

up to the bottom of the obstruction with not less than 6 inches of concrete at the bottom and sides of the pipe.

- K. Surface Water Crossings: Surface water crossings, both over and under water, present special problems and should be discussed with the City before final site and construction plans are prepared and, in addition to project specific requirements for such crossings, shall meet the following criteria: .
1. Above Water Crossing: A pipe crossing above water shall be:
 - (a) adequately supported,
 - (b) adequately protected from damage from freezing,
 - (c) readily accessible for repair or replacement, and
 - (d) located above 100-year flood level.
 2. Underwater Crossing:
 - (a) The pipes shall be of special construction, having flexible watertight joints.
 - (b) Valves shall be provided at both ends of the water crossing so that the section can be isolated for tests or repairs; the valves shall be easily accessible and not subject to flooding.
 - (c) Sample taps shall be available at each end of the crossing and at a reasonable distance from each side of the crossing.
 - (d) Permanent taps shall be made for testing and locating leaks.

203.00 MATERIALS AND EQUIPMENT

All pipe for water main construction shall be ductile iron pressure pipe of the "push-on" joint or "mechanical joint" variety, conforming to ANSI A21-51 (AWWA C151, latest revision). Thickness class shall be class 52 for all pipe twelve inches (12") or less in diameter and class 51 for all pipe greater than twelve inches (12") in diameter.

- 203.01 Ductile Iron Standard Mechanical Joint Pipe: All ductile iron standard mechanical joint water pipe shall conform to ANSI Specification A21.51 and shall be double lined with cement mortar and have a protective exterior coating. Linings and protective coatings equal to "Enameline" with tar coating on the exterior will be considered as a satisfactory lining and coating for the water pipe; however, any substitution in pipe lining and/or coating from the

ANSI A21.4 must first be specifically approved by the Director of Public Works. Joints and gaskets of standard mechanical joint pipe shall conform to ANSI Specification A21.11.

High-strength ductile iron tee-head bolts, hex nuts, ductile iron glands and rubber gaskets shall be as furnished by the pipe manufacturer.

In making connections of ductile iron pipe using the standard mechanical joint, the gland followed by the rubber gasket shall be placed over the plain end of the pipe, which shall be carefully inserted and aligned into the socket end of the pipe line. The gasket shall then be pushed into position so that it is evenly seated in the socket. The gland shall then be moved into position against the face of the gasket, bolts inserted and made finger tight. The bolts shall then be tightened up by using a ratchet wrench not less than fourteen inches (14") in length. All other requirements concerning bedding, alignment, and cleaning of the pipe before making the joint shall be followed.

- 203.02 Ductile Iron Pipe - "Push On" Joint: All "push-on" or "slip" joint pipe shall conform to the requirements of Section 203.01 for mechanical joints in regard to strength, class protection coating, and all other criteria.
- 203.03 Pipe Fittings: Fittings for ductile iron pipes shall be ductile iron or gray cast iron in accordance with AWWA Specifications C111 or C153, latest revision, with a minimum pressure rating of three hundred fifty (350) pounds per square inch. All pipe fittings shall be restrained with megalugs.
- 203.04 Gate Valves: All gate valves shall be of superior quality cast iron body with double disc parallel seat with full bronze mount. All gate valves shall withstand a working pressure of at least one hundred and fifty (150) pounds per square inch and shall be in strict conformance to applicable AWWA Standards. The wrench nut shall turn to the left (counter clock-wise) to open valve. The valves shall be arranged to fit into pipe lines having standardized mechanical joints or slip joints. The gate valves shall be Mueller No. A-2380-20, or approved equal and shall be installed as shown in the Construction Standards. On valves sixteen inches (16) or larger, butterfly valves conforming to AWWA C-504 may be used.

Resilient seat wedge valves shall be used for valves twelve (12) inches and smaller. Resilient seat wedge valves shall conform to AWWA C509 and shall be approved by the Director of Public Works.

Valve ends shall be mechanical joint (MJ) in accordance with AWWA C111. The valve body will be fusion-bonded epoxy coated in accordance with AWWA C550.

203.05 Fire Hydrants: All hydrants shall be Mueller Centurion, Dresser 500 Traffic Model, Darling Model B-50-B, Quick Pix Kennedy K81-A or approved equal. Hydrants shall be of the compression type with main valve openings of not less than five inches (5") in diameter. Hydrants shall have a cast iron body with full bronze trim and shall withstand a hydrostatic test pressure of three hundred (300) pounds per square inch. Hydrants shall have a six inch (6") connection base for setting with a minimum of thirty-six inch (36") cover on connection pipe. Hydrants shall be equipped with hose connections as follows:

Two each 2 1/2", N.S.T. hose connections.
One each 4 1/2", N.S.T. pumper connection.

