ENGINEERING SPECIFICATIONS

MATERIALS OF CONSTRUCTION

1. GENERAL.

The type and class of materials to be used shall be as shown on the project plans approved by the District. Where no specific reference is shown, the following Specifications shall govern the materials used. All materials shall be new and undamaged of a known brand, with replacement parts readily available from the general Seattle area. All materials shall be manufactured within one year of installation.

Prior to the installation of any of the facilities required on the project, all materials shall be approved by the District.

No materials shall be delivered to the job site and no construction shall take place until all fees are paid, all bonds and permits obtained, and a pre-construction conference has been held. In addition, no construction shall take place until the District has approved all material s.

All reference specifications herein shall be of the latest revision.

The District requires any new or remodeled developments to construct or be connected to a 12" water main. The current fire flow requirement established by Snohomish County is 1,500 gpm for 2 hours in commercial zoned areas and for multifamily structures over 4,000 sq. ft. To accomplish this fire flow requirement, a 12" water main is necessary throughout commercially zoned areas. The District also recognizes that other potential developments that require this higher fire flow may be constructed in residential (or other) zones throughout the District like churches, private schools, etc., where large parcels were previously used for agricultural purposes. On these development sites, connecting to a 12" water main or constructing a 12" water main will be required. The District will enforce this requirement on new and/or remodeled developments.

Water system extensions for development of property shall be designed to provide adequate capacity, redundancy, and reliability of the distribution system, and may require on-site looping of water systems, connection to all existing mains adjacent to the property, and/or installing water main stubs to the limits of the property to allow for future water system connections. Where a development borders or spans different pressure zones, the installation of main line pressure reducing valve (PRV) stations will be required. The length of dead-end mains for new development will be limited to a maximum of 300 feet. Off-site water system improvements may be required where deemed necessary by the District for flow capacity or system reliability.

2. DUCTILE IRON PIPE .

Ductile iron pipe shall be new, kept clean, delivered plugged and kept plugged prior to installation of, Class 52, cement-lined, conforming to ANSI Standard A21.51 (AWWA C-151) or whatever size and class of pipe is determined on the plans.

Ductile iron pipe shall be push-on joint or mechanical joint. Pipe with push-on joints shall be furnished with a single rubber ring gasket. All gaskets, including MJ, shall be lubricated to affect the seal. Pipe with mechanical joints shall be furnished with a mechanical joint of the stuffing box type, including rubber gasket, cast-iron gland, and tee-head bolts and nuts to affect the seal. All joints shall conform to ANSI Standard A21.11 (AWWAC-111).

Flanged joints shall conform to ANSI Standard 816.1.

Where restrained joints are required, fittings may be manufactured with U.S. Pipe TR Flex, Griffin “Snap Lok” or Pacific States Restrained Joint. In addition, Mega-Lugs may be used.

Bell and socket joints shall be in accordance with ANSI A21.10 and equal to U.S. Pipe "Usiflex".

Standard thickness cement mortar lining shall be in accordance with ANSI Standard A21.4 (AWWA C-104).

The Contractor shall furnish certification from the manufacturer of the pipe and gasket being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of this standard.

3. GALVANIZED IRON PIPE AND FITTINGS .

Where galvanized iron pipe is specified, the pipe shall be standard weight, Schedule 40, steel pipe per Standard Specifications for black and hot dipped, zinc-coated (galvanized) welded and seamless steel pipe for ordinary uses (ASTM A- 120). Fittings shall be screwed malleable iron galvanized per USA Standard B16.3.

4. POLYETHYLENE PLASTIC SERVICE PIPE .

All material shall be as specified on the Standard Detail.

5. POLYETHYLENE PIPE ENCASEMENT .

Ductile iron pipe shall be encased with polyethylene encasement. Material and installation shall be in accordance with AWWA C105. Installation shall be in accordance with Method A or Method C.

6. DUCTILE IRON FITTINGS .

Ductile iron fittings shall be short body for pressure rating of 350 psi, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of ANSI Standard A21.10, A21.11, A21.53, B16.2 and B16.4.

Standard cement mortar lining in accordance with ANSI Standard A21.4 (AWWA C-104).

Rubber gaskets for push-on-joint (Tyton) or mechanical joint (M.J.) in accordance with USA Standard A.21.11 (AWWA C-111).

Where restrained joints are required, fittings may be manufactured with U. S. Pipe TR Flex, Griffin "Snap Lok" or Pacific States Restrained Joint. In addition, Mega-Lugs may be used.

Approved Couplers per standard detail shall be used when connection to asbestos cement pipe is required.

7. FIRE HYDRANTS .

Fire hydrants shall conform to AWWA Standard Specification C502.73 and be one of three types: Mueller Super Centurion 250, American B-62-B High Pressure or East Jordan Watermaster 5CD250 WITH 4” STORZ INTERGRATED. They shall be a rising stem compression-type which opens counterclockwise and closes with the pressure. All fire hydrants shall be new and manufactured within one year of installation.

The minimum main valve opening diameter shall be 5-1/4" unless otherwise specified. The hydrant seat and hydrant seat retaining ring shall be bronze. All external bolts, nuts and studs shall be cadmium plated in accordance with ASTM A165 Type HS or rust proofed by some other process approved by the District. Gaskets shall be of rubber composition.

Fire hydrants shall be equipped with one 4-1/2" pumper connection (National Standard Thread) with 4" Stortz Adapter and two 2-1/2" NST hose ports. Pentagon nuts or caps and operating stem shall measure.

