

ARTICLE 31

POTABLE WATER SYSTEMS

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Section	31.01	<u>GENERAL CONSIDERATIONS</u>
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	31.01.01	<u>Type of Water Mains</u>
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The City will approve plans for potable water supply mains and extensions (herein this ARTICLE as water main) only when such mains are designed and constructed in accordance with the criteria set forth in this Manual.

	31.01.02	<u>Design Period</u>
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Water mains shall be shall be designed for the estimated ultimate tributary population, as derived for the City's approved future land uses and/or historical flows. Potable water main shall also consider flows for fire protection demand. In the event the approved City of Ocoee Water Master Plan or Study, latest edition, identifies components of the watermain under consideration, the largest capacity consideration shall be required.

31.01.03 Location

Water mains shall be located in dedicated rights-of-way or utility easements. When installed in rights-of-way, water mains shall, in general, maintain a consistent alignment with respect to the centerline of the road. All water mains located outside of dedicated rights-of-way shall require a minimum 20 foot easement. Additional easement widths shall be provided when the pipe size or depth of cover so dictate. If a water main is located adjacent to a road right-of-way, a minimum 10 foot easement shall be provided. Additional easement widths shall be provided if the pipe size or depth of cover so dictate. Water mains shall not be placed under retention ponds, tennis courts, or other structures. In general, water mains shall not be located along side or rear lot lines. Placement of a water main along side or rear lot line may be allowed on a case by case basis if such a water main configuration results in efficient placement and utilization of the water main network. The criteria shall also apply to water mains in retention pond berms.

Section 31.02 DESIGN BASIS

31.02.01 Average Daily Flow and Peak Flow

Average daily water flow shall be calculated by referencing the Equivalent Residential Unit (ERU) flow rates as outlined below. Peak flow, at a minimum, shall be the average daily flow times a peaking factor of 4. The average daily flow for domestic use shall be calculated at the minimum rate of 100 gallons per day per capita, with 3.5 persons per single family residence, and 2.5 persons per multi-family or mobile home dwelling unit. Maximum hour demand to be used for design shall be 1.0 gallons per minute (gpm) per single family residence and 0.7 gpm per dwelling unit for each multi-family or mobile home unit. Flow demands for commercial, industrial or other special developments shall be established from the estimates provided in current City Ordinance. At the discretion of the City Engineer, existing records of like facilities or estimated projections, using the best available data, may be considered.

31.02.02 Fire Flow Requirements

Fire flow requirements shall be determined in accordance with applicable City Codes. As a minimum, the requirements outlined in the ISO. "Guide to Determining Needed Fire Flow", latest edition, shall be met. In no case shall needed fire flow be less than 750 gpm. Maximum daily flow with fire flow shall not exceed 10 fps. Maximum daily flow, at a minimum, shall be the average daily flow times a factor of 2.

31.02.03 Design Calculations

Owner's/Developer's Engineer shall submit signed, sealed and dated design calculations with the Plans for all water distribution projects. Calculations shall show that the water mains will have sufficient hydraulic capacity to transport:

- A) Peak hourly flows.
- B) A combination of maximum daily flows and fire flows.

All calculations shall meet the requirements of Section 29.03.01. Head losses through meters and backflow devices shall also be included in calculations. The Owner's/Developer's Engineer, at the request of the City, shall perform a nodal analysis of the proposed project along with its effects upon the City's entire system. The City's nodal model shall be obtained and used for this purpose.

31.02.04 Potable Water System Hydraulic Modeling

The City of Ocoee maintains a potable water hydraulic model (Bentley WaterCAD) which is used for but not limited to determining system performances and offsite impacts. For developments that may substantially add to or impact the City's potable water distribution system, the Owner/Developer shall cause the incorporation of the development elements into the City's model and the simulation/analysis of the model. Unacceptable operating conditions and/or offsite impacts created by the proposed development shall be remediated by the Owner/Developer.

This effort to be undertaken by Owner/Developer can be done by either the developer's engineer performing the model work with a City review, or by electing to have the City undertake the work. The election for the City to perform the work shall require City approval. All costs incurred by the incorporation and outside reviews by the City shall be at the Owner/Developer's expense. All final products shall become the property of the City.

