

REGULATIONS FOR STREETS AND RELATED WORK

Chapter 7

UTILITIES

Sec. 701. FRANCHISING POLICY

Utilities to be located within the City street right-of-way shall be constructed in accordance with current franchise and permit procedures and in compliance with these standards. In their use of the right-of-way, utilities shall be given consideration after the traffic-carrying requirements of the streets which are, namely, to provide safe, efficient, and convenient passage for motor vehicles, pedestrians, and other traffic. Aesthetics shall be a consideration. As a matter of policy, placement of all utilities underground will be required in all urban development.

Sec. 702. UTILITY LOCATIONS

Utilities within the right-of-way on new streets shall be located as shown as indicated below. Where existing utilities or storm drains are in place, new utilities shall conform to these Standards as nearly as practical and yet be compatible with the existing installations. All utilities shall be buried at least 30 inches below finished grade, excluding storm drains which shall have a minimum cover of 12 inches. Where utilities are placed in the ditch area the buried depth shall be at least 36 inches below the bottom of the ditch. Exceptions shall be approved when necessary to meet the special requirements or restrictions. Utilities shall be extended through property to allow for future extension, expansion, and continuation of City's distribution system or for confirmation with Comprehensive Water System plan and/or Comprehensive Sewer Plan.

A. Gas and Water Lines.

1. **In Shoulder-and-ditch section:** Gas and water lines shall be located outside the ditch line. If the Public Works Director determines this location is not practical, they shall be located in the shoulder 3 feet from edge of pavement.
2. **In Curb and gutter section:** Gas and water lines shall be located 1.5 feet back of curb, or at a distance which will clear root masses of street trees if these are present or planned for. If the Public Works Director determines that this location is not practical, they shall be located twelve (12) feet from centerline for access streets, and fourteen (14) feet from centerline for collectors and arterials. Mains and service connections to all lots shall be completed prior to placing of surface materials.

3. **Designated side of centerline:** Power, Phone and Cable lines shall be located south and west of the centerline and gas and water lines north and east.
- B. **Sanitary Sewers.** Sanitary Sewers shall be located within five (5) feet either side of centerline, and along the centerline if possible; depth to be approved by Engineer. Wherever possible, sanitary sewers proposed on existing streets shall consider locating outside street right-of-way within separate easements.
- C. **Gravity Storm and Sanitary.** Gravity sanitary or storm drainage shall have precedent over other systems in planning and installation.
- D. **Electric Utilities, Power, Telephone, Cable TV.** Underground cable and structures for Power, Telephone and Cable T.V. shall be located on the opposite side of the street from water and gas at a depth of at least 30 inches. Overhead cable and utility lines shall be located on poles set back of a the ditch line or sidewalk, at locations compatible with driveways, intersections, and other essential street features. To the extent practical, all overhead utilities were allowed shall share facilities so that a minimum of poles are needed and preferably on only one side of street.

Sec. 703. INSTALLATION - NEW RIGHTS-OF-WAY

- A. **During New Street Construction.** Pole utilities and underground utilities, including service crossings, shall be installed or relocated prior to the start of street construction. Otherwise such utilities, with connections, shall be installed or relocated after the subgrade has been completed but before surfacing has been placed only upon prior approval of the Public Works Director.
- B. **Within Unmaintained Rights-of-Way.** All utility installations inside unmaintained City right-of-way shall be done under a Revocable Encroachment Permit, approved by the Public Works Director.

Sec. 704. INSTALLATION - EXISTING, IMPROVED RIGHTS-OF-WAY

- A. **General.** Utility trenching or transverse cuts in City streets shall not be permitted unless it can be shown that alternatives, such as boring or jacking or relocation outside of the paved area are not feasible, or unless the utility can be installed just prior to reconstruction or overlay of the street.
- B. **Revocable Encroachment Permit Required.** No person, firm, or corporation shall commence work or permit any person, firm, or corporation to commence work on the construction, alteration, repair, or removal of any utility or the cutting and/or paving of any street, alley, or other public place in City of Ferndale without first obtaining a Revocable Encroachment Permit, except under emergency conditions when Public Health Safety and Welfare is threatened.