1-1/4" point to flat and shall open by turning to the left. Nozzle shall be fitted with renewable bronze nipples locked in place.

Fire hydrants shall be installed in accordance with the Standard Details included with these Engineering Specifications. Fire hydrant ports are to be oriented as directed by the Fire Protection District having jurisdiction over said area.

The hydrants shall be painted with TWO COATS of RUST-OLEUM HIGH PERFOMANCE PROTECTIVE ENAMEL 7543 SAFETY YELLOW The tops of hydrants shall be painted with two coats of RUST-OLEUM HIGH PERFOMANCE PROTECTIVE ENAMEL as directed by the District in accordance with the following Snohomish County Fire Code coloring table:

Color	**Estimated Flow From Hydrant**
Safety Blue	1,500 gpm or greater
Safety Green	1,000 to 1,499 gpm
Safety Orange	500 to 999 gpm
Safety Red	Less than 500 gpm
Black	For drafting use only (hard suction/steamer port)
White	Cross on top of hydrant - for filling tankers only

See Hydrant Standard Detail Drawing for additional Specifications.

8. GATE VALVES, RESILIENT SEAT .

Gate valves shall conform to the requirements of AWWA Standard Specifications for gate valves for ordinary water works service No. C-500 and C-509, except as superseded by the following: They shall be iron body with epoxy coating inside, resilient seat rubber vulcanized to gate, or S.S. seat ring attached to disc with S.S. screws. The valves shall be non-rising stem, open to the left, and shall be equipped with standard 2" square operating nuts. Valves shall be equipped with "O-ring" packing. Valves to be American-SO "CRS", Waterous Series 500, Mueller resilient wedge or American Flow Control Series 2500 resilient wedge.

Gate valves utilizing hub ends with ductile iron or asbestos-cement pipe shall be installed with rubber gaskets to match the pipe end. Where PVC pipe is used, valves shown on the plans with

hub connections shall have hub connections designed specifically for use with PVC pipe or they shall have mechanical joints with adapting gaskets to accommodate PVC pipe.

All non-RSGV valves shall be ball valves approved by the District. Said valves shall be furnished with a slotted operator, and with an adapting 2" square operating nut (Ford Cat. QT-67) secured with a stainless-steel cotter pin.

9. BUTTERFLY VALVES .

Butterfly valves shall be Class 150 or 250, as required depending upon the local static and test pressure at the location the valves are to be installed. The valves shall be equal to Dresser "450" or Pratt "Groundhog" and shall meet or exceed all strength requirements of AWWA C-504-70, except that certain deviations in the construction details of the valve seats and shaft seals will be considered by the District. The valves shall withstand test pressures in the closed position at two times the local static pressure or 200 psi minimum, whichever is greater.

Valve shafts shall meet or exceed the strength requirements of AWWA C-504-70 and be one-piece. Packing shall be "O-ring" except the District will review other types of packing for possible approval.

Butterfly valves to be installed underground shall have sealed mechanical operators and 2" standard square operating nuts.

Complete manufacturer's Specifications for the valves proposed for use shall be submitted to the District for approval.

No valves shall be used which have not been approved by the District.

10. VALVE BOXES .

Valve boxes shall be cast iron with adjustable sections equal to DISTRICT LOGO LID EAST JORDAN MANUFACTURER FOR TOP AND BOTTOM SECTION AS IDENTIFIED IN THE STANDARD DETAIL, and regular 30" base section or base section as required. Set valve box top on 2” ETHAFOAM 220 Polyethylene Foam (Typical)

11. VALVE AND BLOW-OFF MARKERS .

Markers for valves and blow-offs shall be "Carsonite -CRM3 072" or approved equal. Markers shall be 3-3/4" total width with a minimum length of 66". Markers shall be BLUE-08 and shall include 3" x 3" hi-intensity white reflective sheeting, a "CWV-116 - caution water valve" decal and a prong at the base to prevent pull-out. Installed with CRM Post Driver.

Valve markers shall be **stenciled** with the letter "V" and lettering indicating valve size and distance in feet and inches to the valve on the face of the marker. Lettering shall be **stenciled** with approved permanent black marker, paint or industrial decals and shall be 2 inches high.

Blow-off assembly markers shall be **stenciled** with the letters "B.O." and lettering indicating distance in feet and inches to the blow-off on the face of the marker. Lettering shall be **stenciled** with approved permanent black marker, paint or industrial decals and shall be 2 inches high.

See the Standard Detail Drawings for additional Specifications.

12. FIRE HYDRANT GUARD POSTS .

Concrete fire hydrant guard posts shall be made of precast reinforced concrete, nine (9) inches in diameter, six (6) feet long (MIN), See District Standard Detail.

13. METER BOXES .

Services with 5/8" x 3/4"meter, 3/4" meter, 1" meter, 1-1/2" meter or 2" meter. See District Standard Detail for box type, lid type, service type and size. NOTE THAT ALL METER LIDS ARE TO HAVE CVWD LOGO.

14. SERVICE SADDLES .

a. Ductile Iron Pipe and Asbestos Cement (AC) Pipe .

For 1" standard service, saddle shall be single stainless-steel strap equal to Romac Industries, Inc., Style 101S.

b. PVC pipe .

For 1" standard service, saddle shall be single stainless-steel strap equal to Ford S 90. When the District has preapproved installation.

