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560.01 General

This chapter provides guidelines for the types of utilities to be provided at the terminals. For vessel utility requirements, refer to [Chapter 330](#). This chapter does not address utility routing across specific terminal elements. For information on utility routing, refer to [Chapters 600, 610, and 620](#).

For additional information related to site utilities refer to the following chapters:

Chapter	Subject
200	Capital Project Scoping
210	Design Matrix Procedures
310	Security
320	Environmental Considerations
330	Marine
340	Civil
350	Buildings
360	Electrical
570	Signage and Wayfinding
580	Sustainability/Low Impact Development
600	Trestle
610	Vehicle Transfer Span
620	Passenger Overhead Loading

560.02 References

Unless otherwise noted, any code, standard, or other publication referenced herein refers to the latest edition of said document.

(1) **Federal/State Laws and Codes**

[28 CFR Part 35](#) *Nondiscrimination on the Basis of Disability in State and Local Government Services*

International Building Code (IBC), [International Code Council](#)

[RCW 47.24.020](#) *Jurisdiction, Control*

[RCW 19.122](#) *Underground Utilities*

[WAC Title 51](#) *General Administration, department of (building code council)*

(2) Design Guidance

Design Manual M 22-01

Highway Runoff Manual M 31-16

Hydraulics Manual M 23-03

Standard Plans M 21-01

Standard Specifications M 41-10

Stormwater Management Manual for Western Washington (SWMMWW), Washington State Department of Ecology

Utilities Manual M 22-87

Cross Connection Control Manual Accepted Procedure and Practice, Pacific Northwest Section of the American Water Works Association (AWWA)

NFPA 13 Standard for the Installation of Sprinkler Systems, National Fire Protection Association, Inc. (NFPA)

NFPA 15 Standard for Water Spray Fixed Systems, National Fire Protection Association, Inc. (NFPA)

NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances, National Fire Protection Association, Inc. (NFPA)

Uniform Plumbing Code, International Association of Plumbing and Mechanical Officials

International Fire Code, International Code Council

International Fuel Gas Code, International Code Council

560.03 Design Considerations

It is WSF policy to accommodate utilities within the adjacent highway right of way when such use is consistent with the provisions of federal, state, or local laws and regulations. Guidelines, provided in the *Utilities Accommodation Policy* M 22-86, have been developed to direct designers on when and how utilities may use state right of way, and where they may be placed.

Design utilities to provide minimum cover depths as defined in the *Utilities Manual* M 22-87 and the *Utilities Accommodation Policy* M 22-86. Consider future projects to determine whether the typical coverage depth is sufficient.

See [Chapter 210](#) for utility requirements for specific project types.

See [Chapter 220](#) for proprietary item use and Buy America/Buy American considerations.

(1) Accessibility

Wherever pedestrian facilities are intended to be a part of a transportation facility, [28 CFR Part 35](#) requires that those pedestrian facilities meet ADA guidelines. Federal regulations require that all new construction, reconstruction, or alteration of existing transportation facilities be designed and constructed to be accessible and useable by those with disabilities and that existing facilities be retrofitted to be accessible. Design pedestrian facilities to accommodate all types of pedestrians, including children, adults, the elderly, and persons with mobility, sensory, or cognitive disabilities. Locate utilities so that their placement does not result in excessive pavement cross slopes or uneven surfaces that do not satisfy ADA requirements for accessible paths. Refer to [Chapter 300](#) for accessibility requirements.

(2) Security

[Chapter 310](#) includes a general discussion of security requirements and additional information pertaining to utility design. Below are links to relevant sections by topic. Coordinate with the WSF Company Security Officer (CSO) regarding design issues pertaining to security. In addition, coordinate with the United States Coast Guard (USCG) and Maritime Security for all terminals, the United States Customs and Border Protection (USCBP) for international terminals, and the Transportation Security Administration (TSA) for TWIC and SSI.

