SECTION 7

WATER

SECTION 7

7. WATER SYSTEM STANDARDS

7.01 General

The standards established by this chapter are intended to represent the **minimum** standards for the design and construction of water system facilities. Greater or lesser requirements may be mandated by the City due to localized conditions. Extensions, connections or modifications to the existing system shall also be in compliance with applicable State and/or County Department of Health requirements.

Off-site improvements to the existing system may be warranted based on (1) the condition, ability, and capacity of the existing water system and (2) impacts caused by the proposed development. These off-site improvements in addition to "on-site improvements shall be completed as determined by the City Engineer to mitigate impacts caused by the development.

The following minimum design and construction considerations shall apply:

7.02 Design Standards

The design of water system improvements shall depend on their type and local site conditions. The design elements of water system improvements shall conform to City Standards as set forth herein and follow current design practice as set forth in Section 7.01 and 7.10.

A. Detailed plans shall be submitted for the CITY'S review which provide the locations, size, and type of the proposed water system and points of connection. These Plans shall be separate from Sewer Plans.

B. Project plans shall have a horizontal scale of not more than 50 feet to the inch. Plans shall show:

1. Locations of streets, right-of-ways, existing utilities and water system facilities.

2. Ground surface, pipe type and size, and water valves and hydrants stationing.

3. All known existing structures, both above and below ground, which might interfere with the proposed construction, particularly sewer lines, gas mains, storm drains, overhead and underground power lines, and telephone lines and television cables.

4. All utility easements, and applicable County recording number(s).

C. Computations and other data used for design of the water system shall be submitted to the City for approval.

D. The water system facilities shall be constructed in conformance with the 1998 Standard Specifications for Road, Bridge, & Municipal Construction and current amendments thereto, State of Washington, revised as to form to make reference to Local Governments and as modified by the City's requirements and standards.

E. Material and installation specifications shall contain appropriate requirements that have been established by the industry in its technical publications, such as ASTM, AWWA, WPCF, and APWA standards. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling so as not to damage the pipe or its joints.

F. Except as otherwise noted herein, all work shall be accomplished as recommended in applicable American Water Works Association (AWWA) Standards, and according to the recommendations of the manufacturer of the material or equipment concerned.

G. The location of the water mains, valves, hydrants, and principal fittings and appurtenances shall be staked in the field by the Developer's Engineer. No deviation shall be made from the approved line or grade without approval of the City. The Contractor shall verify and protect all utilities encountered during the progress of this work.

H. Prior to final inspection, all pipelines shall be satisfactorily tested and disinfected.

I. Before acceptance of the water system by the City, all pipes, appurtenances, vaults, meter boxes, manholes, etc., shall be cleaned of all debris and objectionable material. Mechanical systems shall be field checked for performance. Operation and maintenance manuals shall be provided after a "start-up" is satisfactorily witnessed.

J. The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City with a written guarantee covering all material and workmanship for a period of two years after the date of final acceptance and he shall make all necessary repairs during that period at his own expense, if such repairs are necessitated as the result of furnishing poor materials and/or workmanship. The Developer shall obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required and shall deliver copies to the City upon completion of the work.

7.03 General Requirements

A. Prior to construction, the Contractor shall notify the City and schedule a pre-construction meeting.

B. Work shall be performed only by contractors experienced and qualified in constructing public water systems.

C. Prior to any work being performed, the Contractor shall contact the City's Utilities Superintendent or City Engineer to set forth his proposed work schedule.

D. Contractor shall obtain approval of materials to be used from City's Water Superintendent and/or City Engineer prior to ordering of materials.

E. Water mains shall be laid only in dedicated streets or in easements which have been granted to the City. A street is normally not considered dedicated until the plat which created it has been officially filed with the County Auditor.

F. All water main distribution pipelines shall have a minimum 36" cover from finished grade and minimum 42" cover from finished grade over transmission mains. Mains shall generally be located parallel to and ten feet northerly or easterly of street centerline. Water mains shall be extended to the far property line(s) of the property being served. Off-site extensions may, and likely will, be required to hydraulically loop existing and new systems. Oversizing of water mains may be required to be installed per City's current Water Comprehensive Plan.

