

500. WATER REGULATIONS**501. General Requirements****501.1 Use of This Document:**

- A. This document is subject to periodic revision to meet changing requirements for materials, fire and safety regulations, environmental regulations, etc. At the beginning of a project the user should verify that he has the latest edition.
- B. This document is intended to convey the general design and construction requirements for a typical project. It also lists specific City of Emerson requirements relating to plan review, inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering and construction techniques. Individual project conditions may require variance from the provisions in this document in which case such variances should be noted in the plans and other data submitted by the project engineer for the city's approval.
- C. All phases of construction must be completed in accordance with the Erosion Sedimentation Act 12-7-1 *et seq.*
- D. No water mains shall be installed on or in close proximity to an abandoned landfill site or any site used for waste disposal.

502. Submittal Requirements**502.1 Water Flow Test:**

- A. A water flow test must be performed on the existing water line to determine the adequacy of the water supply line for the project.
- B. The test shall consist of a fire hydrant flow test, conducted at the nearest hydrant to the proposed development and a twenty-four (24) hour pressure test.
- C. Test information shall consist of:
 - 1. Static Pressure and Residual Pressure.
 - 2. Flow in GPM at Residual Pressure
 - 3. Twenty-four (24) hour pressure chart
- D. An adequate supply of water for the proposed project must be available prior to the approval of any plans. Flow tests are valid for one year.
- E. The City will perform the test at the Developers expense.
- F. The Developer will be responsible for retaining the services of an outside consultant/contractor to accomplish and submit a design study based on the flow test results and indicating the projected available

flow at the highest point in the development in GPM with residual pressure of 20 psi for the total project. This report should provide results indicating adequacy of flow quantities and pressure for the proposed development.

502.2 Plans for Proposed Water System:

- A. Preliminary Review: Preliminary plans will be prepared and submitted for review as described elsewhere in the development regulations. Questions relating to adequate fire protection, multiple feeds, water supply and proposed locations of connection(s) should be resolved at this step before proceeding with detailed planning. A submittal for preliminary review must include all land to be developed although the land may be developed in several phases or units. Adequacy determinations of the existing water system will be made for the total project.

The project surveyor shall provide a signed statement indicating records of the property have been researched and no abandoned landfills or waste disposal sites are located in the proximity of proposed water line extension.

- B. Construction plans shall consist of the following:
1. Site plan with streets, street names, topography with contour lines at two-foot intervals, location map, lot layout (if subdivision) or building location (if multi-family, commercial or industrial), proposed location of future sidewalks, land lots, district, and north arrow showing the water layout only.
 2. Proposed pipe size and service lateral locations.
 3. Location and size of gate valves and air release valves.
 4. Thrust blocks at all bends, tees, and plugs.
 5. Fire hydrant locations.
 6. Water system materials.
 7. Location and sizes of existing water mains surrounding the project, with nearest line valve in each direction of proposed tie-in.
 8. Detail of connection to existing lines.
 9. Proposed meter sizes and locations.
 10. Residential developments shall have the electric transformer locations indicated, (this is necessary to verify no conflicts exist with water meter and fire hydrant locations).
 11. Plan of fire line meters or detector meters, if applicable.
 12. Any proposed off-site cross-county water mains or mains on existing right-of-way should be shown at a scale no smaller than 1:100.

13. Any other items incidental to the proposed system.
14. All plans must display the "Utilities Protection Center" logo and "Call Before You Dig" notice.
15. See Section 100 Check Lists for additional plan requirements.
The approved water plan shall not be changed except by written approval of the City or its designated representative.

C. As-Built:

1. As-Built drawings will be same format as the original construction plans.
2. Road names and lot numbers should be on plans.
3. "As-Built" or "Record Drawing" is to be stamped in large clear print on plans.
4. Sheet should be no larger than 24" X 36".
5. Water mains and meters should be shown, including size and types.
6. Service and meter locations should be shown.
7. Include detail drawings showing size, type, configuration and location fittings.
8. Include detail drawings depicting the configuration of crossings with other utilities (i.e. storm sewers, catch basins, underground cables) and indicating vertical and horizontal clearances.
9. Clearly indicate easement boundaries on all lines not located inside the public right-of-way.
10. Fire hydrants, gate valves and air release valves should be shown.
11. Plan of fire meters or detector meters should be shown if applicable.
12. As-Built drawings must be submitted to the City and approved before the final plat is recorded.

503. **Design Criteria**

503.1 **General:** The criteria listed herein is not intended to cover all aspects of design, but rather to mention the basic guidelines and those particulars that are required by the City of Emerson.

503.2 **Water Supply:**

- A. Residential water supply for domestic use shall be in accordance with the following table and at a minimum residual pressure of twenty (20) psi at the highest point in the development.

INSTANTANEOUS WATER DEMANDS FOR RESIDENTIAL AREAS

TOTAL NUMBER OF RESIDENCES SERVED	GPM PER RESIDENCE	TOTAL NUMBER OF RESIDENCES SERVED	GPM PER RESIDENCE
5	8.0	90	2.1
10	5.0	100	2.0
20	4.3	150	1.6
30	3.8	200	1.3
40	3.4	300	1.2
50	3.0	400	0.9
60	2.7	500	0.8
70	2.5	750	0.7
80	2.2	1,000	0.6

B. The City may require the following minimum flow/duration quantities prior to development of the property at the highest point in the development.

1. Multi-family: 750 GPM for 30 minutes;
2. Shopping Centers: 750 GPM for 30 minutes;
3. Motels, Light Industry and Schools: 750 GPM for 30 minutes;
4. Heavy Industry, Warehouses, Office Buildings, greater than 200,000 square foot: Minimum 1000 GPM for 45 minutes;
5. Residential: 500 GPM for 30 minutes.

