



CHAPTER 4 MINIMUM DESIGN CRITERIA

4.1 INTRODUCTION

Establishing realistic design criteria is paramount to evaluation of the existing water system's adequacy and planning for future water system improvements. Minimum design criteria for the Olympic View water system are in accordance with the standards and requirements put forth by the U.S. Environmental Protection Agency, the State Department of Health, Snohomish County, and the cities in which it operates.

Minimum design criteria addressed in this section include water supply requirements, storage volume, distribution system and transmission main capacity, and water quality standards. These criteria will be utilized to determine existing deficiencies in the water system and projected water system requirements for the planning area described previously in this document. These criteria are in addition to the District's guidelines for developer extensions to the system, and actual conditions set as part of the developer extension process take precedence over the criteria put forth herein.

4.2 STATE AGENCY REGULATIONS

Unless otherwise specified in this section, the State of Washington DOH (Department of Health) "Water System Design Manual" (December 2009) is the primary document governing the sizing and design of public water systems in the State of Washington. This publication sets the minimum system plan and reliability considerations. Criteria for distribution system design, water storage and daily supply requirements are summarized in this Section.

4.3 REFERENCE DATUM

The datum used for planning of facilities in this study and for District design work is based on the USC&GS (United States Coast and Geodetic Survey) Geodetic Mean Sea Level.

4.4 DESIGN PERIOD

In planning water facilities, it is necessary to design them to be adequate over a specific period of time. The period of design for this study is approximately 20 years. This means that in the year 2035, the facilities proposed in this study may have reached their maximum capacity, assuming that the population projections are reached. Many of the components of the water system, however, have much longer useful lives than 20 years and will continue to serve the community far beyond the design period.

In planning water facilities with capacities adequate for the next 20 years, facilities can be accomplished in phased segments according to need.



4.5 PLANNING CONSIDERATIONS

- Initial system construction and additions should conform to the comprehensive plan and projected service area.
- Public water systems should be designed to provide firefighting capability in accordance with the requirements of the jurisdiction(s) within which the utility operates.
- Phased development is permitted where full development will take several years.

4.6 RELIABILITY CONSIDERATIONS

- Multiple water sources are recommended in combination with adequate emergency reserve in gravity storage to allow for interruption of supply at one point, while still maintaining water supply to the system at the design rate.
- Pumping stations are to contain multiple booster pumps of sufficient capacity to meet the maximum day demands with the largest pump out of service.
- Auxiliary power is required where adequate gravity storage is not provided.

4.7 WATER SUPPLY REQUIREMENTS

- The Department of Health “Water System Design Manual” recommends, and the District requires, a source capacity that meets the maximum day demand while replenishing the standby storage volume within 72 hours of its depletion.

4.8 WATER PRESSURE

- Water systems shall be designed to provide an adequate quantity of water at a positive pressure of at least 30 psi under peak hour demand flow conditions, measured at any customer’s water meter.
- For fire flow, the distribution system shall be designed to provide the required fire flow at a residual pressure of 20 psi throughout the system during fire flows under peak hour flow conditions.

4.9 MATERIALS

- All materials used in the water distribution system shall be in accordance with the District’s Approved Materials List. Materials not listed on the District’s Approved Materials List must be approved by the District prior to use. All materials shall be installed in accordance with the installation procedures provided by the manufacturer.

4.10 PIPE SIZING

- Water main size shall be adequate to deliver required fire flows and the maximum day demand while maintaining minimum system pressures of 20 psi.
- Distribution systems are to be sized to provide peak hourly demand flow.