G. Fire hydrants shall generally be required to be installed approximately every 600 feet in residential areas, and every 300 feet in commercial areas. However, fire hydrants shall be furnished and installed at all locations as specifically mandated by the local fire marshall and/or per City Building Code. Distances referenced herein shall be measured linearly in and along street or road.

H. Fire hydrants on dead end streets and roads shall be located within approximately 300 feet from the center of all lots. Distances referenced herein shall be measured linearly in and along street or road.

I. Pipes connecting hydrants to mains shall be at least 6 inch in diameter and not longer than 50 feet.

J. Dead end lines are not permitted except where the Developer can demonstrate to the City's satisfaction that it would be impractical to extend the line at a future date. Water mains located in platted cul-de-sacs shall extend to the plat line beyond the cul-de-sac to neighboring property(ies) to allow for a convenient future connection, and/or extended off-site to create a hydraulic loop, and, as minimum, have a two (2") inch blow off assembly installed at the termination point.

K. All materials shall be new and undamaged.

L. Unless otherwise approved or required by the City Engineer, the water main shall be ductile iron pipe of the class as referenced below. The minimum nominal size for water mains shall be 8 inches, unless otherwise approved/required by City Engineer.

Pipe Diameter	Class
4" through 14"	Class 52
16" and larger	Class 50

EXCEPTION: 6-inch hydrant spools and pipelines located beneath rock walls or other types of retaining walls shall be Class 53.

M. All fittings shall be cement-lined ductile iron.

N. Provide additional bends in field to suit construction, avoid unknown utilities and obstacles, and to construct in accordance with the pipe manufacturer's recommendations so as not to exceed allowable deflection at pipe joints.

O. Provide concrete thrust blocking and/or restrained joints at all fittings and bends in accordance with the City standards and as local conditions might dictate. Size of blocking to be designed by Developer's Engineer and approval by City. Concrete shall be minimum class 3000 psi.

P. Provide concrete anchor blocking at all up-thrust vertical bends in accordance with City standards. Size of blocking to be designed by Developer's Engineer and approval by City. Concrete shall be minimum class 3000 psi.

Q. All valve marker posts shall be prefabricated concrete and painted yellow (two coats) and marked (in black stenciled letters) with the distance (to nearest foot) to valve being referenced.

R. Residential water service pipe shall be one-inch high plastic "Poly" pipe (no joints beneath pavement areas), meeting or exceeding ASTM D2239, SDR-7 as manufactured by Driscopipe (CL 200), or type "K" copper pipe.

S. Minimum residential size service lines between the water main and the water meter shall be 3/4 inch unless otherwise specified. All service lines shall be the minimum size or larger if specified by the County Plumbing Code in accordance with fixture units. Dual resident service, if approved by the City, shall be minimum 1" diameter.

T. Meter services and meter boxes shall be set to final grade and all adjustments shall be made prior to final pressure testing of the system. Centerline of service inlets shall be located to match bottom elevation of meter box in such a manner that meter inlet and outlet will be the same elevation at the bottom of the meter box. Contractor shall

furnish angle dual check valve with neoprene gaskets for outlet connections to meter and deliver to the City Utilities Department Public Works Yard for each service installed. Service inlet shall be centered at inlet end of box and faced toward outlet end of box parallel with long sides.

U. All water services shall end within road right-of-way (i.e., meters located 12 inches inside property/right-of-way line). They shall be located immediately adjacent to neighboring property lines. They shall not be placed in sidewalks, irrigation strips, major landscaping, driveways, or drainage channels.

V. All meters shall be installed by the City, and the Developer or property owner shall pay the current meter installation charge.

W. Developer shall furnish and install *water sampling stations* in field per City direction, or deliver to City Utilities Department Public Works Yard. One station is required for development in size of 1 to 10 lots. One additional station is required for each additional 50 lots or portions thereof. See detail in back of standards.

X. All new buildings and residences shall include in their water service a suitable pressure reducing valve to protect the plumbing from excessive pressures, unless otherwise waived in writing by the City.

Y. All new construction shall comply with the "Accepted Procedure and Practice in Cross Connection Control Manual" as published by the Pacific Northwest Section of the American Water Works Committee", November 1985, Fourth Edition, and current amendments thereto. A copy of such is available for review at the State D.O.H. office.

