

GENERAL ENGINEERING SPECIFICATIONS

MATERIALS OF CONSTRUCTION

1.	General	GE - 1
2.	Ductile Iron Pipe	GE - 1
3.	Galvanized Iron Pipe and Fittings	GE - 1
4.	Water Service Material	GE - 2
5.	Polyethylene Pipe Encasement	GE - 2
6.	Ductile Iron Fittings	GE - 2
7.	Fire Hydrants	GE - 2
8.	Gate Valves, Resilient Seat	GE - 3
9.	Butterfly Valves	GE - 3
10.	Valve Boxes	GE - 4
11.	Concrete Marker Posts	GE - 4
12.	Fire Hydrant Guard Posts	GE - 4
13.	Meter Boxes	GE - 4
14.	Service Materials	GE - 4

METHODS OF CONSTRUCTION

1.	General	GE - 5
2.	Alignment	GE - 5
3.	Clearing and Grubbing	GE - 5
4.	Trench Excavation	GE - 6
5.	Dewatering and Control of Water	GE - 7
6.	Timbering and Sheeting	GE - 8
7.	Tunneling	GE - 8
8.	Highway Crossings	GE - 8

9.	Laying of Pipe	GE - 8
10.	Laying of Galvanized Iron Pipe	GE - 9
11.	Foundation, Bedding and Backfill Gravel	GE - 9
12.	Trench Backfill	GE - 11
13.	Concrete Blocking	GE - 11
14.	Fire Hydrant Installation	GE - 11
15.	Guard Post Installation	GE - 12
16.	Marker Post Installation	GE - 12
17.	Gate Valve Installation	GE - 13
18.	Butterfly Valve Installation	GE - 13
19.	Valve Box Installation	GE - 13
20.	Air and Vacuum Release Valve Installation	GE - 13
21.	2" Blow-Off Installation	GE - 13
22.	Locating Wire	GE - 13
23.	Water Service Installation	GE - 13
24.	Connection to Existing Water Main	GE - 13
25.	Hydrostatic Tests	GE - 14
26.	Hazard of Asbestos Cement Pipe Removal	GE - 15
27.	Sterilization and Flushing of Water Main	GE - 15
28.	Replacing Road Surfacing	GE - 15
29.	Landscaping, Lawn Removal and Replacement or Reseeding	GE - 17

General Engineering Specifications - Material of Construction

1. General

The type and class of materials to be used shall be as shown on the project plans and as 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.

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

All reference specifications herein shall be of the latest revision.

2. Ductile Iron Pipe

Ductile iron pipe shall be new, Class 52, cement-lined, conforming to ANSI Standard A21.51 (AWWA C-151). Polyethylene encased, restrained-joint ductile iron pipe may be used if needed or wanted.

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 effect 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 effect the seal. All joints shall conform to ANSI Standard A21.11 (AWWA C-111).

Flanged joint shall conform to ANSI Standard B16.1.

Internally-locked joints shall be in accordance with ANSI A21.11 and equal to U.S. Pipe TR Flex or Griffin 'Snap Lok'.

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, for blow-offs and air vacuum relief only, 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. Water Service Material

1" diameter service line, from main to meter shall be copper tubing conforming to the requirements of ASTM B 88, Type K, annealed. The tubing shall be coupled using compression fittings, conforming to the requirements of AWWA C800, minimum 150 psi working pressure. See also Standard Detail Sheet No. 12.

1-1/2" or 2" diameter service line from main to meter shall be polyethylene plastic tubing manufactured from all virgin material ultra high molecular weight polyethylene PE 3408 copper tube size outside diameter, minimum diameter wall thickness ratio DR 9 (AWWA C901), meeting ASTM D2737 with a pressure rating of 200 psi, from Phillips Company or equal with compression type fitting at joints. Insert stiffeners are required with pack joints equal to Ford 54 or 55. All HDPE shall have 14 gage locator wire. See also Standard Detail Sheet No. W-13.

Water meters shall be Badger Recordall Model 55 for 1", Model 120 for 1-1/2", and Model 170 for 2" water meters and shall register in cubic feet.