The Owner/Developer may request the City to develop the project's nodal model, with input from the Owner's/Developer's Engineer, but this will be performed at the availability of City Staff and at a rate to cover City's cost.

Section

31.03

DETAILS OF DESIGN AND CONSTRUCTION

31.03.01 Pressure

All water mains shall be designed in accordance with Section 29.02.03 above. The system shall be designed to maintain a minimum pressure of 20 psi at all points in the distribution system under all conditions of flow. Higher pressures may be required at commercial, industrial and high density residential areas. The normal working pressure in the distribution system should be approximately 55 psi, but in no case less than 35 psi on the downstream side of a meter. For pressures greater than 90 psi special provisions may be required. Design Friction Losses for water mains shall be determined using the Hazen-Williams friction coefficient of C=100. Peak hourly flow shall not exceed 5 fps. Maximum daily flow with fire flow shall not exceed 10 fps.

31.03.02 Diameter

Only 4", 6", 8", 12", 16", 20", 24", 30", 36", 42", 48" and 54" diameter water mains shall be permitted. Four inch water mains shall be permitted only in cul-de-sac areas with a maximum length of 500 feet of pipe. In cul-de-sac areas only, 4 inch looped connections are required to prevent dead ends. As a minimum, 6 inch looped systems shall be required in low density residential projects. Where looping of mains is not practical, minimum 8 inch mains shall be required, unless detailed calculations are submitted to substantiate the sufficiency of a 6 inch main. In commercial, industrial, and high density residential areas, minimum 8 inch looped mains shall be required. Larger size mains shall be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in Section 29.03.01.

31.03.03 Dead Ends

In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins wherever practical, as determined by the City. System looping is required wherever possible to increase overall capacity, service and to maintain quality. Where dead-ends occur, they shall be provided with a fire hydrant or blow-off for flushing purposes. Blow offs shall be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. Where routine and continuous flushing is predicted or determined based on water quality issues, an automatic flushing appurtenance shall be required.

No flushing device shall be directly connected to any sewer.

31.03.04 Valves

Valves shall be provided for all branch connections, loop ends, fire hydrant stubs, or other locations as required to provide an operable, easily maintained, and repaired water distribution system. Valves are to be placed so that the maximum allowable length of water main required to be shutdown for repair work shall be 500 feet in commercial, industrial or multi-family residential areas, or 800 feet in other areas.

31.03.05 Air Relief Valves

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or automatic air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. Refer to the Typical City Details attached as part of this Manual.

31.03.06 Fire Hydrants

Fire Hydrants shall be considered and designed in accordance with this ARTICLE.

31.03.07 Chamber Drainage

Chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any sewer.

31.03.08 Disinfection Following Repair or Replacement

Any part of the City water system which has direct contact with finished water and has been out of service for repair, alteration, or replacement shall be disinfected as outlined in this Manual or AWWA C-651.

Section 31.04 WATER METERING

31.04.01 General

All water service connections shall be metered. In general, the method of metering shall follow the guidelines listed below. However, the Owner's/Developer's Engineer must obtain approval before finalizing the design of the metering system. Master metering for irrigation for common grounds shall be reviewed and approved by the City Engineer on a case-by-case basis.

31.04.02 Single Family, Duplex, and Multi-Family Subdivisions

Each unit shall be individually metered. However, a variance may be requested for multi-family subdivisions. Single and Double services shall be installed at property lines as specified in the Typical City Details attached as part of this Manual.

31.04.03 Commercial, Industrial, and Institutional Projects

In general, each building shall be individually metered. Meter(s) shall be located in the public rights-of-way at the property line.

31.04.04 Shopping Centers

Each unit shall be individually metered. The meters shall be located either in the right-of-way or within a Utility Easement. The meters shall be located within an unpaved area to facilitate removal, repair and/or replacement without damage to paved surfaces.

31.04.05 Meter Installation

All meter boxes shall be installed by the Contractor at finished grade and level. All meters 2 inches and smaller will be installed by the City after payment of applicable fees and charges. All meters 2 inches in size and smaller shall be installed underground in an approved meter box. Meters larger than 2 inches shall be installed above ground. In general, meters larger than 2 inches shall be located in a meter easement located adjacent to the public right-of-way.