Z. Cut in connections shall <u>not</u> be made on Fridays, City recognized holidays, or weekends. All tapping sleeves and tapping valves shall be pressure tested prior to making connection to existing mains. Only qualified contractors, as approved by city, will be allowed to make connections/interties into existing system.

AA. Contractor shall notify City's Water Superintendent and obtain approval from him prior to any scheduled water shut-off or turn-on, affecting the water system or it's customers, a minimum of 48 hours in advance. Contractor shall provide and install door hangers for all customers effected by scheduled shut-down. Language and size and type of door hangers to be approved by City.

BB. Road restoration shall be per City, County, or State permit of approval (as applicable). Developer and Contractor shall become familiar with all State, County and City conditions of required permits, and shall adhere to all conditions and requirements.

7.04 Materials

A. Water Mains and Fittings:

1. All water mains shall furnished and be installed as approved by the City Engineer and/or utility superintendent. Pipe shall be ductile iron pipe for all sizes (4-inches and larger).

2. The ductile iron pipe shall conform to ANSI/AWWA C151/A21.51-91 Standards, and current amendments thereto, except the ductile iron pipe shall be thickness Class 52 for 4" through 14" diameter pipe (except for 6-inch hydrant spools which shall be Cl. 53) and Class 50 for 16" and larger. Grade of iron shall be a minimum of 60-42-10. The pipe shall be cement lined to a minimum thickness of 1/16", and the exterior shall be coated with an asphaltic coating. Each length shall be plainly marked with the manufacturer's identification, year case, thickness, class of pipe and weight.

3. Type of joint shall be mechanical joint or push-on type, employing a single gasket, such as "Tyton", except where otherwise calling for flanged ends. Bolts furnished for mechanical joint pipe and fittings shall be high strength ductile iron, with a minimum tensile strength of 50,000 psi.

4. Restrained joint pipe, where shown on the Plans shall be push-on joint pipe with "Fast Tight" gaskets as furnished by U.S. Pipe or equal for 12" diameter and smaller pipe and "TR FLEX" as furnished by U.S. Pipe or equal for 16" and 24" diameter pipes. The restrained joint pipe shall meet all other requirements of the non-restrained pipe.

5. All pipe shall be jointed by the manufacturer's standard coupling, be all of one manufacturer, be carefully installed in complete compliance with the manufacturer's recommendations.

6. Joints shall be "made up" in accordance with the manufacturer's recommendations, Standard joint materials, including rubber ring gaskets, shall be furnished with the pipe. Material shall be suitable for the specified pipe size and pressures.

7. All fittings shall be short-bodied, ductile iron complying with applicable ANSI/AWWA C110 or C153 Standards for 350 psi pressure rating for mechanical joint fittings and 250 psi pressure rating for flanged fittings. All fittings shall be cement lined and either mechanical joint or flanged, as indicated on the Plans.

8. Fittings in areas shown on the Plans for restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be Romac "Grip Ring" (retainer glands) or City approved equal.

9. All couplings shall be ductile iron mechanical joint sleeves.

10. The pipe and fittings shall be inspected for defects before installation. All lumps, blisters and excess coal tar coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry, and free from oil and grease before the pipe is laid.

11. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and pipe forced home and brought to correct line and grade. The pipe shall be secured in place with select backfill tamped under it. Precaution shall be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug. If water is in the trench when work resumes, the seal shall remain in place until the trench is pumped completely "dry". No pipe shall be laid in water or when trench conditions are unsuitable or unsafe.

12. The cutting of pipe for installing fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe or cement lining, and so as to leave a smooth end at right angles to the axis of the pipe. Pipe shall be laid with bell ends facing in the direction of the laying, unless directed otherwise in the field by the City. Wherever it is necessary to deflect pipe from a straight line, the amount of deflection allowed shall not exceed the pipe manufacturer's recommendations.

13. For connection of mechanical joints, the socket, plain end of each pipe and gasket shall be cleaned of dirt before jointing, and shall be jointed according to manufacturer's directions. Bolts shall be tightened alternately at top, bottom and sides, so pressure on gasket is even.