Sensus Radio Read Meters are required where specified on the plans for projects in former WD 45 area: IPERL for 1", SR2 for 3/4" and 1", Omni R2 and Omni C2 for 1.5" and 2"

5. Polyethylene Pipe Encasement

If specified, 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 withstanding working pressures of 150 psi and test pressures of 250 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 (MJ) in accordance with USA Standard A21.11 (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 to Mega-Lugs may be used.

7. Fire Hydrants

Fire hydrants shall be a breakway type and shall conform to AWWA Standard Specification C502.73 and be one of three types: M&H 929, M&H 129, or Mueller Centurion 250. The min. main valve opening diameter shall be 5 1/4". The hydrant seat and hydrant seat retaining lug 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" pumper connection with Seattle Standard 4.875" threads and two (2), 2 1/2" NST hose parts ("NST" stands for National Standard Thread). Pentagon nuts or caps and operating stem shall

measure 1¼" point-to-flat and shall open by turning to the left (counterclockwise). Nozzle shall be fitted with renewable bronze nipples locked in place.

A 5-inch Storz adapter with compatible female threads shall be installed on the 4.875" pumper port of all fire hydrants unless otherwise directed by the District. The adapter shall be constructed of high-strength aluminum alloy, have a Teflon coating on the seat and threads, and use a rubber gasket and set screws to secure it in place. The adapter shall be provided with an aluminum alloy pressure cap. The cap shall be attached to the fire hydrant barrel or Storz adapter with a cable to prevent loss or theft of the cap.

The fire hydrant shall be furnished with a 6" mechanical joint inlet connection, and shall include extensions, if necessary, for the depth of the cover on the main at each installation.

Vertical bends shall be installed in the 6" DI spool between the footvalve and the fire hydrant as directed by the District, if required to avoid conflict with existing utilities.

The fire hydrant shall be painted with two coats of **Sherwin Williams Sherkem fast dry metal finishing enamel, Color 8156-70319 FW Safety Yellow.**

Fire hydrants shall be installed in accordance with Standard Detail Sheet No. W-02. Fire hydrant ports are to be oriented as directed by the fire protection district having jurisdiction over said area.

8. Gate Valves, Resilient Seat

Gate valves shall conform with 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 as approved by the District only.

Gate valves utilizing hub ends with ductile iron or asbestos-cement pipe shall be installed with rubber gaskets to match the pipe end.

All 2" valves shall be as approved by the District. Valves 10" or larger shall be butterfly valves.

9. Butterfly Valves

Butterfly valves shall be Class 150 or better, with a working pressure rating of 150 psi, and test pressure rating of 150 psi, similar and equal to Dresser "450", Pratt "Groundhog" or as approved by the District and shall meet or exceed all requirements of AWWA C-504. All valves shall open by turning counterclockwise.

Valve shafts shall meet or exceed the strength requirements of AWWA C-504-70 and be one-piece. Packing shall be "O-ring" unless otherwise approved by the District.

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

Within shoulders valve box top & base section shall be Model 940 cast iron, adjustable sections with an 18" top section and regular 24" base section or base section and vertical extension as required. In pavement areas, top & base section shall be Model EJ iron 8555 with valve lid Model EJ Iron 6800. The valve box shall have the word "water" cast in raised letters.

11. Concrete Marker Posts

A concrete valve marker post shall be 4" minimum square section and a minimum length of 42", with beveled edges and containing at least one (1) 3/8" diameter bar of reinforcing steel. See also Standard Detail Sheet No. W-03.

12. Fire Hydrant Guard Posts

Fire hydrant guard posts shall be eight (8) inches in diameter, six (6) feet long, Class 52 Ductile Iron pipe filled with 2,500 psi concrete after placement. Posts shall be painted the same as the fire hydrant. See also Standard Detail Sheet No. W-03.

13. Meter Boxes

For 1" services:

The meter box shall be Mid States MSBCF 1324-12-XL Box and ductile iron lid with hinged read hole.

For 1 1/2" and 2" services:

The meter box shall be Mid States MSBCF 1730-12 box and ductile iron lid with hinged read hole.