Sec. 705. WATER DISTRIBUTION SYSTEMS

- A. **Water Distribution System Design Requirements.** The City of Ferndale requires water distribution plan submittal for development projects when improvements are proposed within public right-of-way or in easements. Two sets of plans are to be submitted to the Ferndale Department of Public Works for review.

1. **Minimum Size Water Mains.** The water main sizes for each individual project shall be determined by a professional engineer, but shall not be less than the minimums listed below.

- (a) **Residential Zones.** The minimum size water main shall be 8 inches in diameter with an average gridded spacing not to exceed 1,500 feet. Pipes less than 8 inches in diameter may be allowed by the Public Works Director when future extension is not anticipated, such as in a cul-de-sac, provided the main does not serve a fire hydrant.
- (b) **Commercial, Industrial, and Institutional Zones.** All water main construction and reconstruction shall be done pursuant to a design that, when fully implemented, will provide the fire flow requirements of the City of Ferndale's fire protection & comprehensive plan standards. When improvements increase the fire flow requirements, the Applicant shall upgrade the water system to support the changes.

The Applicant will install as a minimum, the size pipe as required by the City's water comprehensive plan. The minimum pressures allowed by the City at any time are 40 psi under instantaneous demand, or 20 psi under maximum instantaneous demand and fireflow combined.

- (c) **Supply Water Mains.** Supply water mains shall be provided as specified by the Water Comprehensive Plan. Where clear definition is not provided by the the comprehensive plan, the minimum size supply main shall be 12 inches in diameter and shall be spaced on approximately 3,000 foot centers. The actual size of the supply main shall be determined by its ability to deliver water based on the peak-daily demand, plus designated fire flow.
- 2. **Valve Spacing.** Valves shall be placed on each main at a junction point (node) and shall be spaced along the water main at intervals not to exceed 500 feet for pipe sizes 10 inches in diameter and larger, and not to exceed 800 feet for pipe sizes less than 10 inches in diameter. Resilient seat gate valves shall be used on pipes 8 inches in diameter and smaller, and resilient seat butterfly valves used on pipes 10 inches in diameter and larger.
 - 3. **Fire Hydrant Spacing.** Fire Hydrants shall be spaced as follows:
 - (a) No greater than 500 foot intervals along public streets or approved fire access routes for residential areas. Shorter intervals may be required by the Public Works Director.
 - (b) No greater than 300 foot intervals along public streets or approved fire access routes for all other areas. Shorter intervals may be required by the Public Works Director.
 - 4. **Fire Flow Rates.** Supply water mains shall be provided as specified by the Water Comprehensive Plan. All water main construction and reconstruction shall be done pursuant to a design that, when fully implemented, will provide the fire flow requirements of the Ferndale Fire Department's fire protection standards.

When any improvements which increase the fire flow requirements are made, the water system must be upgraded if necessary to support the changes.

5. **Fire Main and Hydrant Standards.** All fire hydrants and water mains serving hydrants will be publicly owned and maintained.

- (a) **Access.** A minimum 24 foot maintenance easement shall be granted to the city and recorded for any public water main on private property. See Section 505. for easement descriptions. Fire hydrants must be located within 5 feet of the required access.

Water mains on private property serving building sprinkler systems will be privately owned and maintained as long as the main serves only one property and no hydrants are required. In this case, the following requirements apply:

- i. An approved detector check valve device must be installed.
 - ii. No domestic or other water service allowed on fire main.
 - iii. No requirement for construction standards imposed by Public Works.
 - iv. No maintenance easement is necessary.
- (b) **Materials and Installation.** Fire hydrants and fire mains must conform to City of Ferndale Standard Detail W-1 (DOT B-19) and the following standards:
- i. Fire hydrants shall have individually valved two 2½ inch ports and one 5¼ inch main valve opening. A 4½ inch NST pumper nozzle and a 5 inch Storz port with cap and cable shall be supplied. Hydrants shall be either Iowa or M.H. 929T hydrant.
 - ii. Fire hydrants shall have the Storz port facing the required access and the base flange of the hydrant must not vary more than 1 foot in elevation from the grade level of the required access. The lowest stem shall be a minimum of 14 inches above the ground.