- Maximum velocity in distribution pipelines is not to exceed 10 feet per second under peak hour demand conditions.
- Minimum pipe diameter is 8 inches nominal inside diameter for dead-end mains serving hydrants and 6 inches for looped mains or as determined by the District based on hydraulic analysis. All pipelines shall be designed and constructed to ultimate domestic and fire flow conditions as determined by the District.
- Dead-end mains are generally not accepted by the District, except in phased development projects or where no potential for future interconnection of facilities exists. Approved dead-end mains that will not serve fire hydrants may be sized as hydraulically appropriate in residential areas and 8 inches in commercial areas.
- Pipe runs from main line to standard hydrants less than 50 feet in length must be a minimum of 6 inches in diameter. Pipe runs from main line to standard hydrants more than 50 feet in length must be a minimum of 8 inches in diameter.
- Minimum cover over pipes shall be 36 inches from top of pipe to the finished grade.
- Installation of piping and backfill materials shall be in accordance with the District's Standard Drawings and/or the District's Approved Materials List.
- Transmission and distribution pipelines shall be at least 10 horizontal feet from any existing or proposed waste disposal facilities. At crossings, a minimum of 18 inches of vertical separation shall be maintained between the top of a sewer main and the bottom of a water line. Separation between water and sanitary sewer pipelines shall be in accordance with the State Department of Ecology's "Criteria for Sewage Works Design" (August 2008), also referred to as the "Orange Book." Final approval of methods to be used should minimum piping separations not be met, will be determined by the District.
- Water source pumping facilities and storage facilities must be designed so that, in combination, they can supply the maximum instantaneous flow demand at any time in all parts of the system.
- Polyethylene encasing shall be utilized on all new piping installations. Soil samples may be required prior to final plan approval, at the District's discretion, to determine soil corrosiveness that may affect the life of the pipeline. Based on the soil sample results additional protection as determined by the District shall be installed.

4.11 SYSTEM CONNECTION – INFRASTRUCTURE TIE-INS

- New sections of water main must be flushed and disinfected in accordance with the District's Standard Drawings.
- A wet tap method in accordance with the District's Standard Drawings shall be used when tapping into the live water system.

4.12 VALVES

- Valves shall be installed in a configuration that permits isolation of lines.



- Valves should be installed at intersections with normal maximum spacing at 500 feet in commercial, industrial, and multi-family areas, 800 feet in residential areas, and 1/4 mile in transmission mains. Additional isolation valves may be required by the District and will be determined on a case-by-case basis.
- Air relief valves are to be installed, per District Standard Drawings, at appropriate points of high elevation in the system. All piping in the system shall be sloped to permit escape of any entrained air.
- Zone isolation valves shall be installed at pressure zone boundaries to permit future pressure zone realignment without the need for pipeline reconfiguration.
- A blow-off assembly or fire hydrant shall be installed on all dead-end runs and at designated points of low elevation to provide a means for adequate flushing of the system. The blow-off assembly shall be installed in a utility right-of-way, except where a written access and construction easement is provided to the water utility.
- Fire hydrants shall comply with the minimum requirements established by Snohomish County, the City of Edmonds, or Town or Woodway (as appropriate), and shall meet the type, location and spacing requirements of the agency having jurisdiction in the project area.
- In general, minimum spacing for hydrants in commercial and multi-family areas shall be 300 feet on center, and 600 feet on center for low density single-family residential areas.
- Installation shall be in accordance with the District's Standard Drawings.

4.13 THRUST RESTRAINT

- Thrust restraint is required at all changes in direction or as determined by the District.
- Installation shall be in accordance with the District's Standard Drawings.

4.14 WATER SERVICES / METERS / METERS BOXES

- Installation shall be in accordance with the District's Standard Drawings.
- Service line sizes shall be 1", 2", 4", 6", or 8", dependent on water demand.
- There shall be one meter per service line. Branched water service line tees are not allowed.
- Domestic water service taps are prohibited on any line primarily designed to service fire sprinkler systems and/or fire hydrants
- Manifolding, combining, or connecting several smaller meters to meet a flow demand that could be provided by a single larger meter is not allowed.
- Water service taps shall have a minimum 3 feet separation between taps.
- Water meter type shall be determined by the District based on application.



- Water meters are to be supplied and installed by District forces only after payment and completion of all requirements set forth in the District's Contract Documents for Developer Constructed Water Extensions.
- Meter boxes should be installed in areas accessible at all times. They should not be located in driveways, sidewalks, manmade or natural drainage channels, retention basins, etc.
- In the case where a meter must be relocated, it may be relocated a maximum of 5 feet from the original location. If the location is greater than 5 feet, the service line must be severed at the corporation stop and a new service line installed.

4.15 FIRE LINES

- A dedicated fire line must be installed when required by the Fire Marshal or local building codes.