14. For connection of "Tyton" joints, the jointing shall be done according to manufacturer's recommendations, with special care used in cleaning gasket seat to prevent any dirt or sand from getting between the gasket and pipe. Lubricant to be used on the gasket shall be non-toxic and free from contamination. When a pipe length is cut, the outer edge of the cut shall be beveled with a file to prevent injury to the gasket during jointing.

15. Valves, fittings, plugs and caps shall be set and jointed to pipe in the manner as required. All dead ends on new mains shall be closed with dead end M.J. caps or plugs and blocking.

16. Fittings shall be "blocked" with poured-in-place concrete, with a firm minimum bearing against an undisturbed earth wall. Timber blocking will not be permitted. Thrust blocks shall be poured as soon as possible after setting the fittings in place to allow the concrete to "set" before applying the pressure test. The concrete thrust blocks shall be in place before beginning the pressure test. Anchor blocks shall be allowed to set sufficiently to develop the necessary bond strength

between the reinforcing rods and the concrete anchor before beginning the pressure test. Concrete shall be Class 3000 psi.

17. All of the new piping, valves and blocking shall have been installed, disinfected and tested up to the point of cutting into existing lines before the crossover is made. The crossover to the existing system shall be in full readiness, including the cut and sized specials. Forty-eight (48) hour notice shall be given the City in advance of the planned "cut-ins". All solid sleeves shall be "long body" ductile iron.

B. **Valves**:

All valves 14" and larger shall be butterfly valves. All valves 12" and smaller shall be resilient seat gate valves.

1. **Resilient-Seated Gate Valves**

All gate valves shall conform to ANSI/AWWA C509-87 Standards for resilient-seated, high strength, bronze stemmed gate valves. The valves shall be iron-bodied, iron disk completely encapsulated with polyurethane rubber and bronze, non-rising stem with "O" ring seals. The polyurethane sealing rubber shall be fusion bonded to the wedge to meet ASTM tests for rubber to metal bond ASTM D429. The valves shall open counter-clockwise and be furnished with 2-inch square operating nuts except valves in vaults shall be furnished with handwheels. All surfaces, interior and exterior shall be fusion bonded epoxy coated, acceptable for potable water.

The valve shall be valve rated at 250 psi or higher.

All valves shall be set with stems rising in a true vertical. The axis of the valve box shall be common with the axis projected off the valve stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

Valves shall be Dresser, M&H, or Waterous.

2. **Butterfly Valves**

Butterfly valves shall be of the tight closing rubber seat type with rubber seat either bonded to the body or mechanically retained in the body with no fasteners or retaining hardware in the flowstream. The valves may have rubber seats mechanically affixed to the valve vane. Where threaded fasteners are used, the fasteners shall be retained with a locking wire or equivalent provision to prevent loosening. Rubber seats attached to the valve vane shall be equipped with stainless steel seat ring integral with the body, and the body internal surfaces shall be epoxy coated to prevent tuberculations buildup which might damage the disc-mounted rubber seat.

No metal-to-metal sealing surfaces shall be permitted. The valves shall be bubble-tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving valve operations after long periods of inactivity. Valve discs shall rotate ninety (90) degrees from the full open position to the tight shut position. The valves shall meet the full requirements of AWWA C504, Class 150B. The valve shall be Henry Pratt Company *"Groundhog"*, or owner approved equal.

3. **Tapping Sleeves and Tapping Valves**

The tapping sleeves shall be rated for a working pressure of 200 psi minimum and furnished complete with joint accessories. Tapping sleeves shall be constructed in two sections for ease of installation and shall be assembled around the main without interrupting service.

Mechanical joint style sleeves shall be ductile iron and is required for size-on-size connection to cast iron pipe. Mechanical joint sleeves shall be cast by Clow, Dresser, Mueller, Tyler, U.S. Pipe, or owner approved equal.

Fabricated steel style sleeves shall be fusion bonded coated, acceptable for potable water, and is acceptable for A.C. pipe taps only. Fabricated steel sleeves shall be manufactured by JCM, Romac or approved equal. Tapping valves shall be provided with a standard mechanical joint outlet for use with ductile iron pipe and shall have oversized seat rings to permit entry of the tapping machine cutters. In all other respects, the tapping valves shall conform to the resilient seat gate valves herein specified with regards to operation and materials.