- iii. If, in the opinion of the Public Works Director, fire hydrants are vulnerable to vehicular damage, appropriate crash posts shall be provided. No obstructions shall exist within a 3 foot working area of each required access. Crash posts shall be 4 inch cement-filled pipe minimum 3 feet in height with 2 feet of piping below grade. Hydrant shutoff valves shall be located between 5 and 20 feet from the hydrant.
- iv. Underground supplies to fire hydrants must be inspected. Such inspection shall include visual inspection of piping and hydrostatic pressure test of a minimum of 200 psi or 50 psi in excess of street main pressure, whichever is greater. A flow test will be required when installation is complete.
- v. Fire hydrant installation must comply with Standard Detail W-1 (DOT B-19).
- vi. Fire hydrants must be maintained in an operable condition at all times and must be repaired or replaced when defective. Hydrants shall be fully operable before construction commences above grade level.

B. **Construction of Water Main Extension.** The petitioner shall contract with a contractor licensed to perform the construction in the State of Washington to install a main extension as approved by the Department of Public Works.

The applicant shall grade all roads to the design subgrade elevation prior to the start of waterline construction and shall advise the City in writing of any changes which may be contemplated during construction. If the Applicant changes the subgrade elevation of the road after completion of the waterline extension, or any part thereof, the applicant shall be responsible for all costs incurred for the water extension as a result of said change in subgrade elevation. This obligation shall remain in full force until City releases performance bond or bond of other description in connection with the Applicant's obligation for completion of the roads within the area.

The Department of Public Works shall inspect the installation of the water main to ensure compliance with the specifications. The charges for such inspection, including administrative and overhead charges, shall be withdrawn from the construction inspection fee deposited with the City Planning Director.

At such time as the Director of Public Works determines the remaining funds are not adequate to provide necessary inspection for the project, the petitioner shall be notified and an estimate of additional inspection fees required will be provided.

The additional fees shall be deposited with the City Planning Director prior to the depletion of the funds on deposit. The City reserves the right to reject any installation not inspected and approved by the Department of Public Works. Any monies unexpended from the inspection fee upon completion of the project shall be returned to the petitioner.

Upon satisfactory completion of all required tests and acceptance of the main extension, the Department of Public Works shall cause the extension to be connected to the City system. All cost incurred in the connection, including overhead and administrative charges, shall be paid by the petitioner. Any adjustment of the actual cost of installation because of a variance between the estimate and the actual costs shall be refunded upon completion of the job to the petitioner or by payment by the petitioner to the City of any additional expense above the estimate.

When a main extension is to serve a new single-family residential area, individual services shall be installed by the developer to supply each proposed building site. These services shall be installed to City standards. All fees and charges for installation of the services shall be paid at the time a building permit is obtained.

1. **Energizing Main Extensions.** No main extensions shall be energized other than for test purposes by duly authorized personnel until the main extension has been accepted by the City and all fees and charges have been paid. If energizing a main is necessary to restore service to existing customers, fire hydrants will not be activated until acceptance of the main extension.
2. **Payment for Water Mains.** Water mains placed in public rights-of-way or easements and connected to City mains may be paid for by:
 - (a) The party benefitting from the installation;
 - (b) The City;
 - (c) A local improvement district, as provided by law; or
 - (d) **Latecomer Agreements.** The City may, in accordance with state law, grant the party constructing a new water main the right to partial reimbursement from other abutting property owners benefitted by the improvement. Such reimbursement shall be administered by the City and shall be subject to reasonable overhead and administrative charges by the City.

3. Standards for Water Main Construction

- (a) **Pipe for Water Main.** All pipe shall be of AWWA Standards H3-71, C151-71 and cement lining C104-71, and shall be ductile cast-iron, standard thickness Class 50 push-on joints or M.J. joints. The pipe shall be of 150 psi working pressure, plus 100 psi surge pressure. No PVC or AC pipe will be allowed.

Pipe laying shall meet the requirements of Section 7-11 of the Washington State Department of Transportation Standard Specifications for Road, Bridge or Municipal construction. All pipe shall have minimum covering of 3.5 feet.