503.3 Fire Protection:

- A. Fire hydrants shall be spaced not more than 500 feet apart with additional fire hydrants located as necessary to permit all portions of buildings to be reached by hose lays of not more than 300 feet in length. (Spacing as traffic travels.) In subdivisions, hydrants will generally be aligned with the property line separating two adjacent lots.
- B. Fire lines shall be metered per these Specifications.
- C. Hose lay distance for fire truck hoses is defined as being measured along the route a piece of fire apparatus must travel in laying a fire hose from the fire to the fire hydrant.
- D. All plans for development must meet all applicable fire protection codes.

503.4 Water Mains and Appurtenances:**A. Water Mains**

1. Ductile Iron Pipe - Ductile iron pipe shall be used in all locations.
2. On Existing Streets - On existing roads, water lines shall be located on the south and west side of the road, 8 feet from the back of curb, with a minimum cover of 36 inches below the level of the road shoulder. Fire hydrants on existing roads shall be located between the waterline and the back of curbing.
3. On New Streets - All curbing must be installed before any water lines are installed. Water lines on new streets shall be located on the south and west side of the street, as shown in the standard detail drawings. Water lines shall be installed with 36 inches of cover at finish grade. Fire hydrants shall be located between the water main and the back of curbing.

B. Service Laterals

1. Shortside service laterals shall be installed with a uniform slope from the main shallowing to a bury of 12 inches at the water meter setting. Water meter settings are to be located adjacent to the right of way limit. Longside services shall have a minimum cover of 36 inches under areas of pavement and curbing then shallowing to 12 inches at the water meter.
2. Service laterals crossing any roads shall be placed inside a minimum of a 2 inch diameter PVC casing.
3. A (W) shall be etched into the curb where each service tap is made for permanent location.
4. Copper tubing shall be used for all services. There shall be no splices of copper tubing under any pavement.
5. Services for subdivisions shall be sized and located as shown on the Standard Detail Drawings.

C. Residential water meters shall be located at the limits of the street right-of-way. In general meters will be located near the property line, where possible a double yoke assembly will be utilized at the property line separating two adjacent lots. The project designer is responsible for verifying electric transformer locations and avoiding conflicts. The Developer shall be responsible for installing the meter box and yoke assembly. See standard detail for listing of required components. The City shall install the water meter in the yoke assembly after tap fees have been paid and service applied for.

- D. Vaults and all valve and piping assemblies for Commercial and Industrial meter settings shall be installed by the Developer. Installations for 3/4-inch and 1-inch meter settings shall utilize a standard yoke assembly and the required additional backflow device located in a separate box. The City shall provide the meter after tap fees are paid and service applied for. No water service shall be provided until all required backflow devices are in place.
- E. Backflow Preventer - All water meters shall be provided with a backflow preventer. Residential services shall be provided with a dual check backflow preventer installed by the Developer as part of the standard yoke assembly. Additional backflow prevention measures are required for residential services with lawn irrigation sprinkler systems connected. Commercial water services, as a minimum, shall be provided with a double check valve backflow prevention device installed by the Developer and located immediately downstream of the meter setting in a separate vault or utility box. Additional and/or more extensive backflow prevention measures may be required depending on the type of business, materials handled and plumbing configuration. All customers applying for commercial water service are to contact the Emerson Water Department Backflow Prevention Coordinator for a determination of specific requirements concerning backflow prevention devices.
- F. Fire Line Meters shall be designed to meet site-specific conditions. See Standard Details for conceptual layout of meter.
- G. Detector Meter shall be designed to meet site-specific conditions. See Standard Details for conceptual layout.
- H. Water Valves
1. At Intersections - Valves on water mains at intersections shall be located behind the curb. As a general rule, the number of valves shall equal the number of streets in the intersection minus one. The City may require valves in excess of this requirement if the water system layout warrants additional valves.
 2. At End of Line - A water valve and a minimum of 36 feet of pipe shall be provided at the end of all lines for phased developments, and at locations where the water main may be extended in the future for water system improvements. The end of the line shall be provided with a temporary plug and thrust collar designed to function in a manner that will allow for the end of the line to be excavated and exposed for tie-on of an extension without taking the main out of service.
 3. Along Mains - Maximum spacing of water valves along mains

shall be 1000 feet. These line valves, unless at intersections, shall be located near fire hydrants.

- I. Valve Markers - One concrete valve marker shall be furnished and set at each line valve as required by the City.
- J. Air and Vacuum Release Valves - Air and vacuum release valves shall be located where appropriate as determined by a registered engineer in responsible charge of the project design. All A&V release valve locations are subject to approval of the City. In general, within subdivisions A&V release valves are not necessary as long as services are located at the water main high points.
- K. Polyethylene Encasement - Ductile iron pipe water main shall be provided with polyethylene encasement where the water main either crosses or is in close proximity to a steel gas main.
- L. Easements - Water mains that are located off the public right-of-way shall have a 20 foot permanent easement.

503.5 Line Extension Requirements:

- A. Developers are required to extend all mains along their entire property frontage. The size of the extension will be at least the size of the existing main and may be larger if required by the City.
- B. If an existing main must be extended to serve a particular development, the Developer will be required to pay all costs.

504. Fire Line Ordinance:

- A. All fire service lines must be equipped with an appropriate backflow device. As a minimum this device shall be a double check valve installed in a vault at a point on the fire service line as near to the main as practical. Certain fire system configurations may require more extensive backflow prevention measures. Contact the Emerson Water Department Backflow Prevention Coordinator for a specific determination of backflow prevention requirements of a particular fire service system design.
- B. All fire service systems require the installation of an underwriter approved detector meter installed as a component of the double check assembly or a factory mutual fire line meter immediately upstream of the double check valve assembly.
 - 1. All detector check assemblies shall utilize a "Neptune Trident" meter equipped with a "Proread" remote reading device.
 - 2. Factory mutual fire line meter systems shall utilize " Neptune HP Fire

Service Turbine" or "Neptune HP Protectus III" meters equipped with "Proread" remote reading devices.

- C. Fire service charges for systems utilizing a detector meter shall be based on a count of sprinkler heads plus a service fee.
- D. Fire service charges for systems utilizing a factory mutual fire meter shall be based on actual water usage and monthly minimums for meter size.
- E. When unauthorized water is used through a detector meter in three or more billing periods in one calendar year, it shall be replaced with a factory mutual fire line meter. Unauthorized use of water is defined as non-fire fighting water and/or water use without prior notification and approval of the City.
- F. All domestic water supply must be metered with a proper meter.
- G. Work to be performed by Developer. Installation of detector meters or factory mutual fire line meters as required by this ordinance will be handled by the Developer under supervision of the City's inspectors. The cost of installation will be the responsibility Developer.
- H. The City shall have the authority to cut off water service to buildings whose owners refuse to comply with the provisions of this ordinance upon proper notification of sixty (60) days.
- I. The customer shall have ownership and be responsible for maintenance and repairs of the fire service line beginning at the boundary with the public right-of-way . For mains located outside of public right-of-way the customers ownership and maintenance responsibility shall begin at the connection to the main.

505. **Material Specifications**

All materials used in the work including equipment shall be new and unused materials of a reputable U.S. Manufacturer conforming to the applicable requirements of the Specifications, and no materials shall be used in the work until they have been approved by the City.

- 505.1 **Ductile Iron Pipe:** Ductile iron pipe shall be designed in accordance with ANSI A21.50 (AWWA C150), latest revision, and manufactured in accordance with ANSI A21.51 (AWWA C151), latest revision. Wall thickness class shall be a minimum Class 50.

Ductile Iron Pipe shall have an outside asphaltic coating per ANSI A21.51 (AWWA C151), latest revision. Pipe shall have standard cement lining inside with asphaltic seal coat per ANSI A21.4 (AWWA C104), latest revision.

Pipe Joints - except where restrained or flange joints are specified - shall be push-on or mechanical joint type conforming to ANSI A21.11

(AWWA C111), latest revision. Pipe shall be in 18' to 20' nominal lengths with standard deflection pipe sockets. Where restrained joints are shown or specified on pipe larger than 12" diameter the joints shall be "Lok-Fast", "Lok-Ring", or equal. Restrained joints for pipe sizes 12" diameter and smaller requiring restrained joint construction may utilize "Fast Grip" gaskets as manufactured by American Pipe or an approved equal.

Where river crossing pipe is shown or specified, the pipe shall be "Flex-Lok Boltless Ball Joint Pipe" as manufactured by American Pipe or approval equal.

Where specified, flanged pipe shall meet ANSI A21.51 and be used with fittings meeting ANSI A21.53. (AWWA C153).

505.2 **PVC Pipe:** All PVC pressure pipe used for temporary water mains shall be Class 200, DR 14 pipe rated at 200 psi working pressure.

505.3 **Copper Tubing for Water Service:** House service pipe shall be copper service pipe, type K, soft temper, seamless copper tubing, conforming to Federal Specification WW-T-T00. Compression joints shall be used.

505.4 **Steel Casing Pipe:** Steel casing pipe shall be steel pipe conforming to A.S.T.M. Designation A-139, Grade B, electric fusion welded steel pipe. The pipe shall have a minimum tensile strength of 35,000 psi. Both the exterior and interior of the pipe shall have a coal tar varnish coating.

505.5 **Pipe Fittings:** Fittings shall be ductile iron furnished in accordance with ANSI Specifications A21.53 (AWWA C153), latest revision, and shall have a minimum of 250 psi. pressure class rating. Joints shall be mechanical joint with ductile iron retainer glands conforming to ANSI Specification A21.11 (AWWA C111), latest revision. Ductile iron retainer glands shall be Mega-Lug glands as manufactured by EBAA Iron. All fittings shall be furnished with a cement mortar lining.

505.6 **Butterfly Valves:**

A. All butterfly valves shall be bubble-tight closing at the rated pressure with flow in either direction, and shall be satisfactory for applications involving throttling service and frequent operations or operations after long periods of inactivity. Valves shall meet the full requirements of AWWA Standard C504, latest revision for 150 psi working pressure and shall be suitable for above ground or buried service.

All interior ferrous surfaces of valves larger than 12-inch shall have a special epoxy coating meeting the requirements of AWWA C550.

Valve bodies shall be equipped with integrally cast mechanical joint ends meeting ANSI A21.11 (AWWA C111). Mechanical joints shall be fitted with retainer glands with set screws on ductile iron pipe. Retainer glands shall be Mega-Lug as manufactured by EBAA Iron.

Butterfly valves installed underground shall come equipped with the manual operator specified in the following paragraph.

- B. Manual operators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Operators shall be equipped with mechanical stop-limiting devices to prevent over travel of the disc in the open and closed positions. Valves shall close with a clockwise rotation. Operators shall be fully enclosed and designed for buried operation. Provide extensions as necessary to bring the operating nut within eighteen inches of the ground surface

505.7 **Gate Valves:** Valves 12-inches and smaller shall be gate valves. These valves shall be non-rising stem design, iron body, bronze mounted with a compression, resilient seat manufactured in accordance with AWWA Standard C509, latest revision. Valves shall be designed for a minimum working pressure of 200 psi and shall have 2" square operating nuts, except in meter vaults where handwheels shall be installed. Valves shall have non-rising stems, shall open when turned counter-clockwise and shall meet AWWA Specifications for Class C valves. Valves with flanged connections shall conform to ANSI B16.1. Mechanical joints shall be fitted with retainer glands and set screws on ductile iron pipe. Retainer glands shall be Mega-Lug as manufactured by EBAA Iron. Gate valves shall be as manufactured by American Darling, Mueller, or M&H. Provide extensions as necessary to bring the operating nut within eighteen inches of the ground surface.

505.8 **Valve Boxes:** Each valve shall be provided with a valve box. Valve boxes for valves shall be approved standard cast iron, screw type adjustable-shaft boxes having a minimum shaft diameter of 5-1/4 inches adjustable for the necessary depth. The casting shall be coated with two coats of coal tar pitch varnish. The lids of all boxes shall bear the word "Water". Boxes shall be equal to Russco Model 562-S with a 5-1/4 inch cast iron drop cover. All off-pavement valve boxes shall have concrete collars and valve markers.

