DIVISION V
WATER DISTRIBUTION

SECTION 51

INSTALLATION

51. 1 GENERAL

Pipe shall be installed in accordance with the manufacturer's specifications and instructions for the type of pipe used and applicable AWWA standards, such as C600 and C603, unless otherwise stated in these specifications.

51. 2 PIPE HANDLING

All types of pipe shall be handled in such manner as will prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the CITY or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that is damaged beyond repair by the CONTRACTOR, in the judgment of the CITY, shall be removed from the work site and replaced with another unit.

Joint gaskets shall be stored in a clean, dark, and dry location until immediately before use.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations. Any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and re-laid. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a water-tight plug or by other means approved by the CITY to ensure absolute cleanliness inside the pipe.

51. 3 SEPARATION OF WATER MAINS AND SEWERS

51. 3. 1 GENERAL

Potable water mains that are laid in the vicinity of pipe lines designated to carry raw wastewater, reclaimed water, or storm water shall meet the horizontal and vertical separations specified below.

51. 3. 2 HORIZONTAL SEPARATION

NORMAL CONDITIONS: Water mains shall be located at least 10 feet horizontally from pipes carrying raw wastewater or storm water, and 3 feet horizontally from pipes carrying reclaimed water. The distance shall be measured from inside edge of pipe to inside edge of pipe.

UNUSUAL CONDITIONS: When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a pipe carrying raw wastewater or storm water provided that the bottom of the water main is at least 18 inches above the top of the sewer or storm water pipe and the water main is laid in a separate trench or on an undisturbed earth shelf. Such installations shall be specifically approved by the CITY.

51. 3. 3 VERTICAL SEPARATION

NORMAL CONDITIONS: Water mains shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sanitary sewer or storm water pipe.

UNUSUAL CONDITIONS: When construction conditions prevent a vertical separation of 18 inches as described hereinabove, the sewer pipe shall be constructed of ductile iron pipe with mechanical joints.

51. 3. 4 CROSSING OF WATER MAINS AND SEWERS

Water mains shall be above the sanitary sewer or storm water pipe whenever they cross.

A vertical separation of at least 18 inches shall be maintained between the top of the sanitary sewer or storm water pipe and the bottom of the water main.

Adequate structural support for both the water main and sanitary sewer or storm water pipe shall be provided to prevent excessive deflection of joints and settling.

Sanitary sewer mains shall be constructed of PVC or ductile iron pipe with mechanical joints and the length of PVC or ductile iron pipe shall be a minimum of 18 feet and centered at the point of crossing so that the joints will be equidistant and as far as possible from the water main.

DIVISION V
WATER DISTRIBUTION

51. 4 TRENCH PREPARATION AND PIPE BEDDING

51. 4. 1 TRENCH PREPARATION AND PIPE BEDDING

Applicable provisions of Section 32 and the STANDARD DRAWINGS shall apply.

51. 4. 2 PIPE PREPARATION AND HANDLING

All pipe and fittings shall be inspected prior to lowering into the trench to insure no cracked, broken, or otherwise defective materials are being used. CONTRACTOR shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of the pipe and keep clean during and after installation.

CONTRACTOR shall use proper implements, tools, and facilities for the safe and proper protection of the WORK. CONTRACTOR shall lower pipe into the trench in such a manner as to avoid any physical damage to the pipe and shall remove all damaged pipe from the jobsite. Care shall be taken to not drop or dump pipe into trenches under any circumstances.

51. 4. 3 TRENCH DEWATERING AND DRAINAGE CONTROL

Specifications from Section 32 shall apply. CONTRACTOR shall prevent water from entering the trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.

51. 4. 4 SURVEY LINE AND GRADE

Pipe shall be laid to the lines and grades shown on the PLANS. The CONTRACTOR shall provide line and grade stakes at a 100 foot maximum spacing and at all line and/or grade change locations. CONTRACTOR shall provide temporary bench marks (TBM's) at maximum 1000 foot intervals. The minimum ground cover shall be three (3) feet from the finished grade surface or three (3) feet below the elevation of the edge of pavement of the road surface, whichever is greater.

51. 4. 5 PIPE LAYING IN TRENCH

CONTRACTOR shall prevent foreign material from entering the pipe while it is being placed in the trench. CONTRACTOR shall remove all foreign material from the pipe or joint ring before the next pipe is placed. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into the pipe, the CITY may require that snugly-fitted and tightly-woven canvas bags be placed over each end before lowering the pipe. The bags shall be left in place until the connection is to be made to the adjacent pipe. During laying operations, CONTRACTOR shall keep debris, tools, clothing, or other materials out of the pipe.

51. 4. 6 LAYING POLYVINYL CHLORIDE PIPE

All PVC pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe Design and Construction" unless such standards conflict with this MANUAL in which case this MANUAL shall govern.

51. 4. 7 LAYING DUCTILE IRON PIPE

All ductile iron pipe shall be installed in accordance with AWWA C600 unless such standards conflicts with this MANUAL in which case this MANUAL shall govern. CONTRACTOR shall cut pipe only as necessary to comply with alignment shown on the PLANS. Torch cutting of pipe shall not be allowed.

CONTRACTOR shall provide special tools and devices, such as special jacks, chokers, and similar items required for proper installation. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer with no substitutes to be permitted under any circumstances.

The pipe shall be polyethylene encased (8 mil) where shown on the DRAWINGS in accordance with ANSI/AWWA A21.51/C105.

51. 4. 8 LAYING OF PIPES ON CURVES

Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. Maximum deflections at pipe joints and laying radius for the various pipe lengths shall be as recommended by the pipe manufacturer.

51. 4. 9 PIPE RESTRAINING AND THRUST BLOCKING

Requirements specified in Section 34 shall apply.