- (b) **Fittings.** Material for fittings such as crosses, tees, bends, reducers and sleeves shall be ductile iron. Joints shall be M.J., flanged or push-on joints and shall conform to AWWA specifications C-110-71 and C-104-71.
- (c) **Concrete Thrust Blocking.** Concrete blocking shall be as specified in City of Ferndale Standard Details W-2 through W-4, or as directed by the Project Engineer. Blocks shall be installed as specified in Section 7-11.3(13) of the Washington State Department of Transportation Standard Specifications for Road, Bridge or Municipal construction. No precast blocks are allowed.
- (d) **Connection to Existing Water Mains.** The Contractor must notify the Ferndale Public Works Director of a proposed connection time at least four working days in advance.
- (e) **Hydrostatic Testing and Disinfection of Water Main.** All hydrostatic testing and disinfection of water mains shall conform to Sections 7-11.3(11) and 7-11.3(12) of the Washington State Department of Transportation Standard Specifications for Road, Bridge or Municipal Construction - current edition. Hydrostatic testing inspected by City.
- (f) **Water Service Transfers.** Tap installations shall meet the requirements of the City of Ferndale Standard Details.
- (g) **Gate Valves.** Gate valves shall be for lines 2 inches through 10 inches, and shall be installed in cast-iron valve boxes. Short-body valves suitable for a nonshock shut-off pressure of 130 psi resilient seat valves and suitable for direct burial are specified.

Gate valves shall be resilient seated iron-body, full-bronze mounted valves conforming to AWWA C509 and suitable for service with the type and class of pipe used.

All valves shall have nonrising stems and shall open counterclockwise and shall be equipped with a 2 inch square operating nut. Valves will be flange or M.J. joints.

Valve markers shall be located outside of pavement section.

- (h) **Butterfly Valves.** Butterfly valves shall be for mains 10 inches and larger and be resilient seated and shall meet or exceed AWWA C504, Class 150B. Butterfly valves shall be suitable for direct burial. Shaft seals shall be standard O-ring seals. The size of the butterfly valves shall be the same as the main on which they are located.

Valves shall be iron-body, full-bronze mounted, resilient-seat valves and suitable for service with the type and class of pipe used.

The valve operator shall be of the traveling-nut or worm-gear type, sealed, gasketed, and permanently lubricated for underground service. The valve operator shall be constructed to the standard of the valve manufacturer to withstand all anticipated operating torques and designed to resist submergence in groundwater.

- (i) **Hydrant Installation.** Hydrants shall be supplied and installed according to City of Ferndale Standard Detail W-1 (DOT B-19), and shall include a Storz-type fire hose adapter fitting.
- (j) **Blow-off Valves.** Blow-off valves shall be supplied and installed at high points, line ends, or as required by the plans. Blow-off installation shall be in conformance with Standard Details W-9 or W-10.

- C. **Water Service Standards.** Water service and sewer service connection fees shall be based on an equivalent single-family basis. Table 6-1 below gives the basis for calculating single-family connections. City does not supply flushing water. City provides PRV to individual connection.

TABLE 7-1
POTABLE WATER USE

Type of Establishment	Useage (gpd) per Unit of Measurement	Unit of Measurement
Banks	0.130	sq. ft.
Barber shops	0.190	sq. ft.
Bathhouses for swimming pool	10.200	per swimmer
Beauty salons	0.410	sq. ft.
Bowling alleys	0.080	sq. ft.
Car dealerships	0.070	sq. ft.
Car washes	3.810	sq. ft.
Car washes - self service	0.693	sq. ft.
Child daycare centers	13.000	per student
Churches	1.000	per building
Churches with daycare schools	2.000	Use
Dental offices	0.480	sq. ft.
Department stores with and without food service	0.040	sq. ft.
Drug stores	0.090	sq. ft.
Dry cleaning pick-up & drop-off	0.010	sq. ft.
Dry cleaning on-site	0.380	sq. ft.
Dry cleaning & laundry on-site	0.450	sq. ft.
Dry cleaning, laundry, coin-wash	1.280	sq. ft.
Dry goods stores (clothing)	0.060	sq. ft.
Fire and rescue services	0.190	sq. ft.
Funeral homes	0.050	sq. ft.
Furniture stores	0.020	sq. ft.
Gasoline service stations	816.000	per station
Hospitals	0.370	sq. ft.
Indoor tennis courts	153.000	per court
Kennels and animal hospitals	0.150	sq. ft.
Laundromats	2.900	sq. ft.
Luxury campsites	65.000	per campsite
Manufacturing - public water not used in processing	20.000	per employee
Medical office building	0.300	sq. ft.
Medical practioners metered separately	0.190	sq. ft.
Motels with restaurant	168.000	unit
Motels without restaurant	75.000	unit
Newspaper offices	16.000	per employee
Nursery and garden centers	2.000	site
Nursing homes	0.350	sq. ft.