15. SERVICE MATERIALS .

All small size valves, pipe and fittings to be as specified on the Standard Details or its equal approved by the District.

16. RESIDENTIAL DOMESTIC AND FIRE SPRINKLER SERVICES .

Combination service for residential domestic and fire sprinkler systems shall be according to the Standard Detail.

17. BACKFLOW ASSEMBL IES.

All backflow assemblies required shall be in compliance with the District Cross Connection Control Policy and District Standards. Commercial, Industrial, school, or other building upgrades are required to install a Reduce Pressure Backflow Assembly per the District's Cross Connection Control Policy.

18. BLOW-OFFS .

2" Blow-offs shall be installed for 12" diameter pipe and smaller in accordance with the standard detail. Blow-offs for pipe larger than 12" in diameter shall be as directed by the District.

19. PRESSURE REDUCING VALVE S.

The Developer shall install pressure reducing valves if necessary at their expense unless agreed otherwise prior to the District signing the Developer Extension Agreement. The PRV shall be located “downstream” of the meter. The Contractor shall be responsible for the proper installation and the property owner shall be responsible for the operation of the valve. All PRVs larger than 2” require District approval.

20. PRESSURE REDUCING VALVE STATIONS.

The District’s standard detail for pressure reducing valve stations is with GC Systems. The Developer will be required to install this pressure reducing valve station at their expense unless agreed upon prior to the District signing the Developer Extension Agreement.

METHODS OF CONSTRUCTION

1. GENERAL.

A pre-construction conference will be held at the District office prior to the start of construction.

The Contractor shall notify the District and the District's Engineer at least 72 hours in advance of contemplated construction to allow for field staking the pipeline and checking of materials to be used on the job.

Except as otherwise noted herein, all work shall be accomplished with adopted standards of Cross Valley Water District and as recommended in applicable American Waterworks Association (AWWA) specifications and according to the recommendations of the manufacturer of the material or equipment used. Contractor performing actual construction shall have a copy of the specifications on the jobsite at all times.

2. ALIGNMENT.

Unless otherwise specified, the location of the water mains, valves, hydrants, and principal fittings will be staked out by the Engineer, upon 72-hour notice by the Contractor.

Prior to construction staking any water mains by the District Engineers, the Developer's Engineer or Surveyor shall have provided a minimum of three (3) horizontal control points and a minimum of three (3) vertical control points in the form of either road centerline stakes, property stakes, or easement centerline stakes, the necessary lot corners and easement centerline stakes and center of cul-de-sacs.

The Engineer may elect to stake the entire job; however, in no event will he stake less than the entire job or one full field crew day in advance of construction. Pipe shall be laid closely to specified alignment. The centerline of proposed water main location will be staked. Alignment deviation is not to exceed 0.5 feet. Replacement of stakes lost or destroyed shall be made at the Contractor's expense and in accordance with the Contract Plans. Contractor shall provide a limed line between stakes for trench centerline.

3. TRENCH EXCAVATION.

Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the property owner or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the Contractor. The Contractor shall be responsible for locating all existing utilities well enough in advance of the excavation to prevent damage during construction. The Contractor shall be responsible for any damage whatsoever resulting from his operations on the project. Trenches shall be excavated to the line and depth so all the new pipelines constructed shall have not less than three (3) feet or in excess of five (5) feet of cover, measured from the top of the pipe to the approved finish grade. If a grade revision is made, the cover over the water main must remain within these limits; otherwise, the water main shall be reconstructed.

All added costs of inspecting such water main reconstruction shall be charged to the Contractor.

The excavation shall be made in a straight grade through localized breaks in grade. The excavation shall be deepened gradually at changes in the street grades so that there are no abrupt changes in pipeline grade.

Except for unusual circumstances where approved by the Engineer, 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. The minimum trench width at the top of the pipe shall normally be the outside diameter of the pipe barrel plus 16 inches. The top width of the trench shall not exceed the outside diameter of the pipe plus 36 inches. The trench shall be kept free from water until jointing is complete. Surface water shall be diverted so as not to enter the trench. The Contractor shall maintain sufficient pumping equipment on the job to ensure that these provisions are carried out. Gravel required in the bottom of the trench due to action of weather or workmen shall be furnished by the Contractor. The Contractor shall perform all excavation of every description and of whatever substance encountered and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the new width of the trench and to a depth 6 inches below water main grade. Where material is removed from below water main grade, the trench shall be backfilled to grade with material satisfactory to the Engineer and thoroughly compacted.

Trenching operations shall not proceed more than 500 feet in advance of pipe laying, except with written approval of the District.

When trenching operations cut through concrete pavement, the pavement shall be removed to a width of 18 inches greater than the top width of the trench. The concrete shall be cut on a straight line and shall be beveled so that the cut will be approximately 1 inch wider at the top than at the bottom. Asphalt paving shall be cut ahead of the trenching equipment to prevent excessive tearing up of the surfacing and to eliminate ragged edges.

All trenching operations shall be performed in strict compliance with applicable Federal, State, local and industry safety regulations and requirements.

4. TIMBERING AND SHEETING .

The Contractor shall provide and install hydraulic jacks, trench boxes, and timbering and sheeting as necessary to protect workmen, the work, and existing buildings, utilities and other properties. All timbering and sheeting above the pipe shall be removed prior to backfilling. All sheeting below the top of the pipe shall be cut off and left in place.