51. 4. 10 BEDDING AND BACKFILL FOR PIPES

Requirements specified in Section 32 shall apply.

51. 5 HYDROSTATIC TESTS

51. 5. 1 GENERAL

Hydrostatic tests shall consist of pressure and leakage tests. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines to the curb stops. Air testing of pressure pipes will not be permitted under any circumstance. Tests may be made on sections not exceeding 2,000 feet when acceptable to the CITY. CONTRACTOR shall furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required. Equipment to be furnished by the CONTRACTOR shall include graduated containers, pressure gauges, hydraulic force pumps, and suitable hoses and piping. The CITY will monitor and approve a satisfactory test.

The CONTRACTOR may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed, for informational purposes only. The hydrostatic tests for acceptance shall be conducted only after the trenches have been completely backfilled and compacted as specified. Where any section of pipe is provided with concrete thrust blocking, pressure test will not be made until at least five days have elapsed after the thrust blocking is installed. If high-early strength concrete is used for the concrete thrust blocking, the time may be reduced to 24 hours if the CITY concurs that the concrete has cured and reached adequate strength. Mechanically restrained joints are highly recommended.

51. 5. 2 TESTING CRITERIA

All pipe sections to be pressure tested shall be subjected to a hydrostatic pressure of 150psi. The duration of each pressure test shall be for a period of 2 hours. If during the test, the integrity of the tested line is in question, the CITY may require a 6 hour pressure test. The basic provisions of AWWA C-600 shall be applicable.

51. 5. 3 PROCEDURE FOR PRESSURE TEST

Each section of pipe to be tested, as determined by the CITY, shall be slowly filled with water through the required jumper connection and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replaced by the CONTRACTOR with sound material and the test shall be repeated until satisfactory results are obtained. Provisions of AWWA C600, where applicable, shall apply.

51. 5. 4 PROCEDURE FOR LEAKAGE TEST

After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C600 shall apply.

Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

Note: L = Allowable leakage in gallons per hour.
S = Length of pipe tested, in feet.
D = Nominal diameter of the pipe in inches.
P = Average test pressure during leakage test in pounds per square inch gauge.

Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valve section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. Should any test of pipe laid disclose leakage greater than that allowed, CONTRACTOR shall locate, replace and/or repair the defective joints, pipe, or valve until the leakage from subsequent testing is within the specified allowance.

DIVISION V
WATER DISTRIBUTION

51. 6 DISINFECTION

51. 6. 1 GENERAL

Before being placed in service, all new water mains shall be chlorinated in accordance with the specifications below and the procedures outline in AWWA C-651 "Standard Procedure for Disinfecting Water Mains". All provisions of the Florida Department of Environmental Protection permit shall be complied with.

51. 6. 2 FLUSHING

Sections of pipe to be disinfected shall first be flushed (full diameter) to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a blow-off valve shall be provided large enough to develop a velocity of at least 2.5 feet per second in the main.

All taps required for chlorination, flushing, or for temporary or permanent release of air shall be provided for by the CONTRACTOR as a part of the construction of water mains. After the disinfection, all such taps shall be sealed to the satisfaction of the CITY.

51. 6. 3 DISINFECTION CRITERIA

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 50 mg/1 and that a chlorine residual of not less than 25 mg/1 remains in the water after standing 24 hours in the pipe.

51. 6. 4 FORM OF APPLIED CHLORINE

Chlorine may be applied as a liquid chlorine (gas-water mixture), or a mixture of water and high-test calcium hypochlorite. CONTRACTOR shall assume responsibility for safe handling of chlorine and shall meet requirements of OSHA and other regulatory agencies for safe handling of chlorine.

51. 6. 5 POINT OF APPLICATION

The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valve section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of applications may be used when approved or directed by the CITY.

51. 6. 6 OPERATION OF CITY VALVES

Valves shall be manipulated by the CITY personnel so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.

51. 6. 7 RETENTION PERIOD

Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 mg/1.

51. 6. 8 CHLORINATING VALVES AND HYDRANTS

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

51. 6. 9 FINAL FLUSHING AND TESTING

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its lengths shows upon test, a free chlorine residual not in excess of that normally carried in the system.

After flushing, water samples collected on 2 successive days from the treated piping system, as directed by the CITY, shall show acceptable bacteriological results. All bacteriological testing shall be the responsibility of the CONTRACTOR. Bacteriological analysis shall be performed by a laboratory certified by the State of Florida with copies of all results provided to the CITY.

Proper chain of custody procedures must be followed and samples shall only be collected by certified laboratory personnel in the presence of CITY personnel.

Copies of testing results and all related correspondence with the Florida Department of Environmental Protection (FDEP) shall be submitted to the CITY. The DEVELOPER'S ENGINEER shall submit request for system clearance to FDEP after approval by the CITY.

Sampling points shall be as stipulated on the FDEP permit.

51. 6.10 REPETITION OF FLUSHING AND TESTING

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the CONTRACTOR until satisfactory results are obtained.

51. 7 NOTIFICATION AND CONNECTION TO EXISTING MAINS

Requirements specified in Section 35.3 shall apply.

51. 8 WATER SERVICE PIPING CONNECTION

Water service piping and connection shall be installed as indicated in the STANDARD DRAWINGS. The location of all service lines shall be as shown on the DRAWINGS and shall be either single or dual service. On curbed streets, the exact location for each installed service shall be marked by etching or cutting a "W" in the concrete curb. Where no curb exists, locations shall be adequately marked by a method approved by the CITY.

51. 9 LOCATION AND IDENTIFICATION

All lettering shall be legible and colors correct for the intended use. See STANDARD DRAWINGS.