TABLE 7-1 (continued)

Office buildings with cafeteria	0.200	sq. ft.
Office buildings w/out cafeteria	0.090	sq. ft.
Restaurants	0.590	sq. ft.
Retail stores (small, quick-service, convenience)	0.210	sq. ft.
Retirement homes	0.18	sq. ft.
Schools - elementary (186 days)	5.500	per student
Schools - junior high (186 days)	9.500	per student
Schools - public high (186 days)	6.500	per student
Schools - private (186 days)	20.000	per student
Single-family dwellings	231.000	per dwelling
Supermarkets	0.120	sq. ft.
Swimming pools (bathhouse separ.)	21.300	per swimmer
Theaters - drive-in	2.520	per car space
Theaters - walk-in	0.900	per seat
Warehouses	0.010	sq. ft.

All ¾, 1, 1½ and 2 inch water services must conform to the following standards and City of Ferndale Standard Detail W-5:

1. Water Service Installation Requirements

- (a) Tapping with tapping clamp and saddle must use I.P. Threaded corporations. If the dry-tap method is used, the following minimum hole sizes shall be used:

1 7/8"	for	2" service
1 7/16"	for	1½" service
15/16"	for	1" service
11/16"	for	¾" service

Caution, care, and prudence is necessary in aligning the clamp and saddle to assure full flow capability.

- (b) Corporation taps shall make as nearly as possible a 45 degree angle off the vertical center line of the main. No tap is to be made on the top of a water main.
- (c) Type "K" copper shall be used on water services within the public right-of-way.

- (d) Curb stops shall be located no closer than three (3) feet or farther than five (5) feet from the property line. Stop-and-waste type curb stops are not allowed.
- (e) All underground fittings shall be flared within the public right-of-way. No sweat or compression connections are to be used. The use of teflon tape as a sealant is acceptable, but the use of pipe dope is not acceptable.
- (f) The water service pipe shall have a minimum of 24 inch depth and a maximum of 36 inch depth, including under ditch sections. If a meter is required, there shall be 30 inches cover in the meter area.

All meters and meter installations shall meet City of Ferndale Standard Detail W-5. If developer changes ground elevation after completion of water service installation, Developer is responsible for all costs incurred as a result of said charges.

- (g) No service is to be covered until the City Inspector has inspected the initial installation. Note that all corporations must be in an ON position and all curb stops must be in the OFF position.
- (h) Service testing shall be done in conjunction with water main testing. Any air relief and flushing shall be the responsibility of the developer.
- (i) An acceptance inspection will be made by the City upon completion of all project work. During the inspection, every service shall be turned on to its full capacity to check flow and guarantee that each service line has been flushed. In no case shall the acceptance inspection be made until all project work is complete. Damage incurred during other construction work on the project shall be corrected by the developer or his agent prior to acceptance by the city.
- (j) The bond release inspection shall be made prior to the end of the 2 year maintenance bond period. Any problems noted at this time shall be corrected by the developer and/or bonding company prior to releasing the bond.

- (k) Staking of lots and/or property lines to assure correct water service locations is the responsibility of the developer. Locations are to be as shown on the approved drawings. Errors due to failure to provide a property survey or due to changing lot locations during final plat approval shall be corrected by the developer at the time of such change or when the error is detected by the City.
- (l) Tools, materials and work area shall be maintained in a sanitary condition at all times.