- IT Equipment Network Room [Section 310.07\(4\)](#)
- Access Control/Restricted Areas/TWIC [Section 310.10](#)
- Closed Circuit Television: [Section 310.11](#)
- Panic Buttons: [Section 310.12](#)

(3) Environmental Considerations

Refer to [Chapter 320](#) for general environmental requirements and design guidance. Refer to the project NEPA/SEPA documentation for project-specific environmental impacts and mitigation. Note that site utilities such as stormwater, lighting, and sanitary sewer are often subject to environmental regulations that vary for each terminal.

(4) Marine

Refer to [Chapter 330](#) for general marine design criteria pertaining to the site utilities. Below are links to relevant sections by topic.

- Vessel Utilities: [Section 330.05\(3\)](#)

(5) Civil

Refer to [Chapter 340](#) for general civil design criteria pertaining to site utilities. Below are links to relevant sections by topic.

- Project Datum: [Section 340.04](#)
- Site Preparation: [Section 340.05](#)

(6) Buildings

Refer to [Chapter 350](#) for general building design criteria pertaining to site utilities. Below are links to relevant sections by topic.

- Building Structures: [Section 350.04](#)
- Building Foundations: [Section 350.05](#)
- Building Utilities: [Section 350.06](#)

(7) Electrical

Refer to [Chapter 360](#) for general electrical design criteria pertaining to site utilities. Below are links to relevant sections by topic.

- Wiring and Protection: [Section 360.04](#)
- Wiring Methods and Materials: [Section 360.05](#)

(8) Utility Coordination Meetings

Hold utility coordination meetings with local utility companies and utility districts early in the design process and throughout design. Coordination meetings serve to identify the applicable utility requirements and standards for areas outside WSDOT jurisdiction. These meetings also serve to identify the availability of existing utilities for connection purposes, identify potential utility conflicts, and help mitigate the risk involved during construction. Coordinate placement of utilities in the State Highway right of way with local agencies when within city limits. The local agency is ultimately responsible for granting utility franchises per [RCW 47.24.020](#).

(9) Existing Utilities

Obtain as-built utility drawings from local utility providers and from WSF record drawings. WSF record drawings are available through the WSF librarian. Note the datum for all information obtained from as-built drawings. Convert all reference data to the Project Datum prior to use.

Refer to [Chapter 200](#) for a list of major underwater utilities in the vicinity of existing WSF terminals of which the designer should take special note when designing terminal improvements and modifications in the area. This utility list is not all inclusive but is provided to make the designer aware of major underwater utilities which could impact design and construction and may otherwise go unnoticed.

Refer to the terminal base map for approximate locations of upland and trestle utilities. The terminal sundry site plan should be consulted for existing utility easements.

(10) Utility Restoration

Design road restoration resulting from utility work to WSDOT Standards or local jurisdiction standards, whichever is more stringent.

(11) Operations and Maintenance

Consult with WSF Operations and Terminal Engineering Maintenance throughout the design process and provide opportunities for their review of the project drawings and specifications. Consider minimizing repairs, operations, and maintenance required over the design life of utilities during the design. Consult Maintenance during design regarding access to system components.

(12) Seismic Design of Utilities and Utility Support Structures

The Operational Level Earthquake (OLE) is a seismic event that has a 50 percent probability of exceedance in 75 years (approximately 100-year return period). All utilities shall remain fully operational following the OLE. The effects on a utility that crosses adjacent structures which move independently in a seismic event shall be considered. Utilities shall have flexible joints to accommodate the relative movement of the adjacent structures and/or the ground for the OLE. The project structural engineer shall provide the utility designer with the maximum relative displacement movement expected during the OLE between adjacent structures including earth-retained structures.

The Design Level Earthquake (DLE) is a seismic event that has a 7 percent probability of exceedance in 75 years (approximately 1000-year return period). All utilities and utility support structures shall not collapse but may require repairs to become operational following the DLE. The project structural engineer shall provide the utility designer with the DLE design loads which are based on the AASHTO LRFD *Bridge Design Specifications*.

OLE and DLE displacements and loads are based on the AASHTO LRFD *Bridge Design Specifications* and/or the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.

Utilities that are required to function for life safety purposes after a seismic event shall be designed in accordance with the IBC.