31.04.06 Meter Sizing

Size of all meters shall be determined by the Owner's/Developer's Engineer and approved by the City Utilities Division. The Owner's/Developer's Engineer shall provide sufficient information on estimated peak flows and low flows so that meter size can be evaluated. The Owner's/Developer's Engineer shall include head-losses through metering device when designing the water system.

Section

31.05 WATER SERVICES AND CONNECTIONS

Water services and connections shall conform to the applicable provisions of this Manual and the Typical City Details attached as part of this Manual. Only 1", 1 ½", 2", 3", 4", 6", 8", 10" and 12" services shall be permitted. Where water services greater than 12 inches are required dual services shall be provided. New services and connections to the water system, either new or existing, shall be made by the Contractor.

Water service piping and connection shall be installed as specified in the Typical City Details attached as part of this Manual. The location of all service lines shall be as specified in the Typical City Details attached as part of this Manual 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.

Section 31.06 SERVICE PIPE, STOPS, FITTINGS, AND SERVICE SADDLES

31.06.01 Service Pipe

All service lines shall be 1", 1 ½" or 2" polyethylene tubing conforming to specifications in AWWA C-800 and AWWA C-901.

31.06.02 Stops

Corporation stops shall be 1", 1 ½" or 2" brass, equipped with connections compatible with the polyethylene tubing and threaded in accordance with specifications in AWWA C-800 and AWWA C-901. Curb stops shall be sized to match the meter size and conform to the specifications in AWWA C-800 and AWWA C-901.

31.06.03 Fittings

Fittings shall be brass, cast and machined in accordance with specifications in AWWA C-800 and AWWA C-901, with compatible polyethylene tubing connections.

31.06.04 Service Saddles

A service saddle may be used for all service line taps. Service saddles shall be double strap, anchored by a minimum 4 bolt pattern on a ductile iron saddle body. The City may require a stainless steel strap and fusion epoxy or nylon coated ductile iron body with stainless steel hardware in areas designated as corrosive.

Section 31.07 WATER MAIN MATERIALS

31.07.01 General

These Specifications cover the pipe, fittings, and accessory items used for water distribution systems.

Pipe used in water distribution systems shall be ductile iron pipe (DIP).

The Contractor shall be responsible for all materials furnished and storage of same, until the date of substantial completion. The Contractor shall replace, at the Contractor's expense, all materials found to be defective or damaged in handling or storage. The Contractor shall, if requested by the City, furnish certificates, affidavits of compliance, test reports, or samples for check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

31.07.02 Ductile Iron Pipe

All ductile iron pipe of nominal diameter 4 through 54 inches shall conform to ANSI/AWWA A-21.51/C-151. A minimum of Pressure Class 350 pipe shall be supplied for all sizes of pipe unless specifically called out in the detail sheets, or required by the City.

31.07.03 Fittings

Any fittings required shall be mechanical joint ductile iron or gray iron conforming to ANSI/AWWA A-21.10/C-110, 250 psi minimum pressure rating, or ductile iron compact fittings 4 through 12 inches in accordance with ANSI/AWWA A-21.53/C-153.

31.07.04 Joints

Joints for ductile iron pipe and fitting joints shall be push-on or mechanical joints conforming to ANSI/AWWA A-21.11/C-111. Where called for in the plans, restrained or flanged joints shall be provided. Flanged joints shall conform to ANSI Standard B-16.1-125 lb. Restrained joints shall conform to ARTICLE 26 of this Manual.

31.07.05 Coatings and Linings

Where ductile iron pipe and fittings are to be below ground or installed in a casing pipe the exterior coating shall be a minimum 1.0 mil thick in accordance with ANSI/AWWA A-21.51/C-151. Where ductile iron pipe and fittings are to be installed above ground, pipe, fittings and valves shall be thoroughly cleaned and given one field coat (minimum 1.5 mils dry thickness) of rust inhibitor primer. Intermediate and finished field coats of Alkyd shall also be applied by the Contractor (minimum 1.5 mils dry thickness each coat). Primer and field coats shall be compatible and shall be applied in accordance with the manufacturer's recommendations. (See approved Manufacturer's List attached as part of this Manual.) Final field coat shall be dark blue for raw water and blue for finished water.