2. Water Service Meter Box Installation Requirements

- (a) Cover of 24 to 30 inches shall be maintained from finished grade to the service pipe except where a variance is approved by the Department of Public Works. Note that the top of the box shall be flush with the finished grade and that this includes the expansion material when required.
- (b) The Meter Setter or Curb Stop shall be located within the meter box.
 - i. Minimum clearance of 1 inch from inside surface.
 - ii. Maximum clearance of 2 inches from inside surface shall be maintained from the stop.
 - iii. Stops shall be within 3 to 5 feet from the property line within the public right-of-way or as approved by the City, except when this puts the stop in the sidewalk, in which case the stop will be located in the planting strip.
- (c) Meter boxes shall conform to City of Ferndale Standard Details W-6 through W-8. P.V.C. boxes are not to be used.
- (d) Location of Meter Boxes
 - i. If a meter box for a $\frac{3}{4}$ or 1 inch service is to be located within a sidewalk area, a #3 Skagit meter traffic-type box must be used with a heavy-duty $\frac{1}{4}$ inch deck plate lid. In any traffic areas a pyramid-type box with a framed lid must be used.

- ii. An expansion material must be used around the lid section to enable removal for maintenance. The material shall be flush with the lid section to avoid any cracks or protrusions.
- iii. As-builts shall show location of water service taps into main, location of meter/boxes with distances to the right-of-way or nearest property corners.

Sec. 706. SANITARY SEWER SYSTEMS

The City of Ferndale requires sanitary sewer construction plan submittal on development projects when improvements are proposed within public right-of-way or an easement. The following chapter has been developed to assist in preparation of sewer construction plans. It includes items pertinent for the City's review and reflects established professional civil engineering practice for preparation of construction plans. Two sets of plans must be submitted to the Public Works Department for initial review.

Sewer systems shall be designed to the requirements set forth in the most current edition of Criteria for Sewage Works Design published by the Washington State Department of Ecology, excepting requirements set forth in these standards.

A. **Criteria for Sewage Design.** This section serves as a guide for the design of sewage collection systems for the City of Ferndale. The goals are:

- To ensure that the design of sewage collection systems is consistent with public health and water quality objectives of the State of Washington.
- To establish a basis for the design and review of plans and specifications for sewage systems.
- To assist the owner or the owner's authorized engineer in the preparation of plans, specifications, reports, and other data.
- To guide departments in their determination of whether an approval, permit, and/or a certificate for a sewage system should be issued.

1. **Design.** Sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow. No new combined stormwater and sanitary sewers will be allowed.

- (a) **Overflows.** No overflows in separate sewers or new overflows in existing combined sewers shall be permitted.
- (b) **Calculations.** Computations and other data used for design of the sewer system shall be submitted to the Department upon request.

2. **Design Consideration.**

- (a) **Design Period.** Collection sewers should be designed for the ultimate development of the tributary areas. Selection of the design period for trunk and interceptor sewers should be based on evaluation of economic, functional, and other considerations; such as:
 - i. Possible solids deposition, odor, and pipe corrosion that might occur at initial flows.
 - ii. Population and economic growth projections and the accuracy of the projections.
 - iii. Comparative costs of staged construction alternatives.
 - iv. Effect of sewer sizing on land use and development.
- (b) **Design Flows.** New sewer systems shall be designed on the basis of per capita flows or alternative methods. Documentation of the alternative method shall be provided upon request.

**TABLE 7-2
DESIGN BASIS FOR DETERMINING LINE SIZE**

<u>Discharge Facility</u>	<u>Design Units</u>	<u>Flow (gpd)</u>
Dwelling	per person	100
Schools (w/showers and cafeteria)	per person	16
Schools (cafeteria but no showers)	per person	10
Boarding Schools	per person	75
Motels, @ 65 gal/person (rooms only)	per room	130
Trailer Courts, @ 3 persons/trailer	per trailer	300
Restaurants	per seat	50
Service Station	per serviced vehicle	10
Factories, per shift	per person	15-35
Shopping Centers	per 1,000 sq. ft. area	200-300
Hospitals	per bed	300
Nursing Homes	per bed	200
Retirement Homes	per bed	100
Doctor's Office in Medical Center	per 1,000 sq. ft. area	500
Laundromats (9 to 12 machines)	per machine	500
Community Colleges	per student/faculty	15
Swimming Pools	per swimmer	10
Theaters (drive-in type)	per car	5
Theaters (auditorium type)	per seat	5
Picnic Areas	per person	5
Resort Camps (limited plumbing)	per campsite	50
Luxury Camps (w/flush toilets)	per campsite	100

These figures are assumed to cover normal infiltration, but an additional allowance should be made where conditions are unfavorable. If there is an existing water system in the area, water consumption figures can be used to help substantiate the selected per capita flow. Generally, the sewers should be designed to carry, when running full, not less than the following:

- i. **Lateral and Submains.** "Minimum peak" design flow should be not less than 400 percent of the average. "Lateral" is defined as a sewer that has no other common sewers discharging into it. "Submain" is defined as a sewer that receives flow from one or more lateral sewers.