Removal of timbering shall be accomplished in such a manner that there will be no damage to the work or to other properties. All timbering and sheeting shall be to the Contractor's design and the cost of installing and removing timbering and sheeting shall be included in the bid price of trenching and backfilling.

5. TUNNELING .

Tunneling may be required by governmental agencies, utilities companies, or ordered by the Engineer under pavements or otherwise. Tunnels shall be not less than 4 feet high and 2 feet wide and not less than 1 foot wider than the outside diameter of the pipe. Tunnels shall be backfilled with materials acceptable to the Engineer and backfill shall be mechanically compacted. When tunneling is used under pavements, subsequent low-pressure grouting may be required.

6. HIGHWAY CROSSINGS .

The Contractor may use any method which provides satisfactory results and is acceptable to the Engineer and the governmental agency having control of the road, provided that the Contractor

restores the roadway to its original condition. Normally, highway crossings require the placing of a steel pipe casing by jacking or tunneling and laying the water main within this casing. Ductile iron pipe shall be used inside the casing and low-pressure grout shall be installed to seal end of casing.

7. LAYING OF PIPE .

All pipe shall be installed in accordance with these specifications and the instructions of the manufacturer subject to the approval of the Engineer. All pipe ends shall be square with the longitudinal axis of the pipe and any damage to the ends shall be cut off before installation, if approved by the Engineer. Where necessary to cut the pipe, the pipe shall be cut with approved cutting tools.

The pipe shall be laid in a straight grade through localized breaks in grade. The excavation shall be deepened gradually at changes in the street grades so that there are no abrupt changes in pipeline grade. To maintain the required alignment, use short lengths and deflect the joints or use necessary bends.

Each pipe section shall be carefully lowered into place in the ditch after inspecting it for defects and removing any gravel or dirt, etc., from the interior of the pipe.

When necessary, water mains to be constructed under other utilities shall meet the minimum cover requirements.

Where it is necessary to cross sanitary sewer or storm sewer trenches, all trench backfill shall be removed and replaced with mechanically compacted pit run material to provide a uniform support for the full length of the pipe.

Where it is necessary to cross an existing asbestos-cement water line, a minimum of 26 feet of the asbestos-cement pipe must be removed and replaced with ductile iron pipe or C-900 DR-18 of the same diameter. See detail SD-10

A 10-foot horizontal separation must be maintained between all sanitary sewer lines and water lines. A 6-foot minimum horizontal separation shall; be maintained between all water facilities and underground power and telephone facilities, unless otherwise approved.

All pipe shall be kept free of gravel, dirt and other contaminants. Temporary pipe plugs must be installed at all exposed pipe ends when the pipe is delivered, stored onsite, and at the end of each working day. The pipe plug must be a watertight, mechanical device, and shall be cleaned thoroughly prior to installation.

8. LAYING OF DUCTILE IRON PIPE .

Work shall be accomplished in accordance with AWWA Specifications and preceding Paragraph 7 Laying of Pipe.

9. LAYING OF GALVANIZED IRON PIPE .

The galvanized iron pipe and fittings shall be threaded. Joints shall be made up in accordance with good plumbing practice. All threads shall be coated with pipe thread sealer before connecting. All galvanized pipe shall require District approval prior to installation.

10. FOUNDATION, BEDDING AND BACKFILL GRAVEL .

Backfilling and surface restoration shall closely follow installation and testing of the pipe, so that no more than 500 feet of pipe is left exposed without express approval of the Engineer. Care shall be taken to ensure that the pipe and its protective coating are not damaged. No rocks or stones shall be permitted within 12" of the pipe. All foundation, bedding and backfill gravel shall be per the District standards Trench Backfill and Restoration or local agencies permitting requirements.

a. Foundation Gravel .

When required in areas of unsuitable trench bottom, foundation gravel shall consist of clean, granular material free from objectionable materials such as vegetable matter or other deleterious substances with at least 90 per cent coarse material ranging from 1" in diameter to 3" in diameter and 100 per cent 3" in diameter or less.

b. Bedding Gravel .

Rigid Pipe: Bedding material shall consist of 5/8" minus crushed rock or washed sand. The Contractor shall provide a sample of the proposed bedding material to the District for approval prior to construction.

Flexible Pipe: Bedding gravel shall be a clean sand/gravel mixture free from organic matter meeting the following gradation when tested in accordance with ASTM D422:

U.S. Standard Sieve Size	% Passing by Weight
3/4"	100
3/8"	70-100
No. 4	55-100
No. 10	35-95
No. 20	20-80
No. 40	10-55
No. 100	0-10
No. 200	0-3
Sand Equivalent	35 Minimum

The Contractor shall excavate for bedding material as described in Methods of Construction, Paragraph 3.

Bedding material shall be carefully placed and firmly compacted to provide a firm, uniform cradle for the pipe. The minimum thickness of the layer of bedding material required shall be 4 inches under the bell for all pipe sizes of 27 inches diameter and smaller, 6 inches for all pipe sizes 30 inches diameter and larger and 6 inches under the bell of the pipe for all diameter pipes where rock is excavated. To provide this firm, continuous support for the pipe, it is necessary to hand tap or "slice" bedding material solidly under the pipe.

After the pipe laying operation, additional bedding material shall be placed and compacted by hand tools for the full width of the trench to a height of 6" above the top of the water main.

c. Backfill Gravel .