560.04 Potable Water

(1) General

Provide potable water service to the following ferry terminal destinations as required:

- Domestic water service to the passenger building
- Domestic water service to the terminal supervisor building
- Domestic water service to the WSF vessel slips
- Domestic water service to hose bibs on the trestle and across the site
- Irrigation water service to planting areas

The WSF Maintenance Department maintains a spreadsheet containing existing water line sizes for each terminal at the following locations: city meter, on dock, on transfer span, at vessel. See hyperlink below: G:\Term_Fac_Info\System_Wide\Terminal_Info

(2) Design Parameters

(a) Domestic Water System

Supply domestic water to buildings, vessels, and hose bibs. Provide a water service pipe running underneath or alongside the trestle. From the water service pipe, extend a branch line to each slip, each building and one or more to feed the hose bibs. Provide hose bibs on the trestle, typically along the trestle railing. Refer to [Chapter 600](#) for utility routing on the trestle. Provide drain valves at the low points of the system. Provide remote valve operators for hard to reach valves so that valves can be operated from the trestle deck, transfer span, or other easily accessible location.

The domestic water service pipe will typically require a meter to be placed near the connection with the right of way. If the facility is to have several separately metered systems, as in the case of separately metered vendor spaces, the WSF meter shall be located downstream of the vendor branch line connection.

The domestic water distribution main will typically require a reduced pressure backflow prevention assembly (RPBP), housed in an insulated aluminum enclosure and located near the connection with the right of way. In addition to the reduced pressure device required for the domestic service, additional RPBP's or double check backflow prevention assemblies shall be provided to isolate service to each slip and building.

Some facilities do not have an RPBP on the main line. If this is the case, then RPBP's must be provided to isolate each slip and building. Consult the *AWWA Cross Connection Control Manual* for further design guidance.

The water service located under the trestle and on the transfer spans shall be protected from freezing by ambient temperature-sensing freeze prevention valves. The valves shall be located immediately adjacent to the water shut-off valve on the span and at the ends of each branch line under the trestle. Route the valve outlets away from walking and driving surfaces.

Water lines located under the trestle shall be mounted as close to the deck as possible to minimize potential damage from waves and floating debris. Pipes shall be clamped directly to rigid supports or hung from laterally and longitudinally braced trapeze-style supports.

Single rod-type pipe hangers shall not be used. Structural cage protection shall be provided if mounted below the pier cap.

Refer to the [Uniform Plumbing Code](#) for additional potable water system requirements.

(b) Local Water District

Water district standards apply to improvements outside the WSF property limits and govern the design of improvements within State and City right of way.

The local water district will require minimum depths of cover for buried water main facilities. Refer to the applicable water district standards for cover depths outside of the WSF right of way. For utility cover depths within the WSF right of way, refer to the [Utilities Manual](#) M 22-87 and the [Utilities Accommodation Policy](#) M 22-86.

(c) Thrust Blocking, Pipe Supports and Flexible Hose

Provide thrust blocking via pipe supports at all above-ground pipe bends. Install pipe supports to provide rigid support to piping both vertically and horizontally. Use flexible hose approved for potable water use where the force main transitions between the fixed pier and the movable transfer span.

(3) Material Selection

Design all materials to meet the requirements of the *Standard Specifications* M 41-10 and the local water district standards, or whichever is more stringent and more appropriate. Additional material considerations are as follows:

- Provide combination air and vacuum release assemblies per water district standards.
- Provide gate valves, blow-off assemblies, pressure-reducing valves, and other appurtenances per water district criteria.
- Provide seamless hot dip galvanized steel pipe for all above-ground water piping situated within the footprint of the trestle. Pipe sizes with nominal diameters 2 inches and below shall utilize threaded connections. Pipe sizes above 2-inch nominal diameter shall utilize mechanical couplings and grooved pipe.
- Buy America/Buy American considerations (see [Chapter 220](#)) and proprietary item use (see the *Plans Preparation Manual* Section 700.05(20) for more information)

Refer to [Chapter 610](#) for water line criteria at the vehicle transfer span.

(4) Permits and Approvals

The design of the water system must be approved by the local water district. Below is a list of permits and approvals which may be necessary for water system improvements.