505.9 Air and Vacuum Relief Valve Assemblies: Air and vacuum relief valves shall be cast iron body and covers with bronze trim, stainless steel float, Buna-N-Seal, and shall be designed for a minimum working pressure of 150 psi.

The valve shall be designed to exhaust large quantities of air during the filling period, and small quantities of air which collect in the line while operating under pressure. Acceptable manufactures of air/vacuum valves are Golden-Anderson, APCO or Val-Matic.

Valves between the water main and air relief valve shall be 2 inch stainless steel ball valves.

All air and vacuum relief valves are to be installed in standard meter boxes with gravel bottoms. Provide a minimum gravel layer thickness of 12 inches.

505.10 Fire Hydrants: All fire hydrants shall be designed and manufactured to comply with the latest specifications of the AWWA. They shall be designed for 150 pounds working pressure. The hydrants shall be of simple design, easy to operate, effectively and positively drained and protected from damage by freezing, have bronze seat and drain ring and convenient for repairing and replacing parts.

Hydrants shall be equipped with one 4-1/2" diameter pumper nozzle and two 2-1/2" diameter hose connections, which shall have threads meeting the latest requirements of the State Fire Insurance Commission. Hydrants shall have a 3-way pentagonal operating nut, and shall open when turned counter-clockwise. Hydrants shall have a safety flange on the barrel and a safety coupling on the valve stem, to prevent damage to barrel and stem in case of traffic accident. Hydrants shall be either Mueller Company's Centurian Traffic Model, M & H Style 129 Traffic Model, or American Darling Mark 73-1.

The construction to the main line shall be with mechanical joint locked hydrant tee equal to American Cast Iron Pipe Company A-10180. All fire hydrant branches shall be valved. Wherever possible the fire hydrant shall be connected to the gate valve by using a locked hydrant adapter equal to American A-10895. The connection at the base of the hydrant shall be mechanical joint with ductile iron retainer gland, for Class 150, centrifugally cast, 6" ductile iron pipe. The valve opening shall meet the requirements of the AWWA Specifications for 4-1/2" hydrant. The valve, valve seat and inner working parts shall be easily accessible. The distance from the ground to the hose nozzle shall not be less than 24". The body of each hydrant shall be neatly painted with a safety yellow reflecting paint

and the ears and bonnet painted silver.

Each hydrant shall be tested to 200 psi. The first test shall be made with the valve closed. The second test shall be made with the main valve open but all nozzles closed. While this test is being carried on, the hydrant shall be subjected to a hammer test. Any hydrant showing defects by leakage, sweating or otherwise shall be rejected. The barrel and all parts shall withstand these tests. These tests shall be made in the field after the hydrants are installed.

505.11 Service Saddles: Service saddles shall be Ford F202 with CC threads (3/4" single, 1" dual.)

505.12 Pipe Couplings: Pipe connections between new pipe and existing pipe shall be made with Dresser Style 90 long steel couplings for pipe sizes 2" and below; Use mechanical joint sleeves for pipe sizes above 2". Field joints shall be made to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting, etc.

505.13 Yokes: Yokes for 3/4" services shall include iron bar Ford Y502P, ball valve Ford B94-223WR, dual check valve Ford HHS91-323 Dual.

505.14 Corporation Stop: Corporation stop shall be Ford F1000 (3/4" single, 1" dual).

505.15 Branch Piece: 1" x 3/4" x 7-1/2" Branch Piece shall be Ford U48-43-7 1/2, 1" compression joint inlet x 3/4" MIP outlet.

505.16 P.V.C. Casing Pipe: P.V.C. casing pipe used for long-side services shall be schedule 40, a minimum of 1" larger in diameter than the service line, but no less than 2" in diameter. Detection wire shall be placed on all non-metal casing pipes and service lines.

505.17 Meter Boxes: The meter box shall be plastic and the lid shall be cast iron. The meter box shall be as manufactured by DFW; the lid shall be as manufactured by Kenflow.

505.18 Tapping Valves: Tapping valves shall be M.J. Type, 200 psi minimum rating, acceptable manufactures include Mueller, M&H, and American Darling.

505.19 Tapping Sleeves: Tapping sleeves shall be Ford Stainless Steel tapping sleeves with carbon steel flange.

505.20 **Water Meters:** The Developer shall install the meter box and yoke on all residential and Commercial and Industrial services in the 3/4 inch and 1 inch sizes. The City shall provide and install the meter after all fees are paid and service is requested.. On larger size Commercial and Industrial services, the developer shall install the vault and all piping and valves. The City will provide and install the meter after all fees are paid. No water service will be provided until all required backflow prevention devices are in place.

505.21 **Backflow Preventers:** Backflow preventers for residential services shall consist of a dual check valve and shall be installed by the Developer as part of the yoke assembly. Backflow prevention devices for commercial services, as a minimum, shall consist of an ASSE approved double check backflow preventer installed by the developer immediately downstream of the meter assembly. Contact the Emerson Water Department Backflow Prevention Coordinator for a specific determination of backflow prevention requirements.

505.22 **Valve Markers:** Valve markers shall be made of 3,000 psi concrete, and shall be four feet (4') long and 4" on each side, with four #4 reinforcing bars. The markers shall be set with an even number of feet between the center line of the valve and the center line of the aluminum disc in the top of the marker, and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

505.23 **Polyethylene Encasement:** Polyethylene film shall be manufactured of virgin polyethylene material conforming to ASTM Standard Specifications D-1248-78 Type I, Class A or C, Grade E-1. The polyethylene film shall have a minimum thickness of 8 mil. The polyethylene encasement material shall be provided in tube sizes adequate for the various size pipes.

505.24 **Insulators for D.I.P. in Steel Casing:** Insulators shall be as manufactured by Cascade Waterworks Manufacturing Company or approved equal. Insulators for 24" D.I.P. carrier pipe shall be CCS-2580 and 8" in width. Insulators for 12" D.I.P. carrier pipe shall be CCS-1320 and 8" in width. Insulators for 8" D.I.P. carrier pipe shall be CCS-905 and 8" in width. All insulators shall have a stainless steel shell. Insulators shall be located within 2' of each end of the casing and spaced no more than 10' apart within the casing. The positioning of the casing insulators shall be centered for water mains.