Where excavated material is not approved for backfill, Gravel Base, Class B, conforming to the requirements of Section 9-03.10 of the State of Washington Standard Specifications for Road and Bridge Construction, or granular material commonly known as bank run gravel, shall be used as directed by the District and/or Engineer.

Bank run gravel shall be free from wood, roots, bark or other extraneous material. It shall have such characteristics of particle size and shape that it will compact readily to a firm, stable base.

The minimum size of stone shall not exceed that which will pass a 2-1/2 inch square sieve opening. Gradation shall be as follows: 25 per cent minimum passing 1/4 inch sieve; 10 per cent maximum passing U. S. No. 200 sieve; dust ratio 2/3 maximum; sand equivalent 30 minimum.

Prior approval for the use of a pit from which the Contractor and/or Developer desire to provide pit run material may be granted by the District and/or Engineer.

Where governmental agencies other than the owner have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having the jurisdiction.

11. TRENCH BACKFIL L.

It is assumed that existing excavated material will be suitable for trench backfill. If the excavated material is judged unsuitable by the District and/or permitting agencies, imported backfill gravel shall be furnished and placed.

In trench areas in the County, City or State right-of-way under the present traveled area of asphalt, at street crossing and under driveways serving residences or commercial establishments, 5/8" minus crushed rock or pit-run backfill gravel shall be furnished and placed as backfill as directed by the District.

All trench backfill shall be mechanically compacted to 95 percent standard density. No water jetting will be allowed.

Compaction testing may be required at the District's or Snohomish County's discretion. All trench backfill shall be per the District standards Trench Backfill and Restoration or local agencies permitting requirements.

12. CONCRETE BLOCKING .

Concrete blocking mix 1:2:4 shall be cast in place and have a minimum of 1/4 square foot bearing against the fitting and two square feet bearing area against undisturbed soil. Blocking shall bear against fittings only and shall be clear of joints so as to permit taking up or dismantling joint. All bends and tees shall be blocked in accordance with Standard Blocking Details. The Contractor shall install blocking which is adequate to withstand full test pressure as well as to continuously stand operating pressures under all conditions of service. For concrete blocking based on 250 psi test pressure with safe soil bearing load of 2,500 pounds per square foot, see Standard Detail.

13. FIRE HYDRANTINSTALLATION .

Fire hydrant shall be set as shown in the Standard Detail. Mega-lugs shall be used to restrain the ductile iron pipe between the hydrant foot and the 6" hydrant valve.

The location of the fire hydrant shall be shown on the plans to determine length of hydrant run required. The hydrant shall be set on a solid concrete block 4"x8"x16" and a minimum of 7 cubic feet of clean gravel shall be placed around the base of the hydrant for a drain pocket.

Fire hydrant ports are to be oriented as directed by the Fire Protection District having jurisdiction over said area.

In some instances, it may be necessary to make a cut or provide a fill to set a hydrant. Where this occurs, the area for at least a three (3) foot radius around the hydrant shall be graded and leveled, and the cut slopes or fill slopes shall be neatly graded by hand, unless otherwise approved by the District and the Fire Chief.

No tool other than an approved hydrant operating wrench shall be used when operating hydrants.

Fire hydrants shall be painted as defined in Section 7, Fire Hydrant materials and on the Districts standard.

Stencil on the face of the hydrant barrel with 2" black contrasting letters, the distance from hydrant to the gate valve in feet and inches.

14. GUARD POST INSTALLATION .

Fire hydrant guard post shall be installed as directed by the District. Guard Posts to be installed per the standard detail and painted two coats as defined in section 7 Fire Hydrant materials safety yellow.

Guard post for air and vacuum valve riser shall be set as directed with top level within top of return bend and shall be painted. Guard posts shall be prime coated with Steelcote SR-53, heavy duty, brush-type or approved equal. The two (2) finishing coats of yellow paint shall be as defined in Section 7, Fire Hydrant Materials of Construction.

15. VALVE AND BLOW-OFF MARKER INSTALLATION .

Markers for all valves and blow-offs shall be placed as directed, situated in a safe and reasonably conspicuous location, and set so as to leave 30" exposed above grade.

Markers shall be in accordance with the Standard Details and The Materials of Construction section of these specifications. Each valve shall have a marker.

16. GATE VALVE INSTALLATION .

Gate valves shall be set in the ground vertically and shall be opened and shut under pressure to check operation and, at the same time, show no leakage. Valves that are not flanged to other fittings shall be blocked in accordance with the Standard Blocking Details.

Gate valves utilizing hub ends with ductile iron pipe shall be installed with rubber gaskets to match the pipe end. Where PVC pipe is used, valves shown on the plans with hub connections shall

have hub connections designed specifically for use with PVC pipe or they shall have mechanical joints with adapting gaskets to accommodate PVC pipe.

All non-RSGV valves shall be ball valves approved by the District.

17. BUTTERFLY VALVE INSTALLATION .

Butterfly valves shall be installed and tested in the same manner as gate vales.

18. VALVE BOX INSTALLATION .

Valve boxes shall be set flush in pavement and in gravel shoulder and, in unimproved roadway.

An asphalt or concrete pad for the valve box shall be constructed according to the Standard Detail. The asphalt or concrete pad shall be provided for all valves, unless otherwise directed.

19. AIR AND VACUUM RELEASE VALVE INSTALLATION .

Air and vacuum release valve assembly shall be installed as shown on the Standard Detail.

Location of the air release valves shall be at the high points of the line. Water line must be constructed so that the air release valve may be installed in a convenient location.