All ductile iron pipe and fittings shall have an interior protective lining of cement-mortar with an NSF approved seal coat material in accordance with ANSI/AWWA A-21.4/C-104.

31.07.06 Polyethylene Encasement

The pipe shall be polyethylene encased (8 mil) where shown on the detail sheets or required by the City in accordance with ANSI/AWWA A-21.51/C-105.

31.07.07 Resilient Seat Gate Valves

All gate valves 12 inches and smaller shall be resilient seat gate valves. Such valves shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C-515, latest revision, and in accordance with the following Specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the Connecting Pipe. (See approved Manufacturer's List attached as part of this Manual.)

The valve body, bonnet, and bonnet cover shall be ductile iron. All ferrous surface inside and outside shall have a fusion-bonded epoxy coating. A 2 inch wrench nut shall be provided for operating the valve. All valves are to be tested in strict accordance with AWWA C-515. The valve shall be operated opening counterclockwise.

The valves shall be non-rising stem with the stem made of cast, forged, or rolled bronze as specified in AWWA C-515. Two stem seals shall be provided and shall be of the O-ring type. The stem nut must be independent of the gate.

The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

All shut-off valves 16" and larger shall be resilient seat gate with horizontal mechanical gearing and clear passage for pigging devices. Valve shall be as listed in the Approved Manufacturer's List.

31.07.08 Butterfly Valves

Butterfly valves are **not** allowed.

31.07.09 Valve Boxes

All buried valves shall have cast-iron three piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at, or slightly above, the finished grade surface as directed by the City. The barrel shall be 2 piece, sliding type, having 5¼ inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron covers. Covers shall have "WATER" cast into the top for all water mains. The actuating nuts for deeper valves shall be extended to come up to 4 foot depth below finished grade.

Care shall be taken while constructing valve boxes to ensure that valve stems are vertical and the cast iron box has been placed over the stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Contractor shall remove any sand or undesirable fill from valve box prior to final inspection.

31.07.10 Air Release Valves

The air release valves for use in water mains shall be installed as specified in the Typical City Details attached as part of this Manual and the make and model per the approved Manufacturer's List. Valves shall be provided with a vacuum check to prevent air from reentering the line. The fittings shall be threaded.

Section 31.08 WATER MAIN INSTALLATION

31.08.01 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 C-600 and C-603, unless otherwise stated in these Specifications. A 2" jumper connection shall be provided for purposes of filling and testing the installed water line prior to clearance for use. The jumper is to be installed per the Typical City Details attached as part of this Manual.

31.08.02 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, in the opinion of the City, is damaged beyond repair by the Contractor shall be removed from the site of the work and replaced with another unit. Joint gaskets shall be stored in clean, dark, 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, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relaid. At times when pipe laying 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.

Section 31.09 VALVE INSTALLATION

All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the City before they are installed. Valves shall be installed in a vertical position and be provided with a standard valve box so arranged that no shock will be transmitted to the valve. The box shall be vertically centered over the operating nut, and the cast iron box cover shall be set flush with the road bed or finished surface. After installation, all valves shall be subjected to the field test for piping as outlined in these Specifications. Should any defects in materials or workmanship appear during these tests, the Contractor shall correct such defects to the satisfaction of the City.

Flanged joints shall be made with hot dipped galvanized bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe.

Section 31.10 IDENTIFICATION

In order to preclude possible domestic water tapping, all installed underground DIP or HDPE water mains shall be marked in accordance with 62.555.320 (21) (b) 3. Florida Administrative Code. Said stripe shall be a minimum 2 inches in width and shall be light blue in color. Backfill shall not be placed for 30 minutes if field painting is required. In addition, all pipe shall be buried with non-metallic warning/identification tape above the top of the pipe, see the Typical City Details. The tape shall indicate the presence of the water main plainly on the tape face. All PVC pipe shall be buried with a locating wire properly affixed to the main.

Section 31.11 SEPARATION OF WATER MAINS AND SEWERS

31.11.01 General

No water pipe shall pass through or come in contact with any part of a sanitary or storm sewer manhole.

Extreme caution shall be exercised when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. Individual septic tanks must be located and avoided.