506. Water System Construction**506.1 General:**

- A. It shall be expressly understood that these specifications are for installation of all underground water mains and appurtenances.
- B. All work shall conform to the applicable provisions of the AWWA Specifications of latest revision except as otherwise specified herein.

506.2 Trench Excavation:

- A. Trenches shall have a minimum width of twenty-four (24) inches or the diameter of the outside of the bell of the water main plus twelve (12) inches, (which ever is greater), and the depth thereof shall be such that there shall be a minimum of 42 inches of cover measured below the roadway surface, natural ground, or proposed grade to the top of the pipe. In cases where water lines cross sanitary sewers, there shall be a minimum of two (2) feet vertical separation between the water and sewer mains. In cases where water mains parallel sewer mains there shall be a minimum of ten (10) feet horizontal separation maintained between the mains.

Trenches shall be dug so that the pipe can be laid to the alignment and depth required, and the trench shall be of such width and shall be braced and drained so that the workmen may work therein safely and efficiently. No chocking under the pipe will be permitted. All joints shall be as specified herein. Excavation must be made under the bell of each pipe so that the entire length of the pipe will lie uniformly on the bottom of the trench and the pipe weight shall not rest on the bells. Trenches shall be free of water during the work.

Water lines shall have a minimum cover of 42". All changes in grade shall be made gradually. At points of interference with storm sewers and cross drains, pipe will be run under the conflicting utility if the minimum cover cannot be maintained by going over the top of the pipe.

In laying pipe across water courses, railroad crossings, or depressions of any kind, the minimum depth here specified shall be maintained at the bottom of the depression.

Where necessary, the line shall be lowered at valves so that the top of the valve stem is approximately one foot below the finished grade. The trench shall be deepened to provide a gradual approach to all low

points of the line.

- B. Wherever rock is encountered in the excavation, it shall be removed by suitable means. If blasting is used for removal of rock, the contractor shall take all proper safety precautions. He shall comply with all rules and regulations for the protection of life and property that may be imposed by any public body having jurisdiction relative to the handling, storing and use of explosives. Before blasting, the Contractor shall cover the excavation with heavy timbers and mats in such a manner as to protect the adjacent property owners from damage. All rock encountered shall be removed six (6") inches below the bottom grade of the trench and the trench built back to the correct grade with suitable material tamped into place. Sides of the trench shall be trimmed of projecting rock that will interfere with backfilling operations. The Contractor shall be wholly responsible for any damage resulting from blasting. Rock excavation by blasting shall be at least 75 feet in advance of pipe laying.
- C. After the pipe has been laid, backfilling shall be performed in two (2) distinct operations. In general, all backfill beneath, around and to a depth of twenty-four (24") inches above the top of the pipe shall be placed in six (6") inch layers for the full width of the trench and thoroughly compacted by hand with vibratory equipment. Care shall be taken so that the pipe is not laterally displaced during backfilling operations. The backfill lifts shall be placed by an approved method in accordance with that hereinafter specified. Backfill materials shall be the excavated materials without bricks, stone, foreign matter or corrosive materials, where not otherwise specified or indicated on the plans.
- D. Backfill under permanent concrete or bituminous pavement and as elsewhere specified or indicated on the plans shall be as shown in the Standard Detail Drawings for trenches in paved areas. Mechanical vibrating equipment shall be used to achieve the required compaction.
- E. Backfill under gravel or crushed stone surfaced roadways and low-type bituminous surfaced roadways shall be approved suitable excavated material placed in twelve (12") inch layers and thoroughly compacted for the full depth and width of the trench, conforming to the compaction, density compaction method and materials as specified in D above.
- F. Backfill in unpaved areas shall be compacted with mechanical vibrating equipment to ninety-five percent (85%) as determined by the Standard Proctor Test. Trenches shall be compacted so they will not settle. If settlement occurs, trenches are to be refilled, recompacted

and regraded. Backfill material from pipe bedding to ground surface shall be excavated earth free from large stones and other debris.

- G. Contractor shall fully restore and replace all pavement, surface structures, grassing, landscaping, etc., removed or disturbed as part of the work to a condition equal to that before the work began. All pavement removal shall be replaced per Standard Detail Drawings.
- H. Where sheeting is used in connection with the work, it is in no case to be withdrawn before the trench is sufficiently filled to prevent damage to banks, road surfaces, adjacent pipes, adjacent structures or adjacent property, public or private.

506.3 Laying Pipe: All pipe shall be laid straight, true to line and grade. Bell and coupling holes shall be dug in the trench and the pipe shall have a continuous bearing with the trench bottom between bell or coupling holes. No shimming or blocking up of the pipe shall be allowed. When the work is not going on, all pipe openings shall be securely closed by the insertion of the proper size plug and caulking so that dirt and debris will not be washed into the pipe in case of rain.

In making the joints with ductile iron pipe, the spigot end of the pipe and the inside of the bell shall be thoroughly cleaned and the gasket inspected to see that it is properly placed; lubricant shall be applied to the spigot end of the pipe and it shall be inserted into the bell of the adjoining pipe to the stop mark on the pipe.

506.4 Thrust Restraint for Pressure Lines:

A. Reaction Blocking

1. Underground piping laid around curves and at all unsupported changes of direction, all tees, wyes, crosses, plugs and other like fittings shall be solidly and properly blocked with concrete against solid earth to take the reaction of the main pressure and to prevent lateral movement of the pipe or fittings when under pressure. Reaction blocking shall be installed at all locations requiring same and where tie rods and clamps are not called for in the plans. Concrete for reaction blocking shall have a minimum compressive strength of 3,000 psi at twenty-eight (28) days. The blocking, unless otherwise shown, shall be so placed that the pipe and fitting joints will be accessible for repair. In addition to the concrete blocking specified herein, all mechanical joint fittings shall be installed with Mega-Lug retainer glands.