14. Service Material

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

Section 4: General Engineering Specifications - 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 at least 72 hours in advance of contemplated construction to allow for checking field staking of the pipeline and for checking of materials to be used on the job.

Except as otherwise noted herein, all work shall be accomplished with adopted standards of King County Water District No. 20 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 Developer

Prior to construction staking any water mains the Developer 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 Developer 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. Stakes lost or destroyed shall be replaced by the Developer. in accordance with the Contract Plans.

3. Clearing and Grubbing

All clearing and grubbing shall consist of the removal of all trees, stumps, brush and debris and shall be confined within the limits of the easements obtained for the construction of this project and/or existing public rights-of-way. Removal of clearing and grubbing debris shall, in no way, constitute a hazard to the continuous operation of any existing utilities. Any damage to the existing utilities shall be repaired by the respective utility company, at the expense of the Contractor and/or developer.

Within the limits described, all vegetative growth, such as trees, shrubs, brush, logs, fences, upturned stumps and roots of down trees and other similar items, shall be removed and disposed of. All trees shall be felled within the area to be cleared. Where the tree limb structure interferes with utility wires or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility. Any damage which does occur shall be the responsibility of the Contractor and/or developer.

All fences adjoining any excavation or embankment that may be damaged or buried shall be carefully removed and temporarily erected on the adjoining property or stored for reinstallation as directed by the District.

No debris of any kind shall be deposited in any stream or body of water or in any street or alley.

Trees, shrubbery, and flower beds designated by the District shall be left in place and care shall be taken by the Contractor and/or Developer not to damage or injure such trees, shrubbery or flower beds by any of his operations.

The refuse resulting from the clearing operation shall be hauled to a waste site secured by the Contractor and shall be disposed of in such a manner as to meet all requirements of State, County and municipal regulations regarding health, safety and public welfare.

In no case, shall any material be left on the project, shoved onto abutting private properties, or be buried in embankments or water trenches on the project.

Clearing operations shall be carried out well in advance of the construction operations so as to permit a well-planned schedule of work.

Where ornamental trees exist in planting areas and are not to be removed, it shall be the Contractors responsibility to trim low limbs which will interfere with the normal operation of his equipment and paint or seal pruned areas with an approved pruning tar or paint. The trimming shall be performed in a professional manner by competent personnel prior to his machine operations and in such a manner as the District and/or the Engineer and/or the property owner may direct.

The Contractor and/or Developer shall be responsible for all damages to existing improvements resulting from his operations.

4. Trench Excavation

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 District, 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 insure 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 100 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.

5. Dewatering and Control of Water

The Contractor and/or Developer shall dewater and dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public.

The control of groundwater shall be such that softening of the bottom of excavations or formation of 'quick' conditions or 'boils' shall be prevented. Dewatering systems shall be designed and operated so as to prevent the removal of the natural soils.

During excavating, installing of pipelines and water service lines, placing of trench backfill and the placing and settling of concrete, excavations shall be kept free of water. The static water level shall be drawn down below the bottom of the excavation so as to maintain the undisturbed state of the natural soils and allow the placement of backfill to the required density. The dewatering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines and water service lines.

In carrying out the work within the limits of streams or an area that will drain into a stream during a rain event, the Contractor and/or Developer is required to comply with the regulations of the appropriate local, State and Federal agencies. Any isolated potholes remaining from the Contractor's and/or Developer's operations

shall be provided with open water channels in such a manner that there will be a direct drainage outlet at the lowest elevation of the pothole.

The Contractor and/or Developer shall contact the above referenced departments and secure such permits as may be necessary to cover his proposed method of operation within the areas described above. If no permit is necessary and if directed by the District and/or the Engineer, he should receive a letter from the appropriate agency.

6. 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.

7. Tunneling

Tunneling may be required by governmental agencies, utility 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.

8. 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.

9. 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 District. 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 District. 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.

A 10-foot horizontal separation must be maintained between all sanitary sewer lines and water lines. A 5-foot minimum horizontal separation shall be maintained between all water facilities and underground power and telephone facilities, unless otherwise approved.