The installation of the tapping sleeves and valves shall be performed by a qualified contractor. Evidence of same shall be provided to the City.

4. **Pressure Reducing and Relief Valves**

There are two uniform plumbing codes: one is prepared by the International Association of Plumbing and Mechanical Officials, another is prepared by the International Conference of Building Officials. Both codes require installation of pressure reducing valves in the water service pipe when street main pressure exceed 80 psi, as follows:

> When street main pressure exceeds 80 psi, an approved pressure reducing valve with an approved pressure relief device shall be installed in the water service pipe near its entrance to the building to reduce the pressure to 80 psi or lower, except where the water service pipe supplies water directly to a water-pressure boost system, an elevated water gravity tank, or to pumps provided in connection with a hydropneumatic or elevated gravity water-supply tank system. Pressure at any fixture shall be limited to no more than 80 psi under no-flow conditions.

Where local water pressure is in excess of eighty (80) pounds per square inch (551 kPa), an approved type pressure regulator preceded by an adequate strainer shall be installed and the pressure reduced to eighty (80) pounds per square inch (551 kPa) or less. For potable water services up to and including one and one-half (1-1/2) inch (38.1 mm) regulators, provision shall be made to prevent pressure on the building side from exceeding main supply pressure. Approved regulators with integral bypasses are acceptable. Each such regulator and strainer shall be accessibly located and shall have the strainer accessible for cleaning without removing the regulatory or stainer body or disconnecting the supply piping. All pipe size determinations shall be based on eight (80) percent of the reduced pressure.

Both uniform plumbing codes also require installation of pressure and temperature relief valves for hot water tanks as follows:

Pressure-Relief Valves: Pressure-relief valves shall meet the ANSI Standards and the ASME Standards when required by the building office. The valves shall have a pressure relief rating adequate to meet the pressure conditions of the equipment served. They shall be installed either directly in a top tank tapping or in the hot or cold outlet line close to the tank. There shall be no shutoff valves between the pressure relief valve and the tank. The pressure relief valve must be set to open at not less than 25 psi above the street main pressure or not less than 25 psi above the setting of any house water press-regulating valve. The setting shall not exceed the tank rated working pressure.

Temperature-Relief Valves: Temperature-relief valves shall be adequate relief rating, express in Btu/hr, for the equipment served. They shall be installed so that the temperature-sensing element is immersed in the hottest water within the top six inches of the tank. The valve shall be set to open when the stored water temperature is 210 degrees Fahrenheit (or less). These valves must conform to an approved standard and shall be sized so that when the valve opens, the water temperature cannot exceed 210 degrees Fahrenheit with the water heating element operating at maximum input.

All storage-type water heaters and hot water boilers deriving heat from fuels or types of energy other than gas, shall be provided with, in addition to the primary temperature controls, an over-temperature safety protection device constructed, list and installed in accordance with nationally recognized applicable standards for such devices.

The City will require that its customers install such pressure-reducing valves in the water service pipe when the street main static pressure exceeds 80 psi. The City will make static pressure information available upon request.

5. **All Valves**

All valves with operating nuts located more than 42" below finished grade shall be equipped with extension stems to bring the operating nut to within 18" of the finished grade.

At the top of the extension stem, there shall be a two-inch (2") standard operating nut, complete with a centering flange that closely fits the five-inch (5") pipe encasement of the extension stem. The valve box shall be set in a telescoping fashion around the five-inch (5") pipe cut to the correct length to allow future adjustment up or down.

Each valve shall be provided with an adjustable two-piece cast iron valve box of five inches (5") minimum inside diameter. Valve boxes shall have a top section with an eighteen-inch (18") minimum length. The valve boxes and covers shall be Rich No. 940 or equal.

6. **Valve Markers**

For each valve located outside of an asphalt or concrete surface, provide a concrete valve marker post.

The concrete marker posts shall have a 3-inch minimum square section and a minimum length of thirty-six inches (36"), with beveled edges, and contain at least one (1) three-eighths inch (3/8") diameter bar of reinforcing steel. Markers shall be placed at the edge of the right-of-way opposite the valve, and set so as to leave twelve inches (12") of the post exposed above grade. The exposed portion of the marker posts shall be painted with two (2) coats of Preservative Brand No. 43-616 yellow enamel paint. Distance to referenced valve shall be to the nearest 0.5 foot, and shall be clearly stenciled in black numerals two inches (2") in height.