2. Reaction blocking shall be constructed as per AWWA Standard C600 Section 3.8, latest revision. It shall be constructed in conformance with the Standard Detail Drawings for Reaction Blocking.
- B. Retainer Glands: Mechanical joint fittings on Ductile Iron Pipe shall be installed with retainer glands. Retainer glands are to be Mega-Lug retainer glands as manufactured by EBBA Iron.
1. Clean the socket and the plain end. Lubrication and additional cleaning should be provided by brushing both the gasket and the plain end with soapy water or an approved pipe lubricant meeting the requirements of ANSI C111 or AWWA A21.11 just prior to slipping the gland and gasket onto the plain end for joint assembly. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket.
 2. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
 3. Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make deflection after joint assembly but before tightening bolts.
 4. Tighten the bolts to the normal range of bolt torque specified in AWWA C600 while at all times maintaining approximately the same distance between the gland and the face of the flange at all points around the socket.
 5. Tighten the torque limiting twist off nuts in a clock-wise direction until all wedges are in firm contact with the pipe surface. Continue tightening in an alternate manner until all of the nuts have been twisted off.

506.5 Setting Fire Hydrants: Fire hydrants shall be placed at the locations shown on the plans or as directed by the City. All fire hydrants shall be installed with a resilient seat gate for isolation from the main. Gate valves for fire hydrants shall be connected directly to the main by means of a "Locked Hydrant Tee". Fire hydrants shall be connected to the isolation valve with a locked hydrant adapter. Installations where locked hydrant tees or locked hydrant adapters cannot be utilized, either due to distance from the main or size, shall be restrained with retainers glands and threaded rods. Care shall be exercised that set screws and retainer glands are tightened sufficiently to secure the hydrants before pressure is put on the main. Not less than nine cubic feet of coarse, broken stone shall be placed around the base of the hydrants, as shown in the Standard Detail Drawings, Section 400. Before placing the hydrants, care shall be taken to see that all foreign material is removed from within the body. The stuffing

boxes shall be tightened and the hydrant valve opened and closed to see that all parts are in first class working condition. All hydrant openings shall be kept capped, except when hydrant is being worked on.

Existing fire hydrants shall not be operated without permission of the City.

When a fire hydrant has been constructed but is not yet in service, the Contractor shall provide and attach to the fire hydrant, flags or collars indicating that the fire hydrant is not in service. Said flags or collars shall remain on the fire hydrant until it is put into service.

Whenever an existing fire hydrant is taken out of service, whether temporarily or permanently, it shall be equipped with a flag or collar indicating that it is not in service. The Contractor shall provide and install flags or collars as required and shall notify the Fire Department whenever the operating status of any fire hydrant changes.

FIRE HYDRANTS SHALL NOT BE OPERATED WITH ANY TOOL EXCEPT A SPECIFICALLY DESIGNED FIRE HYDRANT WRENCH. If the Contractor observes any other contractor or person operating a fire hydrant with an unapproved fire hydrant wrench, he shall report that fact to the City immediately. It is the Contractors responsibility to insure that all new facilities are maintained in new condition until final completion of the project and acceptance by the City. Fire hydrants with damaged operating nuts shall not be accepted.

- 506.6 Setting Valves and Fittings:** Valves shall be set plumb, and shall have cast iron valve boxes. The valve boxes shall be placed directly over the valve and set plumb, the top of the box being brought to the surface of the ground. Provide valve extensions on all valves with operating nuts more than three feet in depth. Valve extensions shall bring the operating nut to within eighteen (18) inches of the surface and shall be keyed into the valve nut. After the boxes are in place, earth shall be filled in the trench and thoroughly tamped around the box. After all settlement has taken place, a precast concrete collar shall be installed for each valve box.

Fittings shall be properly restrained to insure that they will not be blown off or broken loose under the greatest possible working pressure (see Standard Detail Drawings). All fittings shall be mechanical joint and shall be installed with Mega-Lug retainer glands and concrete blocking unless specified otherwise. In situations where there is insufficient undisturbed earth to act as a bearing surface or where otherwise directed by the City, fittings shall be restrained by the use of threaded rods or other method acceptable to the City.

Prior to blocking any joint or fitting with concrete, that joint or fitting shall be wrapped with polyethylene film in such a manner that the concrete will not stick directly to the pipe but that the load bearing capacity of the blocking will not be affected. Care shall be taken to prevent the concrete from covering bolts. Polyethylene film shall be installed at other points along the water main where so directed by the City.

506.7 Placing of Steel Casing Pipe: Casing pipe shall be installed at the location shown on the plans. Unless directed otherwise, the installation procedure shall be by the dry bore method. The hole is to be mechanically bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The installation of the casing and boring of the hole shall be done simultaneously by jacking. Lengths of pipe are to be adequately welded to the preceding section installed. Excavation material will be removed and placed at the top of the working pit. Backfill material and methods of backfilling and tamping shall be as required under BACKFILLING. Carrier pipe shall be inserted within the casing by use of stainless steel casing spacers. Intervals shall be as detailed in Section 805.24.

506.8 Marking Location of Valves:

- A. Each main line water valve shall be marked by cutting a letter "V" in the horizontal surface at the back of the curb. The "V" shall be turned to point toward the valve which may be either in the street or in the grass behind the curb. The letter height shall be 4" to 6".
- B. Concrete valve markers shall be set for main line water valves with an even number of feet between the center line of the valve and the center line of the aluminum disc in the top of the marker, and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

506.9 Dewatering Trenches: The Contractor shall do all necessary pumping or bailing, build all drains and do all other work necessary at his own expense to keep the trenches clear of water during the progress of the work.

506.10 Bracing, Sheet piling, and/or Shoring: Whenever the condition of the ground is such that it is necessary to protect the work, the street, the roadway or the workmen, the sides of the trench shall be supported with suitable bracing, sheet piling and/or shoring to be furnished by the Contractor at his own expense.

506.11 Rock Excavation: Drilling and blasting operations shall be conducted

with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired by the Contractor to the satisfaction of the City and property owner.

Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

<u>Size of Pipeline</u> <u>Inches</u>	<u>Depth of Excavation Below</u> <u>Bottom of Pipe, Inches</u>
6 and Less	6
8 to 18	8
18 to 30	10
Over 30	12

The undercut space shall then be brought up to grade by backfilling with Size #57 crushed stone material or approved equal.

506.12 Location and Protection of Existing Underground Utilities: It is the responsibility of the Contractor to locate the underground utilities and to protect same. Utility lines or services damaged by the Contractor shall be repaired by the Contractor at his own expense. The Contractor is to comply with all Federal, State and Local laws requiring notification of the Utilities Protection Center prior to excavating.

506.13 Connection to the Existing City Water System:

A. Requirements for all connections: All persons desiring to connect a line extension to an existing main must make application at the City at least 21 working days prior to the date the connection is to be made. Connection to existing mains will only be allowed for approved projects. All connections must be made with a wet tap using a tapping saddle or tapping sleeve. The contractor has the option of contracting with the City Water Department to perform the actual tapping of the main or they may contract with an outside private contractor. City approval of private contractor to perform pipe tapping is mandatory. Submit detailed resume and work history with references to establish competency and expertise for performing tap work. A City of Emerson Water Department inspector must be present at all times during tapping operations. The contractor shall furnish the following information when making application:

1. Approved plan for the project.
2. Copy of Street or highway permit if applicable.

3. Schedule of work to be performed.
 4. Resume, work history and references of proposed tapping contractor for taps installed by a private contractor.
 5. Payment of cost estimate for connections installed by the City.
- B. City makes connection: The City will charge for work at prevailing department rates and schedule the connection to conform to their work schedule and notify the Contractor so that he can complete his preparation.
1. The Contractor shall furnish the following at site:
 - a. Tapping sleeve and valve installed on the line and ready for tapping.
 - b. Proper traffic control devices and person(s) to direct traffic if required.
 - c. Backhoe or lift capable of handling the tapping machine.
 - d. Minimum of three (3) men to assist with the work.
 2. The Contractor will be billed for making the connection based on material costs and the hourly rates for the City's operator, additional laborers, truck and any other equipment used if made by City forces.
- C. Private Contractor makes connections:
1. City personnel shall supervise the tap and associated work by private contractor.
 2. All taps shall be made on wet lines under pressure.
 3. All taps to be made with saddles or tapping sleeves meeting City standard specifications.

506.14 Street Cuts:

- a. All paved roads will be bored and cased. A bore must be attempted before consideration will be given to cutting the street. A permit is required for all utility installations in existing City streets as detailed in Section 307.6 of the General Design Regulations.
- b. One lane of traffic shall be maintained open at all times.
- c. Construction work shall be limited to the hours between 9 A.M. and 4 P.M. Other time constraints may be imposed if deemed necessary by the City.
- d. The Contractor shall furnish traffic control devices and person(s) to direct traffic, if required.
- e. Compaction and surface replacement to be performed per City Standard Specifications as detailed in other sections herein.

506.15 Standard Drawings: Installation of fire hydrants, water valves, valve

boxes, meters, long side services water lines, etc. shall be made in accordance with applicable Standard Design Drawings in these specifications.

506.16 **Clean Up:** Prior to requesting the final inspection, the Contractor shall do the following:

- A. Remove and dispose of in an acceptable manner all shipping timbers, shipping bands, spacers, excess materials, broken material, crates, boxes and any other material brought to the job site.
- B. Repair or replace any work damaged by the water line construction.
- C. Regrade and smooth all shoulder areas disturbed by the water line construction.
- D. Set precast concrete collars around all valve boxes outside paved areas.
- E. Insure that all fire hydrants are set to grade and that all valves have been located and are fully open.

506.17 **Interruption of Water Supply During Construction:** Approval of the City Water Department must be obtained prior to interrupting water service to an occupied building. A minimum of twenty-four (24) hours advance notice shall be given to any occupied building served by a water line which is required to be shut off. Occupants shall be informed of the date, time of cutoff and the duration of stoppage by written notice posted on doorways of all buildings affected. Failure to do so will make the Contractor liable for any damages reported to the City Office.

507. **Inspection and Tests**

507.1 **Scope:** This section pertains to the inspection and testing of installed water lines requiring testing for assuring proper operation and service and/or specifically specified to be tested. In general, all lines designed to operate under pressure shall be successfully tested. Tests of installed piping shall consist of a pressure and leakage test.

All piping to be tested must satisfactorily comply with the pressure tests before being eligible for acceptance. In general, tests shall be conducted in accordance with AWWA Standard C-600 except as otherwise herein specified.

507.2 **Testing:**

- A. After all piping has been placed, each run shall be tested by the Contractor in the presence of the Inspector and tests shall be continued until all leaks have been made tight to the satisfaction of the Inspector. The Contractor shall furnish all necessary water, meters, pumps, gauges, bulkheads, and other materials and appliances necessary to conduct the test as herein required. Every precaution must be taken to valve-off or otherwise protect control equipment in or attached to the pipe line to prevent damage or injury thereto. All piping shall be tested at 200 psi for a minimum test duration of one (1) hour. The City or its representative may require a 24 hour test if it so desires.
- B. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants, blow-offs or air release valves are not available at the high places, the Contractor shall make the necessary taps, as per the standard detail for tap construction, at points of highest elevation before the test is made and close the corporation stop after the test has been completed.
- C. Prior to the pressure test, pipe laid in trenches shall be backfilled adequately to secure the pipe during the test. Any observed leakage shall require corrective measures to pipe lines and/or joints as otherwise provided for in these Specifications and to the satisfaction of the Inspector. During the final pressure test the specified pressure shall be maintained in the pipe being tested for a minimum time of one (1) hour.
- D. The City will furnish the necessary water for testing the lines. However, any water lost through breakage of lines or unnecessary or excessive flushing of line will be charged to the Contractor. Each valved section must be flushed and tested at a pressure of 200 PSI for one hour. Lines shall be tested in sections in a manner that assures testing of the tapping valve and all main line valves. When testing at the above specified pressures, the rate of leakage shall not exceed 15 gallons per 24 hours per inch diameter per mile of line. (See Table below).