10. Laying of Ductile Iron Pipe

Work shall be accomplished in accordance with AWWA Specifications and preceding Paragraph 9.

11. Foundation, Bedding & Backfill Gravel

Backfilling and surface restoration shall closely follow installation and testing of the pipe, so that no more than 100 feet of pipe is left exposed without express approval of the Engineer. Care shall be taken to insure that the pipe and its protective coating are not damaged. No rocks or stones shall be permitted within 12" of the pipe.

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 vegetative matter or other deleterious substances with at least 90 percent coarse material ranging from 1" in diameter to 3" in diameter and 100 percent 3" in diameter or less.

b. Bedding Gravel

Rigid Pipe: Bedding material shall consist of clean, granular manufactured pea gravel with the following gradation requirements:

U.S. Standard Sieve Size	% Passing by Weight
3/4"	100
3/8"	95 - 100
#8	0 - 10
No. 200	0 - 3
Sand Equivalent	50 Minimum

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 4.

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 tamp 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

Backfill gravel shall be 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 percent minimum passing 1/4 inch sieve; 10 percent maximum passing U.S. No. 200 sieve; dust ratio 2/3 maximum; sand equivalent 30 percent 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.

12. Trench Backfill

Imported backfill gravel shall be furnished and placed for trench backfill. Suitable native material will only be allowed for backfill on a case by case basis as specifically authorized by the District.

In trench areas in the Private or Public right-of-way under the present traveled area of asphalt, at street crossings and under driveways serving two or more residences, or under driveways serving commercial establishments, 1 1/4" crushed rock shall be furnished and placed as backfill gravel.

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

A minimum of (2) compaction tests shall be taken for each 200 linear feet of main line trench, or as directed by the District Inspector; one test at subgrade and one at 50% of trench depth.

13. 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 withstand operating pressures under all conditions of service.

14. Fire Hydrant Installation

Fire hydrants shall be as described in Materials of Construction Section 7, and shall be set as shown on Standard Detail Sheet No. W-02. Install vertical bends in the fire hydrant run where required to avoid conflicts with existing utilities. All pipe joints in the hydrant run shall be restrained with megalug joint restraints and locking gaskets or restrained joint pipe, regardless of pipe length. The installation of shackle rods is not permitted. The hydrant and gate valve must also have

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

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" x 8" x 16" and a minimum of 1/4 cubic yard of 1½" drain rock shall be placed around the base of the hydrant for a drain pocket.

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 Marshal.

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

When specified, the fire hydrant shall be painted with two coats of metal enamel, No. X3427, case yellow, quick set, manufactured by Farwest Paint Manufacturing Company.

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

See also Standard Detail Sheet No. W-02.

15. Guard Post Installation

Fire hydrant guard posts shall be as described in Materials of Construction, Section 12, and shall be installed as directed by the District. Guard posts shall be set with the top of the guard posts 2' - 6" from ground level. They shall be plumb, and where two posts are used at a hydrant, they shall be set with their tops at the same elevation. The exposed portion of each hydrant guard post shall be painted with two coats of enamel similar to that of the fire hydrant. Where hydrants are set in back of a concrete curb, guard posts will not be required.

16. Marker Post Installation

Concrete valve marker posts shall be Fog-Tite Meter Seal Co., Inc., standard valve marker, 42 inches long and shall be placed as directed, situated in a safe and reasonably conspicuous location, and set so as to leave 22" exposed above grade. The exposed portion of the marker posts shall be painted with a coat of approved exterior concrete paint, color as designated by the Owner, and then the size of the valve (for example, 6" G.V.) and the distance in feet and inches to the valve shall be **stenciled** with black paint on the face of the post using a stencil which will produce letters 2 inches high. Where valve boxes are set in asphalt-concrete pavement, valve marker posts will not be required.

The 2" blow-off assembly marker post shall be painted with a coat of approved exterior concrete paint and then the letter B.O. shall be **stenciled** with black paint on the face of the post, using a stencil which will produce letters 2 inches high.

17. 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 shall also 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.

All 2" valves shall be as approved by the District.