20. 2" BLOW-OFF INSTALLATION .

2" Blow-offs shall be installed for 12" diameter pipe and smaller in accordance with the Standard Detail. Blow-offs for pipe larger than 12" in diameter shall be as directed by the District.

21. LOCATING WIRE .

All water mains and side services installed shall have 14-gauge solid copper wire with neoprene coating placed in the trench over the water main and the ends brought up into the valve boxes. Said locating wire shall also be placed over the water service line and brought up into the meter box. All connections or splicing shall be made with Copper Split Bolt Wire Connectors, Catalog # S8* Range 16 str. - 8 str.

22. WATER SERVICE INSTALLATION .

All service installation shall be per Standard Detail.

23. CONNECTION TO EXISTING WATER MAIN .

The Contractor shall not operate any gate valves or make any connections to the existing water main without prior approval of the District.

The Contractor shall make the necessary arrangements with the District for the connection to the existing water main. The District may elect to furnish the materials, equipment, and labor necessary for making the connection and the Contractor shall pay the District all costs for the connection. In the event the District does not elect to make the connection, they may authorize the Contractor to furnish the District Approved materials, equipment and labor necessary for making the connection under the supervision of the District.

All material used for the connection shall be thoroughly sterilized by swabbing the interior with a chlorine solution of 50 ppm.

The District reserves the right to delay or reschedule the connection dependent upon on the weather and staff availability to previous scheduled work Example: larger mains cannot be taken out of service between June 1 and September 15, due to hot weather and demand on the water system.

24. HYDROSTATIC TESTS .

After backfilling the completed water main, including all services, setters, fire hydrants and any other connections to the main (unless instructed by the District) with sufficient dirt to prevent movement of the pipeline, allowing sufficient time for the concrete blocking to set, the water main shall be tested in convenient lengths as so ordered and when ordered by the District. In general, new mains shall be tested between valves and large sections of untested main will not be permitted to accumulate.

The pipeline shall be filled with water slowly and all air expelled from the pipeline prior to starting the test. All pipelines shall be tested at a hydrostatic pressure of 200 psi at high point or two times static pressure, whichever is greater. All necessary pump, valves, meter gauges, piping, hose and labor required shall be furnished by the Contractor.

The pressure tests shall be performed in the following manner:

Water shall be pumped into the main, bringing the pressure in the main up to the required test pressure. After a period of one hour, water shall again be pumped into the main to bring the pressure up to the required test pressure and the quantity of water used during the test shall be accurately measured through a standard water service meter with a sweep unit hand that registers one gallon per revolution. The meter shall be approved by the Engineer prior to any testing. The allowable water consumption shall not exceed the quantities as shown in the following table.

All visible leakage shall be corrected and all new valves installed under these specifications shall be tight.

Any pressure drop during the test period shall not be abrupt under any circumstances and the Engineers shall be the sole judge as to whether the pressure drop is acceptable for the conditions existing in the pipeline being tested.

Whenever repairs or corrections are necessary, the pressure test shall be repeated to provide acceptability.

Pipe Size	**Allowable Water Leakage - Gallons per hour/1,000 feet of pipe**
2”	0.21
4”	0.42

6”	0.63
8”	0.84
12”	1.26
16”	1.68
18”	1.89
Larger Sizes	As determined by Engineer

25. HAZARD OF ASBESTOS CEMENT PIPE REMOVAL .

To remove existing asbestos cement pipe from the trench, a fee and permit is required from the Puget Sound Air Pollution Control Agency. In addition, Washington State Department of Labor and Industries requires the operators removing asbestos be certified.

26. STERILIZATION AND FLUSHING OF WATER MAI N.

Before being placed in service, all new water mains and repaired portions of, or extensions to, existing mains shall be chlorinated, and a satisfactory bacteriological report obtained. The District will pass on the results of the bacteriological test.

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap shall be provided large enough to develop a velocity of at least 2.5 fps in the main.

Water supply for filling, testing and flushing of the new mains will be available from the existing distribution system. The Contractor shall make arrangements with the District for the necessary flushing of the pipeline. Opening of valves and use of water from the District's system will be done by the District.

Taps required by the Contractor for temporary or permanent release of air, chlorination or flushing purposes shall be provided by the Contractor as a part of the construction of water mains.

Where dry calcium hypochlorite is used for disinfection of the pipe, flushing shall be done after disinfection.

a. Dechlorination and Disposal of Treated Water .

The Contractor shall be responsible for disposal of treated water flushed from mains and shall neutralize the wastewater for protection of aquatic life in the receiving water before disposal into any natural drainage channel. The Contractor shall be responsible for disposing of disinfecting solution to the satisfaction of State and local authorities.

b. Requirement of Chlorine .

Before being placed into service, all new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than 10 ppm remains in the water after standing 24 hours in the pipe.

The initial chlorine content of the water shall be not less than 50 parts per million.

c. Form of Applied Chlorine .

Chlorine shall be applied by one of the methods which follow, to give a dosage of not less than 50 ppm of available chlorine.

d. Dry Calcium Hypochlorite .

As each length of pipe is laid, sufficient high test calcium hypochlorite (65-70% chlorine) shall be placed in the pipe to yield a dosage of not less than 50 ppm available chlorine, calculated on the volume of the water which the pipe and appurtenances will contain.

The number of ounces of 65% test calcium hypochlorite required for a 20-foot length of pipe equals 0.008431D2, in which "D" is the diameter in inches.

e. Liquid Chlorine .