- Building Permit, administered by local municipality
- Shoreline Development Permit, administered by local municipality
- Shoreline Exemptions

560.05 Fire Protection

(1) General

Provide fire water service to terminals for site and building fire protection facilities, including fire hydrants and building sprinkler systems. Per direction of the local fire marshal, the following fire water service for the terminal may be required:

- Fire water service to the passenger building sprinkler system
- Fire water service to the terminal supervisor building sprinkler system
- Fire water service to sprinkler system under passenger OHL
- Fire water service to upland fire hydrants
- Fire water service to sprinkler system under trestle

Refer to the NFPA publications for additional fire system requirements.

(2) **Design Parameters**

(a) **Coordination with Fire Marshal and Water District**

Schedule a coordination meeting between the local fire marshal, water district, WSF, and the design team to coordinate fire protection needs. The meeting will help to clarify fire flow requirements, hydrant locations and spacing, and fire access requirements.

Confirm the following:

- Fire flow requirements (gallons per minute)
- Fire flow provided by each hydrant
- Maximum distance between hydrants
- Hydrant setbacks
- Hydrant clear zones
- Hydrant requirements for trestle
- Fire lane access requirements
- Locations requiring medical aid access
- Locations requiring ladder truck access
- Lane width requirements for ladder truck
- Turning radii requirements for ladder truck
- Horizontal and vertical clearance requirements for ladder truck

(b) **Fire Flow Calculations**

Consult the local water district for available water pressure information and fire flow requirements. The gross square footage of structure to be used in the fire flow calculations includes any enclosed conditioned areas of the overhead walkway and/or the storage spaces under the walkway. Any portion of the overhead walkway and dock area that is not enclosed does not need to be included in the calculation.

(3) **Material Selection**

All materials will meet the requirements of the *Standard Specifications* M 41-10 and the local fire district standards.

Buy America/Buy American considerations (see [Chapter 220](#)) and proprietary item use policies (see the WSDOT *Plans Preparation Manual* Section 700.05(20) for more information) may apply.

(4) **Permits and Approvals**

Below is a list of permits and approvals which may be necessary for fire system improvements.

- Building Permit, administered by local municipality
- Shoreline Development Permit, administered by local municipality.
- Shoreline Exemptions

560.06 Sanitary Sewer

(1) General

Provide sanitary sewer service to terminals, including a force main for vessel pump-off from each slip at terminals where vessel pump-off is required. [Exhibit 560-1](#) indicates which terminals accommodate vessel pump-off. Route the force main(s) to a gravity system.

Provide service lines from the passenger building and terminal supervisor building to the gravity system. At multi-slip terminals with common sewage lines, provide check valves in the force mains near the bridge seats to prevent sewage backflow. Structural cage protection shall be provided if mounted below the pier cap.

Terminal	Sewer Pump-out	Terminal	Sewer Pump-out
Anacortes	X	Mukilteo	X
Bainbridge Island		Orcas	
Bremerton		Point Defiance	X
Clinton		Port Townsend	X
Coupeville		Seattle	X
Edmonds	X	Shaw	
Fauntleroy	X	Southworth	
Friday Harbor	X	Sidney	
Kingston		Tahlequah	
Lopez		Vashon	

Sanitary Sewer Service at Existing Terminals
Exhibit 560-1

All sanitary sewer improvements outside WSF property boundaries will be owned and maintained by the local sewer district and will require design approval from that district. Use the local sewer district design standards for sanitary sewer facilities to be owned and maintained by the sewer district. Implement sewer district standards, wherever feasible, for sanitary sewer appurtenances that lie within the WSF property boundaries. Keep all existing live sewers (including septic tanks and drain fields) in service at all times.

Refer to [Chapter 610](#) for sewer line criteria on the vehicle transfer span. Refer to the [Uniform Plumbing Code](#) for additional sewer line requirements.

(2) Design Parameters

Design sanitary sewer force mains to match the flow and pressure regime of existing and future WSF vessel pumps. Refer to [Appendix O](#) for the vessel sewage discharge rates. Simultaneous pump-off from multiple vessels is not a design requirement.