18. Butterfly Valve Installation

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

19. Valve Box Installation

Valve boxes shall be set flush in pavement and in gravel shoulder and, in unimproved roadway, install protective asphaltic concrete pad as shown in the Standard Details.

20. Air & Vacuum Release Valve Installation

Air and vacuum release valve assembly shall be installed as shown on Standard Detail Sheet No. W-07 and W-08.

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.

21. 2" Blow-off Installation

2" blow-off assemblies shall be installed as shown on Standard Detail Sheet No. W-06.

22. Locating Wire

Where specified, water mains, air vacuum relief, and water 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 Split Bolt Wire Connectors.

23. Water Service Installation

All service installation shall be per the Standard Detail Sheets and bedded in sand.

24. Connection to Existing Water Main

The Contractor shall not operate any valves or make any connections to the existing water main without prior approval of the District. Any unauthorized use of water or connection to the District's system, such as through a fire hydrant or other means shall be subject to a \$1,000.00 fine.

The Contractor shall make the necessary arrangements with the District for the connection to the existing water main. The Contractor shall make such notification in writing to the District at least seventy-two (72) hours prior to making the connection.

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

25. Hydrostatic Tests

After backfilling the water main between joints 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 250 psi for a minimum of 15 minutes. The pipeline will be considered acceptable if during the testing period there is a pressure drop of less than 5 psi. If a pressure drop greater than 5 psi occurs, the Contractor shall identify and correct the problem prior to retesting. All necessary pump, valves, meters gauges, piping, hose, and labor required shall be furnished by the Contractor.

The pressure tests may also 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 fifteen minutes, 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 District 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 mains installed under these specifications shall be tight.

Any pressure drop during the test period shall not be abrupt under any circumstances and the District 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 prove acceptability.

<u>Pipe Size</u>	<u>Allowable Water Consumption - Gallons per 15 minutes/1,000 feet of pipe</u>
4"	0.24
6"	0.36
8"	0.48
12"	0.71
16"	0.95

18"	1.07
20"	1.19
Larger Sizes	As determined by Engineer

26. 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.

The projects shall be completed by carefully disassembling existing AC pipe without saw cutting and the disassembled pipe left in the trench.

If the AC pipe is sawcut or removed from the trench, the Contractor shall be responsible for all fees and permits and work performed in accordance with requirements of the various agencies.

27. Sterilization & Flushing of Water Main

The pipeline shall be thoroughly sterilized by the Contractor. Sanitary test samples will be taken in accordance with State Health Department regulations. Re-sterilization will be required when unsatisfactory samples are encountered.

Water supply for filling, testing, and flushing of the new mains will be available from the existing distribution system.

The Contractor shall perform all flushing of the pipeline. The Contractor shall make arrangements with the District for the necessary flushing of the pipeline.

28. 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 King 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 Standard Specifications of the State of Washington Department of Highways.

All crushed surfacing shall be placed in accordance with the requirements of Sections 4.04.1-4 of the Standard Specifications of the State of Washington.

b. Gravel Base

All gravel base shall conform to the requirements of Section 9-03.10 Standard Specifications for the State of Washington, Department of Highways for Gravel Base, Class B. 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 hot mix asphalt class 1/2" PG64-22 and shall conform to Section 5-04 of the Standard Specifications of the State of Washington, Department of Highways, 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 of the Standard Specifications of the State of Washington, Department of Highways, 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 Standard Specifications of the State of Washington, Department of Highways.

All reinforcing steel shall conform with and be placed in accordance with Section 5-05 of the Standard Specifications of the State of Washington, Department of Highways, and shall conform to the requirements of ASTM Designation A-15 and A-305, 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 as designated by the Washington State Department of Highways as Class "B"; both the base and the surface mat shall be carefully prepared, placed and cured in full compliance with Section 5-05.3 of the Standard Specifications of the Washington State. Department of Highways.

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 State Highway Standard Specifications.

29. Landscaping, Lawn Removal & Replacement or Reseeding

In the event construction is to be carried out in areas 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 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# fl nitrogen, 10# phosphate and 4# potash per each 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 Owner until

such time that the grass is two (2) inches high and all work shall be performed by an experienced landscape gardener.