A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solution of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

f. Chlorine-Bearing Compounds in Water .

A mixture of water and high-test calcium hypochlorite (65-70% Cl) may be substituted for the chlorine gas-water mixture. The dry powder shall first be mixed as a paste and then thinned to a 1 per cent chlorine solution by adding water to give a total quantity of 7.5 gallons of water per pound of dry powder.

This solution shall be injected in one end of the section of main to be disinfected while filling the main with water.

g. Sodium Hypochlorite .

Sodium hypochlorite, commercial grade (15% Cl) or in the form of liquid household bleach (5% Cl) may be substituted for the chlorine gas-water mixture.

This liquid chlorine compound may be used full strength or diluted with water and injected into the main in correct proportion to the fill water so that dosage applied to the water will be at least 50 ppm.

h. Point of Application .

The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it and through a corporate stop inserted in the horizontal axis of the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of application may be used when approved or directed by the Engineer.

i. Rate of Application .

Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly laid pipeline during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion to the rate of water entering the newly laid pipe that the dosage applied to the water will be at least 50 parts per million.

j. Preventing Reverse Flow .

No connection shall be made between the exiting distribution system and pipelines not disinfected constructed under this contract without a State Department of Social and Health Services' approved backflow preventer installed in the connecting line.

k. Retention Period .

Treated water shall be retained in the pipe for a minimum of 24 hours and a maximum of 48 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 10 parts per million.

I. Chlorinating Valves and Hydrants .

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

m. Chlorinating Connections to Existing Water Mains and Water Service Connections .

The chlorinating procedure to be followed shall be as specified in Section 11 of the AWWA C602. All closure fittings shall be swabbed with a very strong chlorine solution.

n. Final Flushing and Testing .

Following chlorination, all treated water shall be flushed from the newly laid pipe until the replacement water throughout its length shows, upon test, the absence of chlorine. In the event chlorine is normally used in the source of supply, then these tests shall show a residual not in excess of that carried in the system.

Before placing the lines into service, a satisfactory report shall be received from the local or State Health Department on samples collected from representative points in the new system. If a chlorine residual is present, the samples must be collected in specially treated bottles. Sample bottles and/or instructions shall be obtained by the Contractor from the laboratory where the samples will be tested. The Contractor shall collect all samples of the bacteriological tests under direct supervision of the Engineer.

o. Repetition of Flushing and Testing .

Should the initial treatment result in an unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory test shall be considered as failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main.

27. REPLACING ROAD SURFACING .

The Contractor shall restore all roadway and driveway surfaces excavated or disturbed to a condition acceptable to the District and the governmental agency having control of the road.

All work in County right-of-way shall be subject to the approval of the Snohomish County Engineer.

All work in the City Street right-of-way shall be subject to approval of the City Engineer.

Paving restoration consists of two steps. The first step is installation of a temporary cold mix patch to be maintained until all work and other restoration is complete. The second step is installation and sealing of the permanent pavement trench patch.

This work shall consist of the preparation, placing and compaction of subgrade and the patching of various types of pavement cuts to the complete resurfacing of roadways, the performance of which shall be in accordance with the requirements outlined herein.

Roadway surface restoration and patching shall be in accordance with the Standard Specifications of the State of Washington, Department of Highways, unless specifically directed otherwise by the District and/or the Engineer.

Before patching material is placed, all pavement cuts shall be trued so that marginal lines of the patch will form a rectangle with straight edges and vertical faces a minimum of one (1) foot back from the maximum trench width.

Proper signs, barricades, lights and other warning devices shall be maintained 24 hours of the day until the patch is completed and ready for traffic.

a. Crushed Surfacing .

Crushed surfacing material shall be 1-1/4" and 5/8" minus crushed gravel and shall be manufactured from ledge rock, talus or gravel in accordance with the provisions of Section 9-03.9(3) of the WSDOT Standard Specifications.

All crushed surfacing top course shall be placed in accordance with the requirements of Sections 4-04.1 through 4-04.4 of the WSDOT Standard Specifications.

b. Gravel Base .

All gravel base shall conform to the requirements of Section 9-03.10 of the WSDOT Standard Specifications. Gravel base shall be spread as directed by the Engineer during construction and compacted in accordance with the requirements of the Department of Highways Specifications before material for succeeding course is spread. Gravel base shall be used for a base material and for the select backfill of trenches in the event that the excavated material is unsuitable for backfill.

Gravel base shall be used as shown on the plans and as directed by the District and/or the Engineer.

c. Asphalt Concrete Surfacing .

Asphalt concrete surfacing or repair shall be asphalt concrete pavement, Class “B”, and shall conform to Section 5-04.1 through 5-04.4, of the WSDOT Standard Specifications, and the Standard Specification Drawing for Permanent Asphalt Concrete Patch. All edges and joints of asphalt concrete pavement repair shall be sealed with asphalt cement. After pavement is in place, all joints shall be sealed with SS-1, or equal.

d. Cement Concrete Pavement .

Concrete shall conform with and shall be placed in accordance with Section 5-05.1 through 5-05.4, and Section 5-05.5(1) of the WSDOT Standard Specifications and shall be Class "B" and shall be furnished only by manufacturers who are members of the Portland Cement Association. Concrete cylinder samples will be taken by the Engineer for the purpose of testing the compressive strength of the concrete. The concrete shall be five (5) sack "High Early" cement mix. Subgrades shall be prepared as shown on the plans and in compliance with the WSDOT Standard Specifications.

