built Drawing information:

Prior to final acceptance, two (2) copies of As Built drawings certified by a Florida Registered Land Surveyor and mapper (PMS) shall be provided to the City for review and approval. Signed and sealed letter of certification by the "Engineer of Record", together with a copy of digital media producing such As-Builts shall be required at the time of final acceptance by the City. As a minimum, the As-Built must show Station numbers and horizontal offsets from the Base Line and Right- of- Way lines on a plan scaled 1"=20 ft. for all fittings, valves and changes in horizontal alignment, and a profile with a vertical scale of not less than 1"=2 ft. with elevations at all horizontal and vertical changes in alignments and grade profile elevations at approximately 50 ft. intervals. As-Built plans and profiles must also show all abandoned pipes and plugs that were modified within the project limits and actual elevation/description of all other utilities crossing or encountered in the vicinity of the new water mains. The paper size of the drawings shall be 22" X 34".

3.0 Warrant

The Pump manufacturer or builder shall supply a minimum five (5) year warrant on the equipment starting with the date of final acceptance by the City. The pump manufacturer shall supply five (5) sets of operation and maintenance manuals for the equipment.

4.0 Special Considerations:

- A. All force main shall require profile drawing to show high and low elevation of the piping. Top of pipe shall be shown at each 100 ft. intervals, and finish grade.
- B. Conflict manholes involving other utilities mains are to be avoided.

- C. Discharge from private lift station force mains shall discharge only into an epoxy coated gravity sanitary manhole sewer system.
- D. Design criteria evaluation for Air Release Valves will be required for vertical elevation changes of more than two (2) pipe diameter. The engineering Division shall review the flow and elevation changes and review the engineers recommendations.

F:\work\ALL\PUBLIC WORKS MANUAL\Section10PartII_Pump System and Force Mains.doc