C. **Fire Hydrants:**

All fire hydrants shall be approved by the National Board of Fire Underwriters and conform to AWWA Specification C502, break-away type, in which the valve will remain closed if the barrel is broken. The hydrant barrel shall have a diameter of not less than eight and one-half (8-1/2") inches, and the valve diameter shall be not less than five-and-one-quarter inches (5-1/4"). Each hydrant shall be equipped with two (2) two-and-one-half-inch (2-1/2") hose ports (National Standard Thread), and one (1) four-and-one-half-inch (4-1/2") pumper connection (National Standard Thread), with permanent Storz hydrant adaptor and Storz blind cap.

Each hydrant shall be equipped with a suitable positive acting drain valve and one-and-one-quarter-inch (1-1/4") pentagonal operating nut (counter-clockwise opening). The fire hydrants shall be M&H "Reliant" #929, Clow, Mueller, or City approved equal. A blue pavement marker shall be furnished and installed.

The holding spools between the gate valve and fire hydrant shall be made from six-inch (6") Class 53 ductile iron pipe, 0.34-inch wall thickness. The hydrant and gate valve shall be anchored in place using holding spools and mechanical joint restraint device. Holding spools with length in excess of seventeen feet (17') shall be supplied with an M.J. sleeve and mechanical joint restraint device.

The fire hydrants shall be painted per local fire marshall requirements with two (2) coats of Preservative Brand caterpillar or international yellow paint. After installation, they shall be wire brushed and field painted with two additional coats of similar yellow enamel paint. Distance to the hydrant valve shall be clearly stenciled in black numerals two inches (2") in height on the fire hydrant below the pumper port.

Between the time that the fire hydrant is installed and the completed facility is placed in operation, the fire hydrant shall at all times be wrapped in burlap, or covered in some other suitable manner to clearly indicate that the fire hydrant is not in service.

D. **Blow-Offs and Air Relief Assemblies:**

Two (2") inch or four (4") inch blowoff assemblies (per City direction) shall be installed at the terminus of all dead end water mains. Blowoffs utilized by the Contractor for flushing the water main shall be sufficiently sized to obtain a minimum 2.5 feet per second velocity in the main. Temporary blow-offs shall be removed and replaced with a suitably sized watertight brass plug.

Two (2") inch air and vacuum release assemblies (located in vaults or manholes) shall be installed at principal high points in the system. See detail.

The installation of these items shall include connection piping, gate valve, valve box, and all accessories. Valve markers shall be optional with City.

E. **Water Sampling Station**

One water sampling station shall be provided to the City for each development in size of 1 to 10 lots. One additional sampling station shall be provided for each additional 50 lots or portion thereof. The water sampling station shall be furnished and installed at a location as determined by the City Engineer and as further shown on the Standard Detail.

7.05 Water Pipe Testing and Disinfecting

All pipelines shall be tested and disinfected prior to acceptance of work. A water hydrant meter shall be required and procured from the City for all water utilized for flushing pipelines. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Contractor. Feed for the pump shall be from a barrel or other container within the actual amount of "makeup" water, so that it can be measured periodically during the test period.

The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking.

As soon as pipe is secured against movement under pressure, it may be filled with water. Satisfactory performance of air valves shall be checked while the line is filling.

Contractor shall preflush all water mains after water has remained in the main for 24 hours and before pressure testing the main.

After the pipe is filled and all air expelled, it shall be pumped to a test pressure of 250 psi, and this pressure shall be maintained for a period of not less than thirty (30) minutes to insure the integrity of the thrust and anchor blocks. **The contractor/developer is cautioned regarding pressure limitations on butterfly valves.** All tests shall be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. Hydrostatic tests shall be performed on every complete section of water main between two valves, and each valve shall withstand the same test pressure as the pipe with no pressure active in the section of pipe beyond the closed valve.