4.16 CROSS-CONNECTION CONTROL

Where the possibility of contamination of potable water exists, water services shall be equipped with appropriate cross-connection control assemblies in accordance with State requirements and District Resolution No. 965 (Appendix C) and the "Cross-Connection Control Manual, Accepted Procedure and Practice," published by the American Water Works Association (February 2003). The need, size, location, and type of cross-connection assemblies shall be determined by the District and shall be installed in accordance with the District's Standard Drawings.

4.17 STORAGE

Storage requirements are based on five components: operational storage, equalizing storage, standby storage, fire suppression storage, and dead storage. Operational storage is the volume of storage devoted to supplying the water system while, under normal operating conditions, the source(s) of supply are "off." Equalizing storage is required to supplement water supply sources during periods of high demand, at a minimum of 40 psi, and allows for storage of water during low demand periods. Standby storage provides a backup supply in the event that the District's sources are unavailable. Fire suppression storage is required to meet fire flow requirements over a specified period of time. Dead storage is the volume of stored water that is not available to all customers at the minimum design pressure. Each of the three main components – equalizing, standby and fire suppression storage – must be evaluated with regard to the operational storage requirements, or storage above the required hydraulic grade line available to deliver service at adequate pressures. Storage that does not meet this criterion is considered dead, or unusable.

The minimum requirements for each of the components of the total storage requirement are summarized below. The minimum amount of storage required shall be adequate to provide for equalizing storage plus the larger of standby or fire suppression storage. The recommended storage volume is equal to the sum of the equalizing, standby, and fire suppression storage components. Section 5 of this document includes a complete analysis of the District's water storage requirements and existing capacities.



4.17.1 OPERATIONAL STORAGE

The following definition and brief explanation is presented as reference information. As defined previously, the operational storage is the volume of water available to supply the system under normal operating conditions while the source is considered “off.” This volume varies according to the sensitivity of the water level sensors controlling the source pumps and the configuration of the tanks designed to provide the required volume while preventing excessive cycling of the pump motor(s).

4.17.2 EQUALIZING STORAGE

The volume of equalizing storage must be sufficient to meet hourly water system demands in excess of the rate of supply and must be at an elevation sufficient to meet these demands at a minimum delivery pressure of 40 psi. The amount of required equalizing storage is to be calculated in accordance with the DOH “Water System Design Manual.”

4.17.3 STANDBY STORAGE

Standby storage is required in order to augment the available supply of water during a period of restricted flow from the supply source. Restriction of flow may be caused by a pumping equipment failure, supply line failure, maintenance or repair, or other condition which causes interruption in supply. For single source systems, standby storage requirements are twice the average day demand for a system, deliverable at 20 psi. For a multiple source system, the standby storage is calculated as twice the average day demand, less the flow available with the largest source out of service, multiplied by the amount of time the remaining sources will be pumped each day. It is recommended that standby storage not be less than 200 gallons per connection per day.

4.17.4 FIRE SUPPRESSION STORAGE

Fire suppression storage must be equal to the amount of water required to accommodate fire demand while maintaining a minimum system pressure of 20 psi. Fire flow requirements are determined by the Fire Marshal having jurisdiction and generally conform to the procedures utilized by the Washington Surveying and Rating Bureau as set forth in a pamphlet entitled “Guide for Determination of Required Fire Flow” published by the Insurance Services Office, Municipal Survey Service (updated June 2014).

4.17.5 DEAD STORAGE

Dead storage is the amount of water not available to all customers at the minimum design pressure. Dead storage is not considered when determining volumes to provide operational, equalizing, standby, or fire suppression storage.

4.18 PUMP STATIONS

Pump stations shall contain multiple booster pumps of sufficient capacity to meet the maximum day demands of the service area with the largest pump out of service.



4.19 GENERAL FACILITY PLACEMENT

All piping, pumping, source, storage and other facilities, shall be located in public rights-of-way, dedicated utility easements, or on District-owned property. Utility easements must be a minimum of 15 feet in width, and piping shall be installed no less than 5 feet from the easement's edge. Unrestricted access shall be provided to all public water system lines and their appropriate appurtenances and all public fire hydrants.

The location of utilities shall be in accordance with the standards and guidelines established by Snohomish County or the appropriate City criteria. Where existing utilities or storm drains are in place, new facilities shall conform to these standards as nearly as practicable and still be compatible with the existing installations. Where practical, there shall be at least 5 feet horizontal separation from other utilities.