All reinforcing steel shall conform with and be placed in accordance with Section 5-05 of the WSDOT Standard Specifications and shall conform to the requirements of ASTM Designation A-615 and A-616 and A-617, latest revisions.

e. Rigid-Type Pavements Resurfaced with Asphalt Concrete .

Those areas that now have a Portland cement concrete base and are surfaced with the asphalt concrete mat shall be replaced in kind. The base shall be five (5) sack mix using "High Early" cement. The surface of the cement concrete portion of the patch shall be left low enough to accommodate the asphalt portion of the patch. Brush finishing will not be required. Joints shall be placed if directed by the District and/or Engineer. The asphalt concrete surface mat to be placed over the Portland cement concrete base shall be Class "B" as designated by the WSDOT Standard Specifications. Both the base and the surface mat shall be carefully prepared, placed and cured in full compliance with Section 5-04.3 of the WSDOT Standard Specifications.

Asphalt concrete or bituminous plant mix shall not be placed until the day after the cement concrete has been placed unless otherwise permitted by the District and/or the Engineer. The edges of the existing asphalt pavements and castings shall be painted with hot asphalt cement or asphalt emulsion immediately before placing the asphalt patching material. The asphalt concrete pavement shall then be placed, leveled and compacted to conform to the adjacent paved surface. Immediately thereafter, all joints between the new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies.

f. Shoulder, Gravel Surfaces .

Shoulders, gravel driveways, and all other gravel surfaced areas shall be repaired as detailed on the plans, with a 2-inch lift of 5/8 inch minus crushed rock. Immediately prior to placement of the gravel, the drainage ditch, shoulders and/or driveways shall be graded to the original smooth contours existing prior to the construction of water lines in the area. The gravel shall then be placed and compacted in accordance with the applicable WSDOT Standard Specifications.

28. LANDSCAPING, LAWN REMOVAL AND REPLACEMENT OR RESEEDING .

In the event construction is to be carried out in area which are landscaped, appropriate measures shall be taken to restore such areas to conditions existing prior to construction. Such measures shall include, but not be limited to, sod removal and replacement or reseeding and replanting, subject to the approval of the property owner and/or the District.

a. Lawn Removal and Replacement .

The area of sod to be removed shall be laid out in squares or strips of such size as to provide easy handling and matching. The sod shall then be carefully cut along these lines to a depth of four (4) inches taking care to keep all cuts straight and cut all strips to the same width. After the sod has been cut vertically, it shall be removed to a uniform depth of approximately three (3) inches with an approved type of sod cutter. This operation shall be performed in such a manner as to insure uniform thickness of sod throughout the operation.

As the sod stripping proceeds, the sod strips shall be placed in neat piles at convenient locations and, from then on, they shall be maintained in a damp condition continuously until the sod strips are replaced on the lawn. In no case shall the sod remain in piles longer than ten (10) days before replacement on the lawn.

Prior to replacing the strips of sod, the stripped area shall be carefully shaped to proper grade and be thoroughly compacted. Wherever the construction operations have resulted in the placement of unsuitable or poorer soils in the area to be resodded, the surface shall be left low and covered with a minimum of four (4) inches of topsoil.

All tools used shall be of the type specially designed for the work and be satisfactory to the District and/or the Engineer.

b. Grass Reseeding .

When the grass is required to be reseeded, it shall be performed in the following manner: After the pipeline has been backfilled and compacted, tested and approved, the Contractor shall excavate and place a minimum of four (4) inches of an approved topsoil for the full width of the area being repaired.

The soil shall be fertilized prior to seeding using a commercial grade 6-10-4 consisting of 6# nitrogen, 10# phosphate and 4# potash per 100# of fertilizer. It shall be dry, free-flowing and applied at the rate of 20.0# per 1,000 square feet with a lawn type spreader. This fertilizer shall then be raked into the top two (2) inches of compacted topsoil.

Seed shall be applied after the fertilizer and shall be raked into the top one (1) inch of the fertilized topsoil. The seed shall be applied with a lawn type spreader at the rate of 5.0# per 1,000 square feet. The seed mix shall consist of the following proportions:

Kentucky Bluegrass (24# Bushel).....50% by Weight

Creeping Red Fescue, Certified.....40% by Weight

White Clover (99% Purity, 90% Germination)....10% by Weight

Immediately following the raking of the seed into the soil, the total area shall be covered with horticultural grade sun-dried peat moss, "HI-PRESS", or approved equal, applied with a lawn type spreader at the rate of 70# per 800 square feet. This material shall not be raked into the topsoil but shall be rolled with a water- filled roller. The seeded and prepared area shall then be kept continuously moist until the grass .is two (2) inches high. Water shall be furnished by the Contractor. The Contractor shall be responsible for providing a finished grass area which meets the approval of the District and/or permitting agency until such time that the grass is two (2) inches high and all work shall be performed by an experienced landscape gardener.

29. EROSION AND SEDIMENT CONTROL .

The Contractor shall install and maintain erosion and sediment control measures in conformance with Snohomish County requirements, industry standard Best Management Practices and the requirements included in the project grading, storm drainage and T.E.S.C Plans and specifications.

Erosion and sediment control measures shall be in place prior to beginning water main construction and shall be maintained until removal is allowed by Snohomish County and the District.