Design for use of a flexible hose and rotary joint in locations where the force main transitions between the trestle and the movable transfer span. Include a ball valve placed at the pump connection at the off-shore end of each vehicle transfer span.

Conduct a hydraulic analysis to validate the performance of the slip force mains. Base the design on maximum and minimum flow velocities of 8 fps and 2.5 fps, respectively. The minimum flow velocity has been set in order to avoid excessive increases in the hydrogen sulfide concentration within the force main. Provide cleanouts for flushing the force mains in locations where minimum flow velocities are not able to be maintained and where effluent from vessels may sit idle between vessel pumping. Use a 300-gpm vessel pump-off rate, assumed to occur during off-peak hours, for design.

Design gravity sanitary sewers to accommodate the 300-gpm vessel pump-off, combined with peak flows generated by the terminal supervisor and passenger buildings. Provide thrust blocking at all force main pipe bends by means of pipe supports and restrained joints. Install pipe supports to provide rigid support to piping both vertically and horizontally. Provide cleanout assemblies for access and cleaning. Analyze the potential for odor problems and address in the design.

Consult the local sewer district for additional development standards that apply to sanitary sewer improvements outside the WSF project site.

(3) Material Selection

All materials will meet the requirements of the *Standard Specifications* M 41-10 for sanitary sewers and the local sewer district requirements.

Buy America/Buy American considerations (see [Chapter 220](#)) and proprietary item use policies (see the *Plans Preparation Manual* Section 700.05(20) for more information) may apply.

Use schedule 80 PVC, steel, or ductile iron sanitary sewer pipe for all above-ground force main piping. Provide insulation and heat tracing.

(4) Permits and Approvals

Below is a list of permits and approvals which may be necessary for sanitary sewer system improvements.

- Building Permit, administered by local municipality
- Shoreline Development Permit, administered by local municipality
- Shoreline Exemptions, administered by local municipality or county

560.07 Stormwater

(1) General

Design storm drainage to collect, convey, treat, and discharge stormwater in accordance with WSDOT and DOE regulations. The stormwater system may consist of both natural and constructed facilities to provide for the conveyance and treatment of stormwater. Evaluate and select stormwater conveyance and treatment methods for each terminal individually based on site parameters. Refer to the *Highway Runoff Manual* Chapter 600 for additional stormwater design information. See [Chapter 200](#) for stormwater retrofit scoping information.

(2) **Design Parameters**

(a) **Conveyance**

Design the conveyance system to the 25-year storm event and per guidelines contained in the [HRM](#) and the [Hydraulics Manual](#) M 23-03. Grade the site to prevent ponding of stormwater and to minimize the number of storm sewer structures (e.g. catch basins, manholes, piping). Design curbs and flow paths to direct runoff towards the drainage structures. Design the conveyance system to prevent stormwater from directly discharging into the Puget Sound.

Existing storm drainage at some terminals discharges stormwater directly to the Puget Sound; however, it is the intent of WSF that new terminals will provide treatment. Refer to [Chapter 600](#) for a discussion of conveyance options on the trestle.

(b) **Treatment**

Provide stormwater treatment for the terminal. Evaluate stormwater treatment options for each terminal on an individual basis based on site parameters. Determine if the project site is considered a high use site per the definition provided in the [HRM](#) and provide associated treatment capabilities, as required. Oil control treatment for stormwater should be considered. Refer to [Chapter 600](#) for stormwater treatment options.

(c) **WSF Guidelines**

Where feasible, incorporate the following guidelines into the stormwater design.

- Divide drainage into basins that are consistent with probable future maintenance responsibilities.
- Avoid tying WSF stormwater systems into local municipality systems
- Select treatment facilities capable of treating oil contaminants.
- Avoid wet vault as basic treatment
- Include low impact development techniques. Refer to [Chapter 580](#).

(3) **Stormwater Calculations**

[Exhibit 560-2](#) summarizes the main stormwater calculations required. Comply with the minimum requirements outlined in the [HRM](#) as they apply to the project. The minimum requirements are applied on a site-specific basis and may vary within the project limits depending on the drainage characteristics of the project. Design the terminal stormwater system to outfall into the Puget Sound. Stormwater systems that discharge to the Puget Sound are exempt from Minimum Requirement #6 (Flow Control) and therefore are not required to provide flow control.