Size of Pipe	Leakage Tabulation	
	Gallons/Hr./100 Ft.	Gallons / Day
12"	0.142	3.409
10"	0.118	2.841
8"	0.095	2.273
6"	0.071	1.704

Any section of the line not meeting the above test shall have the leaks found and corrected at once and re-tested until the leakage falls within

the limits specified above.

- E. All fire hydrants shall be flushed to check operations.
- F. All valves shall be located and operation checked.

507.3 **Disinfection:** After leakage testing, and all necessary repairs have been made, the lines shall be flushed clean and then disinfected in strict accordance with AWWA Standard For Disinfecting Water Mains, AWWA C651, latest revision subject to the following special conditions:

- A. The method of disinfection shall be either the Continuous-Feed Method or the Slug Method. The Tablet Method is not acceptable.
- B. The form of chlorine may be either: (1) a 1 percent solution made from either sodium hypochlorite or calcium chlorine gas cylinder supplying a vacuum-type chlorinator, or (2) making a solution and pumping it into the pipeline.
- C. The Contractor shall dechlorinate the highly-chlorinated water being flushed from the pipeline or otherwise dispose of in a manner complying with State Environmental regulations.
- D. The developer shall be responsible for collecting bacteriological samples under City supervision. The City shall perform the initial bacteriological testing of water samples from the disinfected pipeline at no charge. The Contractor shall be responsible for charges on all failed tests.
- E. Before any flushing or disinfection work is begun, the Contractor shall outline his planned procedures for these tasks and obtain approval of the City.

507.4 **Contractor Qualifications:**

- A. Licensing and Safety: All contractors who work on water systems that will be owned by the City of Emerson must be licensed in accordance with State of Georgia law and local ordinance. Compliance with applicable safety regulations is the responsibility of each company engaged in the work; the city assumes no responsibility for the actions of others on the job site. It is the responsibility of those installing water mains and related appurtenances to conform to OSHA regulations, 29 CFR Part 1926, Subpart P, Paragraph 1926.650 through 1926.653. Publications from OSHA can be obtained by contacting OSHA Publications Distribution, Washington, D.C.
- B. Contractors performing water system installations must be approved by the City and should be completely familiar with the procedures and contract requirements associated with this type project.
- C. Unsatisfactory work will cause a contractor not to be given a permit for future work.

507.5 **Construction Inspection:**

- A. Responsibility for Inspection: The developer will be responsible for the quality, accuracy and workmanship of his completed work.

City personnel will visit the job site on a periodic basis and will make spot checks as they deem appropriate. The City of Emerson shall have the right to review and inspect all construction and may reject any work that does not meet quality control standards. The contractor shall leave trenches open at critical locations to allow visual inspection of fittings, valves and hydrants prior to backfilling. The City maintains the right to refuse performing inspections at unsafe worksites.

- B. Access To Project: Authorized representatives of the City of Emerson, which may include city employees, the City, state or federal agencies, shall have access to the site for inspection at any time.

- C. Communications During Construction: All written communications regarding water construction shall be directed to the City Water Department. The developer shall be responsible for scheduling a preconstruction conference between their contractor and utilities and affected City departments prior to any construction activities.

After a preconstruction conference has been held the contractor will notify the City in writing 2 days before starting construction. The contractor will provide notification by phone any time the work is to be vacated and will provide notice by phone prior to resuming work.

The Owner/Developer shall request the final inspection in writing.

The city inspector may have informal verbal communications with the contractor foreman or superintendent at any time during construction. The city inspector will not direct the actions of contractor's workmen.

- D. Concealed Work: The contractor shall notify the city and receive inspection approval prior to concealing certain work such as valves, fittings, bends, tees, fire hydrants, pipe bedding, reaction blocking, lot services, or other appurtenances.

- E. As-Built Drawings Provided by Design Professional: As-Built drawings will be provided and certified by the design professional who is employed by the developer. As-builts drawings shall be submitted showing the horizontal location of the mains, main size, valve, hydrant, and service line and meter location. Locations shall be referenced to a fixed landmark where necessary. Provide detail drawings of crossings with other utilities showing vertical and

horizontal clearances.

F. Minimum Testing: All costs for testing required by the City shall be paid for by the developer.

1. Compaction of backfill. Compaction testing will be required for mains constructed in paved areas or where pavement is planned. A minimum of two tests at each road crossing will be conducted at varying depths as fill is being placed. If any of these tests show failing results, then the failing backfill will be removed, re-compacted and re-tested, and one additional area will be tested as well.
2. Pressure and disinfection tests shall be observed until each test is passing.

507.6 Final Inspection And Conditional Acceptance: Prior to final inspection of the water system the developer shall have previously completed the pressure and disinfection tests. After the developer makes written request for final inspection, the city will schedule a final inspection. The contractor and the developer will be present during this final inspection. This final inspection will generally include spot checks of hydrants, valves and other appurtenances and a complete overview of the project.

After any discrepancies are corrected and approved as built drawings are submitted, the city will issue a letter certifying conditional acceptance of the water system. This letter shall commence the start of the 18 month warranty period which is required of the contractor.

On projects having phased development, this letter will clearly identify portions of the project being accepted.

At the end of 18 months, the subdivision inspection team will again re-inspect the entire development. When all discrepancies have been corrected, the city will issue an acceptance letter and will begin perpetual maintenance and operation of the water system.

507.7 Maintenance Bond or Letter of Credit: The developer shall post a maintenance bond or Letter of Credit of 25% of the total project cost on the facility for an eighteen-month period after completion and conditional acceptance of the facility by the City of Emerson for all projects whose cost exceeds \$20,000.00.

507.8 Maintenance Until Final Acceptance: It shall be the developer's obligation to provide all maintenance for an 18 month period after acceptance of the project by the City of Emerson. At the end of the 18 month maintenance period the City shall inspect the water system, and upon correction by the developer of all deficiencies noted by the City, the City will accept the water system for maintenance.