Water mains that are laid in the vicinity of pipe lines designated to carry raw wastewater or reclaimed water (wastewater effluent) shall meet the horizontal and vertical separations specified below. Compliance with all separation requirements of F.A.C. Rule 62-555.314 shall be met as a minimum.

31.11.02 Horizontal Separation

Under normal conditions, water mains shall be located at least 10 feet horizontally from pipes carrying raw wastewater, and 3 feet horizontally from pipes carrying stormwater or reclaimed water. The distance shall be measured from inside edge of pipe to inside edge of pipe.

31.11.03 Vertical Separation

Under 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 wastewater or storm sewer. Under unusual conditions, when construction conditions prevent a vertical separation of 18 inches, a lesser separation in accordance with 62.555.314 may be allowed.

31.11.04 Crossing of Water Mains and Sewers

Water mains shall be above the sewer whenever they cross. A vertical separation shall be maintained as described above. Adequate structural support for both the water main and sewers shall be provided to prevent excessive deflection of joints and settling.

Section

31.12 TRENCH PREPARATION AND PIPE BEDDING

31.12.01 Trench Preparation and Pipe Bedding

Applicable provisions of ARTICLE 6 of this Manual shall apply. Also refer to the Typical City Details attached as part of this Manual.

31.12.02 Pipe Preparation, Handling and Laying

All pipe and fittings shall be inspected prior to lowering into 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 pipe and keep clean during and after laying.

Contractor shall use proper procedures 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 job site. Care shall be taken to not drop or dump pipe into trenches under any circumstances.

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, 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.

All ductile iron pipe shall be installed in accordance with AWWA C-600 unless such Standards conflicts with this Manual, in which case this Manual shall apply. Contractor shall cut pipe only as necessary to comply with alignment shown on the plans. Flame 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, and no substitutes shall be permitted under any circumstances.

The pipe shall be polyethylene encased (8 mil) where shown on the detail sheets in accordance with ANSI/AWWA A-21.51/C-105.

31.12.03 Trench Dewatering and Drainage Control

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.

31.12.04 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 at maximum 1,000 foot intervals. The minimum pipe depth shall be 3 feet below the finished grade surface or 3 feet below the elevation of the edge of pavement of the road surface, whichever is greater.

31.12.05 Laying of Pipes on Curves

Pipe installed on long radius curves, either horizontal or vertical, may be installed with standard pipe by deflections at the joints. Maximum deflections at pipe joints, fitting and laying radius for the various pipe lengths shall not exceed 75 percent of the pipe manufacturer's recommendation.

The maximum allowable tolerance in the joint due to variances in installation is 0.75 degrees (3-inches per joint per 20 ft stick of pipe). No bending tolerance in the pipe barrel shall be accepted. Alignment change shall be made only with sleeves and fittings.

31.12.06 Pipe Restraining and Thrust Block

Requirements specified in ARTICLE 26 of this Manual shall apply.

31.12.07 Bedding and Backfill for Pipes

Requirements specified in ARTICLE 6 of this Manual shall apply.

Section 31.13 HYDROSTATIC TESTS

31.13.01 General

Hydrostatic tests shall consist of pressure test and leakage test. 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 shall not be permitted under any circumstance. Tests shall not be made on sections exceeding 2,000 feet. 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 inspection for informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified. Where any section of pipe is provided with concrete thrust blocking, pressure test shall not be made until at least 5 days have elapsed after the thrust blocking is installed. If high-early cement 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.

31.13.02 Testing Criteria

All pipe sections to be pressure tested shall be subjected to a hydrostatic pressure of 150 psi. 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.

31.13.03 Procedure for Pressure Test

Each section of pipe to be tested, as determined by the City, shall be slowly filled with water 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 C-600, where applicable, shall apply.

31.13.04 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 C-600 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 valved 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 and replace or repair the defective joints, pipe or valve until the leakage from subsequent testing is within the specified allowance.

Section 31.14 DISINFECTION OF WATER MAINS

31.14.01 General

Before being placed in service, all new water mains shall be chlorinated in accordance with the Specifications below and the procedures outlined in AWWA C-651 "Standard Procedure for Disinfecting Water Mains".

31.14.02 Flushing

Sections of pipe to be disinfected shall first be flushed 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 or flushing purpose, 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.