In addition to the hydrostatic pressure test, a leakage test shall be conducted on the pipeline. The leakage test shall be conducted at 150 psi for a period of not less than one (1) hour. The quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{ND(P)^{0.5}}{7{,}400}$$

in which

L = Allowable leakage, gallons/hour
N = Number of joints in the length of pipeline tested
D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, psi

Defective materials or workmanship, discovered as a result of the tests, shall be replaced by the Contractor at the Contractor's expense. Whenever it is necessary to replace defective material or correct the workmanship, the tests shall be re-run at the Contractor's expense until a satisfactory test is obtained.

As sections of pipe are constructed and before pipelines are placed in service, they shall be sterilized in conformance with the requirements of the State of Washington Department of Health Services.

The Contractor shall be responsible for flushing all water mains prior to water samples being acquired. The water mains shall be adequately flushed at a rate to provide a minimum 2.5 feet per second velocity in the main.

In all disinfection processes, the Contractor shall take particular care in flushing and wasting the chlorinated water from the mains to assure that the flushed and chlorinated water does no physical or environmental damage to property, streams, storm sewers or any waterways. The Contractor shall chemically or otherwise treat the chlorinated water to prevent damage to the affected environment, particularly aquatic and fish life of receiving streams.

Chlorine shall be applied in one of the following manners, listed in order of preference, to secure a concentration in the pipe of at least 50 ppm.

1) Injection of chlorine-water mixture from chlorinating apparatus through corporation cock at beginning of section after pipe has been filled, and with water exhausting at end of section at a rate controlled to produce the desired chlorine concentration;

2) Injection similarly of a hypochlorite solution;

3) Other City pre-approved method(s) selected by Developer/Contractor.

After the desired chlorine concentration has been obtained throughout the section of line, the water in the line shall be left standing for a period of twenty-four (24) hours. Following this, the line shall be thoroughly flushed and a water sample collected. The line shall not be placed in service until a satisfactory bacteriological report has been received.

City forces only will be allowed to operate existing and new tie-in valves. The Contractor's forces are expressly forbidden to operate any valve on any section of line which has been accepted by the City.

7.06 Backflow Prevention and Sprinkler Systems

1. All water systems connected to the public water system shall have backflow prevention as required by WAC 248-54-285.

2. All fire sprinkler systems as mandated/proposed/or required by the local fire marshall and/or City Ordinance that have a fire department connection shall have backflow prevention as required by WAC 248-54-285.

3. Building sprinkler systems may be required based on Building Codes/Fire Marshall requirements.

7.07 Staking

All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and capable of performing such work. The engineer or surveyor directing and/or performing such work shall be currently licensed by the State of Washington to perform said tasks.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of water systems shall be as follows:

A. Provide staking sufficient to satisfy City Utilities Superintendent. In new plat development roadway centerline staking must be readily identifiable.

B. Stake locations of all proposed fire hydrants, blow-offs, air-vac assemblies, valves, fittings, meters, etc.

7.08 Trench Excavation

A. Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

B. Trenches shall be excavated to the line and depth designated or approved by the City in order to provide a minimum of 36 inches of cover (distribution system) and 42 inches cover (transmission mains) over the pipe (as measured from finished grade). Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space, and to accommodate placement of material and compaction, and as mandated by the governing agency and in compliance with all safety requirements. The trench shall be kept free from water. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

C. The contractor shall perform all excavation of every description and whatever substance encountered and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below the pipeline grade. Where materials are removed from below the pipeline grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.

D. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval of the City, and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standard.

E. The bedding course shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel.

7.09 Backfilling

Backfilling and surface restoration shall closely follow installation of pipe. The City, based on the location of construction, shall designate the amount of trenching which may be temporarily left open. In no case shall more than 100 feet be left open without approval of the City. Select material shall be placed and compacted around and under the pipe by employing hand tools and labor. Special precautions should be provided to insure protection of the piping to a point 12 inches above the crown of the pipe. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas and road prisms, and 90 percent outside driveways, roadways, road prisms, shoulders, parking or other traveled areas. Where governmental agencies other than the City have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. Typically, all trenches located in roadway sections, roadway "prisms", and in traffic bearing areas shall be required to be backfilled and compacted with imported structural fill. Due to local conditions, as may be specifically approved by the City, suitable excavated backfill material, may be utilized as backfill, or if such material is not available from trenching operations, the City may order the placing of structural back fill conforming with Section 9-03.10 of the Standard Specifications (WSDOT). All excess and/or unsuitable excavated material shall be promptly loaded and hauled to waste.