Calculation Type	Calculation	Reference	Design Frequency	Standard
Conveyance	Inlet Spacing	Hydraulics Manual	10-year	Design Spread, Zd = Shoulder +2 ft (<45mph) Design Spread, Zd = Shoulder (>45mph)
	Sag	Hydraulics Manual	50-year	Design Spread, Zd = Shoulder +2 ft
	Conveyance	Hydraulics Manual	25-year	SBUH or Rational Method. Gravity Flow Required
	Ditch/Gutter Capacity	Hydraulics Manual	10-year	SBUH or Rational Method. 0.5 ft of freeboard required
Stability Calculations	Ditch Stability	Highway Runoff Manual	10-year	SBUH or Rational. Shear Stress to be less than allowable shear stress of ditch liner
	Outlet Protection	Highway Runoff Manual	25-year	SBUH or Rational Method. Flow velocity from Conveyance Calculations
Treatment	Treatment Sizing	Highway Runoff Manual	91st Percentile, 24-hour	MGS Flood Water Quality Volumes
Standards for Design Calculations <i>Exhibit 560-2</i>				

(4) Material Selection

Design conveyance structures per the [Standard Plans](#) M 21-01, the [Standard Specifications](#) M 41-10, and the WSDOT Hydraulics Manual.

(5) Permits and Approvals

Below is a list of permits and approvals that may be required for stormwater improvements.

- Hydraulic Project Approval, Washington State Department of Fish and Wildlife
- Section 10/404 Permit, U.S. Army Corps of Engineers
- Endangered Species Act Section 7 Consultation, NMFS and USFWS
- Stormwater Construction Permit, Washington State Department of Ecology
- Section 401 Water Quality Certification, Washington State Department of Ecology
- Coastal Zone Management Act Certification, Washington State Department of Ecology
- NPDES Municipal Stormwater Discharge Permit, local municipality
- Conditional Use Permit, local municipality
- Shoreline Substantial Development Permit, local municipality
- Building Permit, local municipality
- Shoreline Exemptions

560.08 Natural Gas

(1) General

Provide natural gas service based on the mechanical design. If required, provide gas service for building heat to the terminal supervisor and passenger buildings. Provide gas service stub out for future concessions, as necessary. Design the gas routing by the most economical path.

(2) Design Parameters

Design data and parameters relating to site natural gas distribution are set forth by the local gas company. The gas company will perform and/or review all engineering activities associated with the size and location of natural gas facilities serving the site. Coordinate with the gas company on design responsibilities. Reference the [International Fuel Gas Code](#) for design requirements.

Within WSF right of way limits, the gas company will be responsible for providing and installing all lateral (or main) piping and meters to the buildings. The selected construction contractor will be responsible for the accompanying trenching, earthwork, and surface restoration.

Locate gas utilities that will be within WSDOT right of way outside of the roadbed. Utilities located within the roadbed will require a design variance. Maintain WSDOT standard depths within WSDOT right of way.

(3) Material Selection

Design trenching, backfill, pipe installation, and surface restoration in conformance with local gas company, WSDOT, and local municipality standards.

Buy America/Buy American considerations (see [Chapter 220](#)) and proprietary item use policies (see the [Plans Preparation Manual](#) Section 700.05(20) for more information) may apply.

(4) Permits and Approvals

New gas mains will be reviewed and subject to the approval of the local gas company, WSDOT and the local municipality.

560.09 Site Power

Refer to [Chapter 360](#) for electrical design criteria pertaining to site utilities. Below are links to relevant sections by topic.

- Design Considerations: [Section 360.03](#)

560.10 Site Lighting

Refer to [Chapter 360](#) for lighting design criteria pertaining to site utilities. Below are links to relevant sections by topic.

- Lighting: [Section 360.07](#)

560.11 Communications

Refer to [Chapter 360](#) for communications design criteria pertaining to site utilities.