31.14.03 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/l and that a chlorine residual of not less than 25 mg/l remains in the water after standing 24 hours in the pipe.

31.14.04 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.

31.14.05 Point of Application

The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe shall 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.

31.14.06 Chlorinating Valves and Hydrants

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

31.14.07 Operation of City Valves

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

31.14.08 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/l.

31.14.09 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. Flushed chlorinated water shall be de-chlorinated by an approved method before or during discharge.

After flushing, water samples collected on 2 successive days from the treated piping system, as directed by the FDEP permit, shall show acceptable bacteriological results. All bacteriological testing shall be performed by a certified laboratory or City and paid for by the Contractor. All such bacteriological analysis must be performed by a laboratory certified by the State of Florida.

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 FDEP shall be submitted to the City.

31.14.10 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.

Section 31.15 FIRE HYDRANTS

31.15.01 Material

Fire hydrants shall have a minimum 5¼ inch valve opening and shall comply with AWWA Standard C-502 for fire hydrants for water works service, unless in conflict with Manual, in which case this Manual shall apply. Each hydrant shall have 6 inch mechanical joint ends with harnessing lugs (“dog ears”) and shall open by turning to the left (counter-clockwise). Fire hydrant shall be of ample length for a minimum 3½ foot depth of bury. It shall be provided with two 2½ inch hose nozzles and one 4½ inch pumper nozzle, all having National Standard hose threads. Nozzles shall have caps attached by chains. Operating nuts shall be AWWA Standard (pentagonal, measuring 1½ inch point to flat). Fire hydrants shall be equipped with O-Ring packing. (See approved Manufacturer's List attached as part of this Manual.)

31.15.02 Painting

All iron parts of the hydrant, both inside and outside, shall be painted in accordance with AWWA C-502. All inside surfaces and outside surfaces below the ground line shall be coated with asphalt varnish. They shall be covered with 2 coats, the first having dried thoroughly before the second is applied. The outside of the hydrant above the furnished ground line shall be thoroughly cleaned and thereafter painted with 1 coat of paint of a durable composition, Hydrant Green for bonnet and Hydrant Yellow for body. Products shall be as identified in the Approved Manufacturer List.

31.15.03 Construction Details

Hydrants shall be plumb and shall be set so that the lowest hose connection is, at least, 18 inches above the surrounding finished grade. All hydrants shall be inspected in the field upon delivery to the job to insure proper operation before installation. The resetting, moving, and reconnecting of existing hydrants shall be handled in a manner similar to a new installation. Hydrant shall be constructed as specified in the Typical City Details attached as part of this Manual. Fire hydrants shall be required to have approved restraint glands.

31.15.04 Location and Spacing

Fire hydrants shall be as specified in the Typical City Details attached as part of this Manual. The Fire Chief or his Designee shall review the actual placement locations and final field locations of all hydrants. Hydrants shall be located no less than 5 and no more than 10 feet from the edge of pavement of the adjacent roadway and no less than 5 feet away from any physical feature which may obstruct access or view of any hydrant unless otherwise approved by the City. Hydrants shall not be placed on private distribution systems unless specifically approved in writing by the City of Ocoee Fire Rescue Department. Hydrants shall be within a right-of-way or an easement.

Hydrants shall be spaced and installed according to the following schedule in all buildings falling under the LDC regulations, unless specifically permitted by City to do otherwise

- A) Single-Family Residential sprinklered and non- sprinklered:
 - 1) 500 feet between hydrants.
 - 2) No building further than 250 feet from a hydrant.
- B) All other non-sprinklered and sprinklered (commercial, multifamily or industrial areas)
 - 1) 350 feet between hydrants.
 - 2) No building further than 200 feet from a hydrant.
- C) These areas may require additional hydrants due to required fire flows.

Section 31.16 CROSS CONNECTION CONTROL

In order to protect the public water supply system from contamination due to cross connections, the Developer shall install City approved backflow prevention devices where there is the potential of a non potable substance or contamination coming into contact with the public water system. All backflow prevention devices shall comply with the City of Ocoee's Manual of Cross Connection Control and the Foundation for Cross Connection Control and Hydraulic Research, University of Southern California (FCCCHR).