Hydrants shall be operated by a National Standard one and one-half inch (1½") pentagon shaped, operating nut, which opens counter-clockwise. The direction of opening shall be clearly marked by an arrow cast on the outside of the hydrant. Hydrants shall be connected to the main with a six inch (6") ductile iron pipe and shall be controlled by an independent six inch (6") gate valve. The six inch (6") gate valve shall be located as near to the service main is practical. Where the six inch (6") hydrant service line is longer than fifty feet (50'), a second six inch (6") gate valve shall be located not less than one foot (1') nor more than six feet (6') from the hydrant.

All hydrant barrels shall be painted chrome yellow, reflective paint (or approved equal) on the bonnet, and all two and one-half inch (2½") and four and one-half inch (4½") caps of the hydrant shall be painted as follows:

Fire flow 1000 gpm and over	GREEN
Fire flow 500-1000 gpm	ORANGE
Fire flow less than 500 gpm	RED

The four and one-half inch (4½") connection shall face the street,

travel lane, service drive, or other vehicular travelway.

- 203.06 Valve Boxes: All valve boxes, base extensions, and the head and cover shall be of cast iron. Valve boxes shall be of the Mueller sliding type, with 5.25 inch shaft and round head marked "Water". The shaft diameter shall not be less than five inches (5"). The valve boxes shall have a minimum range of extension to fit two inch (2") to twelve inch (12") valves inclusive, placed on mains at depths of three feet (3') to five feet (5') of cover in order that the top cover of the valve box is set to finished grade. Valve boxes shall be Mueller Company 10364 or approved equal. Valve boxes shall be centered over the valve screw and set plumb.

All valves in which the operating nut is greater than five feet below the normal ground or road surface shall be provided with extension stems to bring the operating nut to within five feet of the finished grade. The extension stem shall be provided with a 2-inch square operating nut on top and a coupling to connect the extension to the operating nut of the valve. A stem guide shall be provided to keep the valve stem extensions concentric with the valve box. Extension stems shall be the same diameter as the valve stem unless otherwise specified.

- 203.07 Water Service Connections: The water meter box and accessories therein necessary for meter installation shall be furnished and installed by the developer or owner. They shall be located within the utility strip located between the curb and sidewalk whenever curbs and sidewalks are required within the subdivision. When curbs and sidewalks are not required, water meter boxes and accessories shall be set just within the right-of-way at the property line as shown on the approved subdivision plat or site plan, unless otherwise approved by the Director.

The water meter box top shall have the connection for the wiring for the remote sensor (see plate II-A). The City reserves the rights to install water meters with its own forces and to establish appropriate procedures for the handling and installation of water meters. The City shall have the option of supplying any and all size water meters for installation within its service area or, in lieu thereof, of establishing a list of approved water meter types and manufacturers for use by the developer or owner in supplying its own water meters. The cost of such meters shall in all cases be borne by the developer or owner. Details for meters three inches (3") in diameter and larger shall be submitted to the City Engineer for review and

approval prior to installation. All water services pipe from main connections to the meter box assembly shall be K type copper. All connections shall use flare or silver floss fittings at the discretion of the City. The minimum size service connection shall be "K" type copper, three-quarters inch (3/4") I.D.

- 203.08 Wet Taps: All wet taps require the prior approval of the Director of Public Works. Sleeve and valve assemblies shall be tested at one hundred fifty (150) pounds per square inch for ten (10) minutes before the actual tap is made.

Wet taps shall employ a Mueller No. H-615 cast iron mechanical joint sleeve, a fabricated steel with epoxy coating as manufactured by Rockwell International or other fitting specifically designed for this purpose as approved by the Director of Public Works or the City Engineer.

- 203.09 Large Meter Installations: Water meters one and one-half inches (1½") and larger shall be installed with a by-pass in order to isolate the meter for repairs. Plans for the installation of three inch (3") and larger meters will be submitted to the City Engineer for review and approval.

204.00 CONSTRUCTION STANDARDS

- 204.01 Installation of Water Mains, Fittings, and Appurtenances: All installations of public or private water systems shall be made in accordance with the American Water Works Association Standards C600 or latest revision for "Installation of Ductile-Iron Water Mains" and with any special applicable supplementary instructions issued by the manufacturers of the equipment being installed. Pertinent parts of AWWA Standards C600 shall also be applicable as shall manufacturers' instructions for installation of copper pipe, or other pipe material specified by the City.

204.02 Excavation, Bedding & Backfill:

- A. Clearing: The site shall be cleared of all lumber, tree stumps, brush and rubbish, which shall be removed or disposed of off-site by the landowner in accordance with applicable law.
- B. General: During excavation operations, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent