

DIVISION 2: WATER

2.1 DESIGN CRITERIA

A. APPLICABILITY

1. These Design Standards shall govern construction and upgrade of all public water distribution facilities in the City of Dundee and applicable work within its service areas.
2. This section supplements the OSSC Standard Specifications.
3. Permanent water distribution facilities shall be provided to all properties within the City of Dundee in accordance with these Design Standards. This shall generally be interpreted to mean that permanent water distribution facilities shall be provided for existing legal lots of record at the time development occurs, and for new legal lots of record created by a major or minor partitioning or subdivision of land at the time of partitioning or subdivision.
4. SPECIAL ITEMS
 - a. The design of the following are considered special items and are not covered in detail in these Design Standards:
 - i. Water Distribution Pump Stations
 - ii. Reservoirs
 - iii. Wells
 - iv. Treatment Plants
 - v. Pressure Regulating Devices
 - vi. Flow Measurement Devices
 - vii. Relining Of Existing Water Mains
 - viii. Chemical Addition or Ph Adjustment
 - ix. Bridge Crossings
 - x. Creek Or Stream Crossings
 - b. Review and approval of the above special items by the City Engineer shall be required. When requested by the City, full design calculations shall be submitted for review prior to approval. Special items may also require review and approval by the Oregon Health Authority - Public Health Division.

B. GENERAL REQUIREMENTS

1. Water distribution systems will be designed to the following general requirements:
 - a. Meet all expected domestic, commercial and industrial demands including fire flows within the design life;
 - b. Have sufficient structural strength to withstand all external loads which may be imposed;
 - c. Be of materials resistant to both corrosion and erosion with a minimum design life of 75 years;
 - d. Meet all design requirements of the Oregon Health Authority - Public Health Division (OHD). Alternate materials and methods will be considered for approval on the basis of these objectives.

C. WATER SYSTEM CAPACITY

1. CALCULATION REQUIREMENTS

- a. Design capacities shall be determined by consideration of the following factors and assumptions:

- 1) Area to be serviced, both immediate and adjacent.
- 2) Current and projected population within the areas to be served.
- 3) Current and projected land use within the areas to be served.
- 4) Commercial, industrial, or institutional users to be served.
- 5) Changes in any of the above factors which are likely to occur within a foreseeable time period.

2. DEMAND ASSUMPTIONS

- a. In the absence of consumption data or other reliable information, the following factors may be assumed:

- i. Peak hour demands as follows:

- 1) 5 gpm per single family residential
- 2) 2.5 gpm per dwelling unit for multiple family residential
- 3) 5,000 gallon/day for commercial development
- 4) 10,000 gallon/day for industrial development

- ii. Demand for unique commercial installations, industrial users, PUD's, multiple and institutional developments shall be calculated on an individual basis.

D. FIRE FLOW REQUIREMENTS

1. Unless otherwise approved or required by the local fire marshal, minimum fire flows shall be as follows:

Land Use		Fire Flows (Gpm)	Duration (Hr.)
Industrial		4,000	4
Commercial		3,000	3
Multiple Family		3,000	2
Residential	R-1	1,000	2
	R-2	1,000	2
	R-3	1,000	2
All Others		1,000	2

**these values do not supersede or take the place of ifc or ibc fire flow requirements. Higher values may be necessary based on fire code, fire marshal or iso requirements. Reductions may be allowed by the fire marshal for buildings with fire sprinkler systems.

2. In all cases, all new fire hydrants shall be capable of delivering a minimum of 1,000 gpm at 20 psi residual system pressure. This requirement will apply independently to each phase of multi-phase projects.

E. HEAD LOSS CALCULATION REQUIREMENTS

1. Head loss shall be determined by the hazen-williams equation based on the following coefficients:

Pipe Diameter	C Value
8 Inches And Less	100
10 To 12 Inches	110
Greater Than 12 Inches	120

F. VELOCITY AND PRESSURE REQUIREMENTS IN MAINS

1. Velocities in mains shall normally range from three (3) to six (6) feet per second for average demand to a maximum velocity of ten (10) feet per second for maximum day demand plus fire flow.
2. Private systems shall limit velocities as required by the Oregon State Plumbing Specialty Code, Installation Standards.
3. Normal working pressure in the distribution system should be approximately 70 psi with a range of 40 psi to 80 psi.
4. The minimum working pressure for all mechanical joint fittings of a diameter ranging from 4 to 24 inches shall be 350 psi.
5. The water system shall have sufficient capacity to maintain 40 psi at the building entrance for one and two family dwellings. For other development, the system shall have sufficient capacity to provide minimum pressure of 35 psi at the building side of the meter during periods of maximum use, and to provide sufficient volumes of water at adequate pressures to satisfy the maximum expected daily consumption plus fire flows.
6. A 20 psi residual pressure under fire flow conditions shall be maintained at all points in the distribution system. Generally, a maximum velocity of 10 feet per second will govern for sizing mains at all other locations of the service level where this criteria does not govern.

G. LOOPING

1. The distribution system mains shall be looped at all possible locations.
2. All water lines shall be looped and valved such that the removal of any single line segment from service will not result in more than one fire hydrant being taken out of service.
3. The installation of permanent dead-end mains upon which fire protection depends and areas of large demands on single mains will not be permitted.

H. BLOWOFFS

1. All dead-end mains shall terminate with a blow-off assembly or a fire hydrant.
2. Permanent dead-ends shall have a permanent blow-off assembly and a permanent thrust restraint system. Permanent blow-offs in cul-de-sacs shall be located in front of the curb within 5 feet from the curb face.
3. Mains which can conceivably be extended at some later date shall have a mainline valve in front of the blow-off assembly, and a thrust restraint system which allows the mainline valve to be connected to without taking the line out of service.
4. Blow-offs shall be sized to ensure that the water mains can be flushed at a minimum velocity of 2½ feet per second in accordance with AWWA c-650. The following table may be used as a minimum guideline assuming 40 psi minimum residual system pressure under flushing conditions.

Table 2.3 – Mainline Blow-off Sizes

Water Main Diameter	Minimum Blow-off Diameter
6 And 8-Inch	2-Inch
10 And 12-Inch	4-Inch
12-Inch And Larger	As Required

5. The Design Engineer shall submit calculations showing that these flushing velocities can be satisfied.
6. Temporary blow-offs larger than 2-inches in diameter shall have a valve conforming to the requirements contained herein for mainline valves.
7. Temporary blow-offs, where required for cleaning new water mains, shall be located at the lower end of the line to be flushed whenever possible.

I. MINIMUM DEPTH

1. The standard minimum cover over buried water mains within the street right-of-way or easements shall be 36 inches from the finished grade, except that a minimum of 40 inches cover shall be required for waterlines in fill slopes.
2. Finish grade shall normally be determined as follows:

Table 2.4 – Finish Grade

Mainline Location	Finish Grade
Waterline Under Sidewalk In Right Of Way	Top Of Curb
Waterline In Front Of Curb	Gutter
Waterline In Cut Slope Behind Sidewalk	Top Of Curb
Fill Slopes	Perpendicular From Pipe To Surface
Easement	Finish Grade At Pipe Centerline

3. Where the waterline is located in the cut side slope, in an undeveloped right-of-way, or along a roadway developed at less than ultimate width (including sidewalks), the waterline shall be placed at a depth sufficient to ensure that 36-inches of cover is maintained at the time of final construction of the roadway.

J. WATER MAIN REQUIREMENTS

1. MINIMUM MAINLINE SIZE

Minimum sizes for water mains shall be as follows:

Table 2.5 - Mainline Size Requirement	
Minimum Diameter	Type of mainline
6-Inch	Private fire line supplying either a single fire hydrant or a building fire suppression system.
8-Inch	Minimum size water main for the public water system. Looping back into the distribution grid shall be at intervals as required by the City, but shall generally not exceed 600 feet.
8-Inch	Public water distribution mains and permanently dead-end mains supplying fire hydrants with a required fire flow of 1,500 gpm or less.
10-Inch And Larger	As required for transmission mains, distribution mains in industrial subdivisions, and fire lines supplying more than 1,500 gpm.

2. ALIGNMENT AND LOCATION

a. General Requirements

- i. Water lines shall generally be parallel to the right-of-way or easement lines
- ii. Unless otherwise required by the City Engineer, water lines shall generally be located on the south and west sides of the right-of-way.

b. Location with Regard to Other Utilities

- i. Water mainlines shall be separated from all other utilities by a minimum of 5 feet.
- ii. Water mainlines shall generally be separated from sewer mainlines by a minimum of 10 feet. In no case shall the separation be less than 5 feet or as required by OAR Chapter 333, Division 61.
- iii. Sanitary sewer main crossings
 - 1) Where water mainline crosses below or within 18 inches vertical separation above a sanitary sewer main or lateral, one full length of ductile iron pipe shall be centered at point of crossing.

3. LOCATION IN EASEMENTS

- a. Unless otherwise specified or authorized by the City, minimum easement widths for water mainlines shall be 15 feet for normal depth lines.
- b. Mainlines in easements will be allowed only in cases where it is required in order to loop a mainline to avoid a permanent dead end condition, and only after all reasonable attempts to loop the mainlines in a right-of-way have been exhausted.

- c. When water mainlines in easements are approved by the City, the easement shall be centered on the mainline, and the mainline shall be offset a minimum of 6 feet from any property line.
- d. The conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for water mainline purposes. Under no circumstances shall a building or structure, trees, ornamental landscaping or fence be placed over a water mainline or easement. Prohibited structures shall include footings, decks and overhanging portions of structures located outside the easement.
- e. Easement locations for public water mainlines serving a PUD, apartment complex or commercial/industrial development shall be in parking lots, private drives or similar open areas which will permit unobstructed vehicle access for maintenance.
- f. Water mainlines with inside diameters larger than 12-inches will require wider easements.
- g. Common placement in the easement of water and sewer or storm drain line may be allowed under certain conditions subject to approval by the City Engineer. Easements wider than the minimum will be required.
- h. Common easements will be reviewed on a case-by-case basis. Separation of utilities must meet OHA PHD requirements.
- i. All easements must be furnished to the City for review and approval prior to recording.

K. VALVES

1. SIZES

- a. In general, valves shall be the same size as the mains in which they are installed.
- b. Unless otherwise approved or required by the City Engineer, valves shall conform to the following table.

Table 2.6 - Required Valves By Size And Operating Conditions		
Valve Size	Static Pressure	Valve Style
10- Inch and Smaller	<120 Psi	Gate Valve
8-Inch & 10-Inch	120 Psi	Butterfly Valve
12-Inch & Larger	All Pressures	Butterfly Valve

- c. Valve types and materials shall conform to the requirements of these Design Standards and the OSSC Standard Specifications.

2. LOCATION

- a. Distribution system valves shall be located at the tee or cross fitting as nearly as possible.
- b. There shall be a sufficient number of valves so located that not more than four (4) and preferable three (3) valves must be operated to effect any one particular shutdown. The spacing of valves shall not exceed 400 feet generally.

- c. A tee-intersection shall be valved on two (2) branches and a cross-intersection shall be valved on three branches.
- d. Hazardous crossings (i.e. creek, railroad, freeway crossings, etc.) shall be valved on each side of the crossing.
- e. Distribution branches on transmission mains shall be spaced not more than 800 feet apart where practical and shall be valved and plugged.
- f. Transmission water mains shall have valves at spacings as required by the City Engineer.
- g. Reducers for reconnection into existing water mains less than eight (8) inches in diameter shall be placed between the new valve and the existing line.

3. TAPPING TEES

- a. Tapping tees to make connection to existing, in-service lines are only allowed in cases where the City determines that water service cannot be interrupted to cut in a tee or cross, or where the additional in-line valve is not needed for system isolation as outlined above.

4. AIR RELEASE VALVES

a. General Requirements

- i. Provisions for air relief shall be provided at all high points of waterlines. Where possible, location of service taps at high points in the line is preferable to the installation of an air relief valve. Fire hydrants may be used for air relief on lines ten (10) inches in diameter or less.
- ii. An automatic air release valve shall be installed in a structure off of the street where flooding will not occur.

L. FIRE HYDRANTS

1. COVERAGE

- a. Preferred coverage shall result in maximum hydrant spacing of 500 feet in residential areas, 300 feet in high-value districts including industrial subdivisions and no further than 250 feet from the furthest point of any dwelling, business, garage or building. Hydrant stubs with mainline valves will be required as a minimum in undeveloped areas.

2. LOCATION

- a. No fire hydrant shall be installed on a main of less than 8-inch diameter unless it is in a looped system of 6-inch diameter mains. The hydrant lead shall be a minimum of 6 inches in diameter.
- b. Hydrants shall be placed in locations approved by the local fire marshal.
- c. In general, hydrants shall be located at the corner of street. Hydrants located at points other than intersections shall be located at the extension of property lines.
- d. Unless otherwise approved by the City, hydrants shall be placed between the sidewalk and the property line.

- e. No hydrant shall be installed within 5 feet of an existing utility pole or guy wire nor shall a utility or guy wire be placed within 5 feet of an existing hydrant.

3. HYDRANT VALVES

- a. Each fire hydrant shall have a hydrant valve and valve box at the mainline hydrant tee which will permit removal and repair of the hydrant without shutting down the water main supplying the hydrant.

M. SERVICE LINES

1. GENERAL REQUIREMENTS

- a. The use of pumps on a service line to provide adequate pressure to a subdivision lot or property located above the pressure level of the supply main shall be prohibited.
- b. Each legal lot of record shall be connected by a separate water service line connected to the public or approved private water main. Combined water service lines will be permitted only when the property cannot legally be further divided. An example of this is a residential lot with a house and unattached garage or shop with plumbing fixtures.

2. SIZES

- a. Standard service line sizes are 1-inch, 1 1/2-inch, 2-inch, 3-inch, 4-inch, 6-inch and 8-inch diameter. Service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

Table 2.7 – Minimum Service Size

Type Of Service	Minimum Service Size
Single Residential Service	1-Inch
Double Residential Service	1-Inch
Triple Residential Service (Triplexes Only)	1½-Inch
Commercial Service	1-Inch Minimum
Note: The Next Larger Service Size May Be Required For Residential Lots Large Enough To Be Partitioned Into Additional Lots Without A Water Main Extension.	

- b. The water service line on the private side of the meter may not be larger than one nominal pipe size larger than the service line size.
- c. Commercial services shall not be smaller than 1-inch. For new streets or streets being cut for service installation, far side commercial services shall be installed in a 3-inch minimum size PVC sleeve.
- d. Service piping shall be equal to the meter size, but not less than 1-Inch.
- e. For 3-inch and larger services, design drawings must be submitted showing the vault and fitting requirements, including a lockable bypass line, with the expected flow requirements and proposed usage.

3. PRESSURE REDUCING VALVES

- a. All new service lines shall be equipped with an approved pressure reducing valve installed on the private side of the meter.

4. TAPPING REQUIREMENTS

- a. Tapping requirements for water service lines shall be as outlined below:

Table 2.8 - Water Service Tapping Requirements		
Service Size	Mainline Type	Tapping Requirements
1 Inch	• Existing Mainlines	Service Saddle
	• PVC Mainlines	
	• 6 Inch And Smaller Mainlines	
	• 12 Inch And Larger Mainlines	
	• New 8 Inch And Larger Class 52 Di	Direct Tap Or Service Saddle Allowed
1½ Inch	All Pipe Types	Service Saddle
2 Inch And Larger	All Pipe Types	Mainline Tee With Flanged Valve

5. LOCATION

a. Domestic

- i. The service lines shall normally extend from the main to a point 6 inches behind the right-of-way. A curb stop and meter box shall be located at the termination of the service line.
- ii. In general, individual service connections shall terminate in front of the property to be served. Double services shall be located on each side of a common side property line.
- iii. Domestic service lines shall not be connected to fire protection services, including hydrant leads.

6. FIRE SERVICE

- a. A backflow prevention assembly shall be placed on fire service lines as required by the City.
- b. Plans for fire service lines shall meet the requirements outlined in Division 1 and shall be stamped by a licensed civil engineer.
- c. Drawings for fire services shall include vicinity map, adjoining street name, width, curb and property line, location of existing water line referenced to the property line, existing hydrant locations and the distance to property pins where the service crosses the property line.

N. WATER METERS

1. GENERAL REQUIREMENTS

- a. All water meters within the service area of the City of Dundee will be furnished and installed by the City at the request and expense of the customer. The service line, meter box and all piping within the meter box must be installed by the developer.

2. LOCATION

a. General

- i. Meters shall be located at the termination of the City service line.
- ii. A public utility and access easement shall be provided to and around any meter boxes set on private property. The easement shall be sized to provide a minimum of five (5) foot clear around the meter box or vault on all sides.

b. 1 inch through 2 inch meters

- i. Meters shall be located in the right-of-way in a location that allows for easy reading and maintenance, preferably 3-inches behind the back of sidewalk.

c. 3-inch and larger meter

- i. Meters shall be located on private property adjacent to the public right-of-way to allow reading and maintenance. Meters must be accessible with a crane truck to within 10 feet of the installation with a 10 foot vertical clearance.
- ii. The meter, vault and piping are to be protected from freezing, vandals and vehicles. The area around the vault must be sloped in such a manner to prevent storm water from ponding over or running into the vault.
- iii. A minimum 3 foot clear space must be provided around the vault to provide ample working space for maintenance.
- iv. All 3-inch and larger meters shall be provided with a remote readout head located such that it can be read without entering the meter vault.

3. METER BOXES

- a. Meter boxes shall be provided by the developer for each water service and meter location. Double set meters (2 meters in 1 box) are not allowed.
- b. Meter boxes shall be set level to finish grade. The developer or builder shall be responsible for setting meter boxes and services to finish grade prior to installation of water meters by the City.

O. PRIVATE WATER SYSTEMS

1. General design considerations for private water systems shall conform to requirements set forth by the Oregon Health Authority - Public Health Division, by the Oregon Plumbing Specialty Code, and these Design Standards.
2. Each connection of the private water system to the City system shall be through an approved backflow prevention assembly and meter.
3. Requirements for capacity, materials, looping, valves, fire protection, service lines and meters shall also be applicable to design within PUD areas.

4. The resale of water without written approval of the City shall be prohibited. Written authorization from the City shall be required for each service connection and for any sale of water.

P. BACKFLOW PREVENTION

1. CROSS-CONNECTIONS.

No cross-connections shall be created, installed, used or maintained when served by the city's water system, unless said cross-connections comply with the applicable requirements of this chapter.

2. BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS.

Unless determined by the cross-connection specialist not to present a backflow threat to the city's water supply, all of the following are subject to backflow prevention:

- a. Whenever the nature and extent of activity or the materials used in connection with said activity or materials stored at a premises could contaminate or pollute the city's water supply;
- b. When premises has cross-connections;
- c. When intricate plumbing arrangements are present that make it impractical to ascertain whether cross-connections exist;
- d. Where a used water return system or auxiliary water supply could be connected to the city's water system;
- e. Where there is unduly restricted entry so that inspections for cross-connection cannot be made with sufficient frequency or with sufficient notice to assure that cross-connections do not exist;
- f. Where there is a repeated history of cross-connection being established or reestablished;
- g. Where materials of a toxic or hazardous nature are being used such that, if backflow should occur, a health hazard could result;
- h. Lawn irrigation systems;
- i. All water services larger than one inch;
- j. Any other water system which receives water from the city and which does not have a cross-connection control program approved by the city;
- k. Where the installation of any approved backflow prevention assembly is deemed to be necessary to accomplish the purpose of these regulations in the judgement of the cross-connection specialist.

3. THERMAL EXPANSION

- a. It is the responsibility of the owner to address the possibility of thermal expansion if a closed system has been created by the installation of a backflow prevention assembly.

4. MOBILE UNITS

- a. Any mobile unit or apparatus using city water or water from a premises attached to the City's system shall first meet all cross-connection requirements imposed by the City and obtain a permit prior to using City water if there is a possibility that the attachment may contaminate the City's water system.

5. INSTALLATION REQUIREMENTS

- a. All backflow prevention assembly installations shall comply with the requirements of OAR 333-061-0070(8) and 333-061-0071, the Oregon Plumbing Specialty Code, and meet all standards of the Oregon State Health Division. All backflow prevention assemblies required under this section shall be of a type and model approved by the Oregon State Health Division.

6. FIRE SYSTEMS

- a. An approved double detector check assembly shall be the minimum protection on fire sprinkler systems using piping material that is not approved for potable water use and/or does not provide for periodic flow-through during each 24-hour period. A reduced pressure principle detector assembly (“RPDA”) must be installed if any solution other than potable water can be introduced into the sprinkler system.

7. ACCESS TO PREMISES

- a. Authorized personnel of the city, with proper identification and sufficient notice, shall have access during reasonable hours to all parts of a premises to which the city supplies water in order to ascertain compliance with the requirements of this chapter.

8. ANNUAL TESTING AND REPAIRS

- a. All backflow prevention assemblies provided water by the city shall be tested consistent with Oregon Health Division Rules at the time of installation, repair or relocation, and at least annually thereafter, by a state-certified backflow prevention assembly tester. Testing shall be more frequently than annually for approved backflow prevention assemblies that repeatedly fail, or are protecting health hazard cross-connections, as determined by the cross-connection specialist. All assemblies found not functioning shall be promptly repaired or replaced.

9. TERMINATION OF SERVICE

- a. Consistent with the terms of OAR 333-061-0070(9)(a), the city may cause the discontinuance of water service to the premises for:
 - i. Failure to remove or eliminate an existing unprotected or potential cross-connection;
 - ii. Failure to install a required approved backflow prevention assembly;
 - iii. Failure to maintain an approved backflow prevention assembly;
 - iv. Failure to conduct the required testing of an approved backflow prevention assembly.

10. LOCATION

- a. The approved backflow prevention assembly shall be installed on the property being served in a location accessible for City inspection and testing as follows:
 - i. Before any branch, immediately downstream of the meter; or
 - ii. If not meter, at the property line; or
 - iii. If in the building, before the first branch or hazard being controlled or as determined by the City Engineer; or
 - iv. If installed outside the building being served, it shall be placed at the property line or easement line in a vault or structure in accordance with the manufacturer's recommendations and as approved by the City Engineer. Vaults must have a sump and be watertight.
 - v. The distance from a fire hydrant to the fire department connection shall not exceed 40 feet unless otherwise approved in writing by the fire chief, but in no case shall a distance of greater than 60 feet be allowed.

Q. UNDERGROUND WARNING TAPE

1. Detectable or non-detectable acid and alkali-resistant safety warning tape shall be provided along all mainlines not located under sidewalks or paved portions of public streets.
2. Underground warning tape shall be placed a minimum of 12 inches and a maximum of 15 inches below the finish ground surface, and shall be continuous the entire length of the mainline as specified.

R. MAINLINE BORED CROSSINGS

1. Bore casing size shall be adequate to permit proper construction of the carrier pipe to the required lines and grades. Carrier pipe used in bore casings shall be as specified herein.
2. All bore crossings shall be provided with casing spacers and end seals. Casing spacer configuration shall conform to the manufacturer's recommendations, but in no case shall less than three (3) spacers per length of pipe be used.
3. In order to prevent over-belling of flexible pipe while installing it through the casing, provide a method for restricting movement between the assembled bell and spigot conforming to the manufacturer's recommendations.
4. The design of the bore crossing shall include the following as a minimum:
 - a. Casing and carrier pipe materials and dimensions, including outside bell diameters of the carrier pipe.
 - b. Details for any part of the system which must be changed as a result of the boring operation (manhole, headwall, etc.).
 - c. Bore and receiving pit backfill material and compaction requirements.

2.2 MATERIALS

A. GENERAL

1. Unless otherwise approved by the City Engineer, materials used for the construction of public water lines shall conform to the most current version of the Oregon Standard Specifications for Construction, the minimum requirements outlined herein and as shown on the Standard Details. This listing is not intended to be complete nor designed to replace the any of the city required standards.
2. In the case of conflicts between the provisions of these Design Standards and the PWS, the more stringent as determined by the City Engineer shall apply. Acceptable materials shall be as outlined in these Design Standards.
3. It is not intended that materials listed herein are to be considered acceptable for all applications. The Design Engineer shall determine the materials suitable for the project to the satisfaction of the City Engineer.
4. All materials or products which will come in contact with or which will be used on material or products which will come in contact with potable water shall conform to the requirements of OAR 333-61-087, product acceptability criteria or the National Sanitation Foundation (NSF) Standard 61, Drinking Water System Components - health effects as approved by the Oregon Health Authority - Public Health Division.

B. PIPE

1. Water distribution pipe shall be Class 52 ductile iron pipe conforming to AWWA C151, and cement-mortar lined and seal coated in accordance with AWWA C104.
2. All ductile iron pipe and fittings buried underground shall be coated on the outside with a standard coating of black bituminous paint a minimum of one (1) mil thick unless otherwise specified.

C. FITTINGS

1. MECHANICAL JOINT FITTINGS

- a. All mechanical joint (MJ) tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 24-inches in diameter shall be ductile iron compact fittings in conformance with AWWA C153.
- b. The minimum working pressure for all mechanical joint (MJ) fittings 4-inches through 24-inch in diameter shall be 350 psi.

2. FLANGED FITTINGS

- a. All flanged tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 48 inches in diameter shall be cast iron or ductile iron fittings in conformance with AWWA c110.
- b. The minimum working pressure for all flanged cast iron or ductile iron fittings shall be 250 psi.

D. COUPLINGS

1. Couplings shall be limited in their application to connection of new pipe work to existing waterlines, temporary installations, and where specifically approved by the City Engineer.
2. Couplings shall be mechanical joint solid sleeve or mechanical joint split sleeve type couplings consisting of a ductile iron sleeve, ductile iron follower rings, rubber gaskets, and corrosion-resistant bolts and hex nuts.
3. Mechanical joint couplings shall have minimum pressure ratings that will accommodate maximum pressures which will be experienced during hydrostatic and leakage testing.
4. Solid sleeve couplings shall be Clow F-1208 or approved equivalent. Split sleeve couplings shall be Mueller H-785 or approved equivalent.
5. Dresser-type couplings are not an approved option unless specifically approved by the City Engineer. Applications shall be limited to transitions between pipe types for which mechanical joint couplings are not available.

E. MAIN LINE VALVES

1. GENERAL

- a. All mainline valves and appurtenances shall have the name, monogram, or initials of the manufacturer cast thereon. They shall be built and equipped for the type of operation as specified herein or as shown on the drawings.
- b. Valve Operators
 - i. All valve operators shall be totally enclosed traveling nut type manual operators, sealed and lubricated for underground service.
 - ii. All buried valves shall be supplied with a 2-inch square operating nut. Nuts shall have a flanged base on which shall be cast an arrow at least 2-inch long with the word "open" cast on the nut to clearly indicate the direction of opening.
 - iii. Extension stems shall be provided for buried valves when the operating nut is four (4) feet or more below finished grade. Extension stem shall extend to within 12-inches (maximum) of the finished ground surface and shall be provided with spacers to center the stem in the valve box.
- c. Valve Boxes
 - i. All buried valves shall be provided with valve boxes as shown on the Standard Details.
- d. Gate Valves
 - i. All gate valves shall be resilient wedge gate valves conforming to the requirements of AWWA C-509, except as herein modified.

- ii. Gate valves shall be epoxy coated iron-body, resilient wedge non-rising stem gate valves. The wedge shall be cast iron completely encapsulated in an elastomer covering with polymer guide bearing caps on each side. The valves shall have a full diameter waterway with no grooves or recesses at the valve seat location. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.
- iii. Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 200 psi and a minimum test pressure 300 psi.
- iv. Gate valves shall be Mueller A-2360, Waterous Series 500 or approved equivalent.
- e. Butterfly Valves
 - i. All butterfly valves shall conform to AWWA C504, except as herein modified.
 - ii. Butterfly valves shall be epoxy coated short body type AWWA Type-B valves. Flanges, where required, shall be 125 pound, full-faced, drilled per ANSI B16.1.
 - iii. Valve operators shall be enclosed traveling nut type manual operators, sealed and lubricated for underground service, and shall be rated for submerged operation up to ten (10) psi (± 23 feet).
 - iv. Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 150 psi and a minimum test pressure 300 psi.
 - v. Butterfly valves shall be Pratt Groundhog Series, or approved equivalent.
- f. Shop Painting
 - i. All valves shall be furnished with a fusion-bonded epoxy coating inside and outside conforming to the requirements of AWWA C550.

F. SERVICE PIPE AND FITTINGS

1. All services that are saddle tapped shall use ductile iron service saddles with stainless steel bolts and clamps. All ductile iron service saddles shall be furnished with a fusion bonded epoxy coating conforming to the requirements of AWWA C-550.
2. Unless otherwise shown on the drawings, single and double residential service pipe shall be one (1) inch in diameter.
3. One (1) inch services
 - a. Unless otherwise specified herein, water service lines shall be seamless Type K copper pipe, conforming to AWWA C500, 160 psi rated.
 - b. All corporation stops shall be brass ball valve corporation stops rated to 300 psi with iron pipe thread inlet and compression outlet to adapt copper pipe. Corporation stops shall be Ford FB-1100 or approved equivalent.
 - c. Each individual water service line shall be equipped with a locking ball valve meter stop assembly at the inlet to the meter. All meter stop assemblies shall be brass with copper pipe connector as appropriate and outlet for meter coupling.
 - d. Meter stops for 1-inch meters shall be locking angle ball valves with CTS pack joint inlet. 1-inch meter stops shall be Ford BA43-242W and Ford BA43-444W, respectively, or approved equivalent. A 1-inch x 3/4 inch adapter shall be provided on the meter stop for each new 1-inch service.

- e. Service line couplings shall be CTS pack joint style couplings. Couplings shall be Ford C44 coupling or approved equivalent.
- f. Double meter stop assemblies for a 1-inch service line to two (2) ¾-inch services shall consist of a 14-inch u-branch assembly with CTS pack joint inlet x MIP thread outlets, and locking angle ball valve meter stops. Double meter stop assemblies shall be Ford U48-43-14 U-branch with Ford BA 13-232w meter stops, or approved equivalent.

4. 1½ Inch and Larger Services

- a. 1½ inch and 2 inch water service lines shall be seamless type k copper pipe, conforming to AWWA C800, 160 psi rated.
- b. 1½ inch and 2 inch water services shall be provided with high bypass copper setters for flanged meters, Ford 70 Series or approved equivalent conforming to Standard Details.
 - i. The coppersetter shall be provided with ball valves on the inlet and outlet, with inlet valve provided with a lock wing and the outlet valve provided with a handle.
 - ii. The bypass line shall be 1-inch diameter minimum, and shall be provided with a lockwing ball valve.
- c. 2-inch and larger services shall have a mainline tee with flanged side outlet and flanged resilient wedge gate valve conforming the requirements specified herein.
- d. 3-inch and larger water service lines shall be reviewed on a case-by-case basis. Pipe and fittings shall be as required by the City Engineer.

G. WATER METER BOXES

- 1. Unless otherwise approved by the City Engineer, all meter boxes must be as shown below:

Table 2.9 - Water Meter Boxes			
Meter Size	Non-Traffic Area	Traffic Area	Inside Dimensions
1 Inch	1armorcast A6001946pcx12	1armorcast A6001946pcx12	13" X 24"
	Lid A6001866r	Lid A6001866	
1 ½ Inch	1armorcast A6001640pcx12	1armorcast A6001946pcx12	17" X 30"
	Lid A6001643r	Lid A6001643	
2 Inch	1armorcast A6001640pcx12	1armorcast A6001946pcx12	17" X 30"
	Lid A6001643r	Lid A6001643	
3 Inch And Larger	Vault Built To Public Works Requirements		
1 –Or Approved Equivalent			

- 2. Meter boxes outside of traffic areas shall be polymer concrete boxes with nonskid polymer concrete covers and hinged reading lids.
- 3. Meter boxes within traffic areas shall be polymer concrete boxes with one piece traffic rated covers.

4. All meter boxes shall be provided with knockouts for touch-read sensors.

H. FIRE HYDRANTS

1. Unless otherwise required by the Dundee Department of Public Safety, all fire hydrants shall conform to the following:
 - a. All fire hydrants shall be improved, dry barrel, 5¼-inch compression type valve, traffic model.
 - b. Fire hydrants shall be equipped with two 2 ½-inch hose ports (NST), one 4 ½-inch pumper port (NST), 1 ½-inch pentagon nut, and barrel drains.
 - c. Fire hydrants shall be oriented so as to optimize access to ports, or as directed by the engineer.
 - d. Fire hydrants shall be Mueller Super Centurion 250, Model A-423, and shall be factory painted red.

I. MAINLINE TAPPING TEES

1. Tapping tees used for making connections to existing, in-service lines shall be all stainless steel construction, including stainless steel flange, with full perimeter gasket, and shall have Class 125 outlet flanges. In all cases, the tapping tee shall be designed for use with the existing pipe materials and O.D. equivalent.
2. All tapping valves shall be resilient wedge gate valves furnished with a fusion bonded epoxy coating inside & outside conforming to the requirements of AWWA C550.
3. Any company performing mainline taps shall be prequalified with the City prior to performing any work on a project.

J. UNDERGROUND WARNING TAPE

1. Underground warning tape shall be detectable or non-detectable acid and alkali resistant safety warning tape. The tape shall consist of a minimum 4.0 mil (0.004") thick, virgin low density polyethylene plastic film formulated for extended use underground. The tape shall be in accordance with the APWA national color code and shall be permanently imprinted in lead free black pigments suitable for direct burial.
2. The tape shall be safety blue and shall be provided with the legend "caution buried water line below" or approved equivalent printed continuously down the length of the tape.

K. BORE CASINGS AND ACCESSORIES

1. Casing shall be welded smooth steel pipe conforming to the requirements of ASTM A-53 or approved equal, with a minimum yield strength of 35,000 psi.