7.10 Street Patching and Restoration

See Chapter 4 and Standard Details for requirements regarding street patching and trench restoration.

7.11 Erosion Control

The detrimental effects of erosion and sedimentation shall be minimized by conforming with the following general principles:

1. Soil shall be exposed for the shortest possible time.
2. Reducing the velocity and controlling the flow of runoff.
3. Detaining runoff on the site to trap sediment.
4. Releasing runoff safely to downstream areas.
5. Best Management Practices shall be employed.

In applying these principles, the Developer and/or Contractor shall provide for erosion control by conducting work in workable units; minimizing the disturbance to cover crop materials; providing mulch and/or temporary cover crops, sedimentation basins, and/or diversions in critical areas during construction; controlling and conveying runoff; and establishing permanent vegetation and installing erosion control structures as soon as possible.

A. Trench Mulching

Where there is danger of backfill material being washed away due to steepness of the slope along the direction of the trench, backfill material shall be compacted and held in place by covering the disturbed area with straw and held with a covering of jute matting or wire mesh anchored in place.

B. Cover-Crop Seeding

A cover crop shall be sown in all areas excavated or disturbed during construction that were not paved, landscaped and/or seeded prior to construction. Areas landscaped and/or seeded prior to construction shall be restored to their original or superior condition.

Cover-crop seeding shall follow backfilling operations. Mix shall be approved by the City.

The Developer and/or Contractor shall be responsible for protecting all areas from erosion until the cover crop affords such protection. The cover crop shall be re-seeded if required and additional measures taken to provide protection from erosion until the cover crop is capable of providing protection.

During winter months, the Contractor may postpone seeding, if conditions are such that the seed will not germinate and grow. The Developer and/or Contractor will not, however, be relieved of the responsibility of protecting all areas until the cover crop has been sown and affords protection from erosion.

The cover crop shall be sown at a rate of 10 to 15 pounds of seed per acre using a hand or power operated mechanical seeder capable of providing a uniform distribution of seed.

7.12 Finishing and Cleanup

After all other work on this project is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections of a new roadway consistent with the original section, and as hereinafter specified.

On water system construction where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be cleaned and shaped such that the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met.

Slopes, grass, and planting areas shall be smoothed and finished to the required cross section and grade by means of hand labor and/or a grading machine insofar as it is possible to do so without damaging existing improvements, trees and shrubs. Machine dressing shall be supplemented by hand work to meet requirements outlined herein, to the satisfaction of the City Inspector.

Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. All graded areas shall be true to line and grade. Where the existing surface is below sidewalk and curb, the area shall be filled and dressed out to the walk or right-of-way line as directed by the City. Wherever fill material is required in the planting area, the finished grade shall be elevated to allow for final settlement, but nevertheless, the raised surface shall present a uniform appearance.

All rocks in excess of four (4) inches in diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance shall the rock be thrown onto private property. Vegetation overhang on slopes which in the City's opinion appears unsightly or is a menace to the safety and welfare to its citizens shall be trimmed, cut, removed, and wastehauled and the slopes dressed neatly so as to present a uniform, natural, well-graded and stabilized surface.

All excess excavated material shall be removed and wastehauled. Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and wastehauled. Where machine operations have broken down brush and trees beyond the outer limits of the project, the Developer shall trim, remove and dispose of same and restore said disturbed areas to a like or superior condition at his own expense.

Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris which is the result of the Developer and/or Contractor's operations.

All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements such as Portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities

which have been sprayed by the asphalt cement shall be cleaned to the satisfaction of the City Public Works Superintendent.

Castings for monuments, water valves, vaults and other similar installations which have been covered with the asphalt material shall be cleaned to the satisfaction of the City.

7.13 General Guarantee and Warranty

The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City a written guarantee covering all material and workmanship for a period of two years after the date of final acceptance and he shall make all necessary repairs during that period at his own expense, if such repairs are necessitated as the result of furnishing poor materials and/or workmanship. The Developer shall obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required, and shall deliver copies to the City upon completion of the work.

Easement documents, if applicable, shall be filed and recorded with the Pacific County Auditor's office and the documents reviewed by the City prior to project acceptance.