Mains shall be extended to the furthest boundary of the Developer's property to allow for future extension by others, unless a more limited extension is approved by the District.

4.20 STANDARD PLANS AND SPECIFICATIONS

In accordance with WAC 246-290-120, Olympic View Water & Sewer District maintains standard plans and specifications on file with the State Department of Health to satisfy DOH approval requirements for the installation of hydrants, valves, fittings, and meters; repair or replacement of system components with similar components; or maintenance or painting of surfaces not contacting potable water. The standard plans and specifications also constitute a waiver from formal submittal and approval of specific distribution main improvements provided that construction of such projects are certified by a registered professional engineer as being in compliance with the standard specifications found in the DOH-approved water system plan, and provided that the District provides documentation to DOH of the pressure test results, disinfection procedures used and tests performed, and water quality sample results obtained prior to placing the distribution pipeline into service. All other water system improvement projects require submittal to and approval from the State Department of Health.

4.21 WATER QUALITY STANDARDS

The maximum contaminant levels allowed in drinking water supplies are as put forth by Washington State DOH and the federal SDWA (Safe Drinking Water Act), as listed in Table 4-1. The District recognizes that additional monitoring requirements are forthcoming and will comply with such requirements as they are implemented in the State of Washington. Similarly, the District recognizes the SDWA requires a variety of source monitoring for surface water supplies which is currently carried out by the Seattle Public Utilities and District staff to ensure compliance. Olympic View's current and projected water quality monitoring program is detailed in Section 7 of this Plan, and water quality data for existing sources are provided in Appendix C.



Table 4-1: DOH Maximum Contaminant Levels (MCLs)¹

Inorganic Chemical Characteristics			
Substance	Primary MCLs (mg/L except as noted)	Substance	Secondary MCLs (mg/L Except as Noted)
Antimony (Sb)	0.006	Chloride (Cl)	250.0
Arsenic (As)	0.010*	Fluoride (F)	2.0
Asbestos	7 million fibers/liter (longer than 10 microns)	Iron (Fe)	0.3
Barium (Ba)	2.0	Manganese (Mn)	0.05
Beryllium (Be)	0.004	Silver (Ag)	0.1
Cadmium (Cd)	0.005	Sulfate (SO ₄)	250.0
Chromium (Cr)	0.1	Zinc (Zn)	5.0
Copper (Cu)	**		
Cyanide (HCN)	0.2		
Fluoride (F)	4.0		
Lead (Pb)	**		
Mercury (Hg)	0.002		
Nickel (Ni)	0.1		
Nitrate (as N)	10.0		
Nitrite (as N)	1.0		
Selenium (Se)	0.05		
Sodium (Na)	**		
Thallium (Tl)	0.002		
Physical Characteristics			
Substance		Secondary MCLs	
Color		15 Color Units	
Specific Conductivity		700 umhos/cm	
Total Dissolved Solids (TDS)		500 mg/L	
Disinfectant Byproducts		Disinfectant Residual	
	MCL (mg/L)		Primary MRDLs (mg/L)
Total Trihalomethanes (TTHMs)	0.080	Chlorine	4.0 (as Cl ₂)
Haloacetic acids (five) (HAA5)	0.060	Chloramines	4.0 (as Cl ₂)
Bromate	0.010	Chlorine Dioxide	0.8 (as ClO ₂)
Chlorite	1.0	Total Trihalomethanes (TTHMs)	0.080
		Haloacetic acids (five) (HAA5)	0.060
		Bromate	0.010
		Chlorite	1.0

Notes:

¹ Source: WAC 246-290-310.

* Does not apply to TNC systems.

** Although the state board of health has not established MCLs for copper, lead, and sodium, there is sufficient public health significance connected with copper, lead, and sodium levels to require inclusion in inorganic chemical and physical source monitoring. For lead and copper, the EPA has established distribution system related levels at which a system is required to consider corrosion control. These levels, called "action levels," are 0.015 mg/L for lead and 1.3 mg/L for copper and are applied to the highest concentration in ten percent of all samples collected from the distribution system. The EPA has also established a recommended level of twenty mg/L for sodium as a level of concern for those consumers that may be restricted for daily sodium intake in their diets.