- ii. **Main, Trunk, and Interceptor Sewers.** "Minimum peak" design flow should be not less than 250 percent of the average design flow. "Main" or "trunk" is defined as a sewer that receives flow from one or more submains. "Interceptor" is defined as a sewer that receives flow from a number of main or trunk sewers, force mains, etc. An alternate method for trunk sewers is to use 80 gallons per capita, per day, a peaking factor from Table 6-1 subject to the above limits, and 1,200 gallons per acre, per day, for infiltration and inflow.

New sewer systems may be designed by alternative methods other than on the basis of per capita flow rates. Alternative methods may include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, separation of infiltration and inflow from the normal sanitary flow, and modification of per capita flow rates (based on specific data). Documentation of the alternative method used shall be provided upon request.

- (c) **Design Factors.** The following factors must be considered in the design of sanitary sewers:

- i. Peak sewage flows from residential, commercial, institutional, and industrial sources
- ii. Groundwater infiltration
- iii. Topography and depth of excavation
- iv. Treatment plant location
- v. Soil condition
- vi. Pumping requirements
- vii. Maintenance
- viii. Existing sewers
- ix. Existing and future surface improvements
- x. Controlling service connection elevations
- xi. Easements (See Section 5.05)

- (d) **Design Considerations.** The utility shall be extended through the property to allow for future extension, expansion and construction of City's collection system or for conformance with comprehensive sewer system plan.

3. **Design and Construction Details**

(a) **Gravity Sewers**

- i. **Minimum Size.** No sewer shall be less than 8 inches in diameter.
- ii. **Depth.** In general, sewers should be a minimum of 3 feet deep to prevent freezing and physical damage and should receive sewage from existing dwellings by gravity.
- iii. **Roughness Coefficient.** An "n" value of 0.013 shall be used in Manning's formula for the design of all sewer facilities (regardless of pipe material) except inverted siphons, where an "n" value of up to 0.015 can be used.
- iv. **Slope.** All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second. The following minimum slopes shall be provided, however, slopes greater than these are desirable:

**Table 7-3
Minimum Slopes for Sewer Mains**

<u>Sewer Size</u> <u>(inches)</u>	<u>Minimum Slope</u> <u>(feet per 100 feet)</u>
8"	0.40
10"	0.28
12"	0.22
15"	0.15

Under special conditions, slopes slightly less than those required for the 2.0 feet per second velocity when flowing full may be permitted. Such decreased slopes will only be considered where the depth of flow will be 0.3 of the diameter or greater for design average flow. Whenever such decreased slopes are proposed, the design engineer shall furnish computations of the depths of flow in such pipes at minimum, average, and daily or hourly rates of flow. The City must recognize and accept in writing the problems of additional maintenance caused by decreased slopes.

Sewers shall be laid with uniform slope between manholes.

Sewers on 20 percent slope or greater shall be anchored securely with concrete anchors or equal. Suggested minimum anchorage spacing is as follows:

- a. Not over 36 feet center-to-center on grades from 20 to 35 percent.
 - b. Not over 24 feet center-to-center on grades from 35 to 50 percent.
 - c. No over 16 feet center-to-center on grades 50 percent or greater.
- v. **Alignment.** Gravity sewers 24 inches or less in diameter shall be designed with straight alignment between manholes. Curved sewers may be approved, where circumstances warrant, for sewers greater than 24 inches in diameter.
- vi. **Matching Pipe.** Where a smaller sewer joins a larger one, the invert of the larger sewer shall be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.
- vii. **High-Velocity Protection.** The use of ductile-iron pipe is required where velocities greater than 15 feet per second are expected.
- viii. **Material.** Any generally accepted material for sewers will be given consideration, but the material selected should be adapted to local conditions, such as characteristics of industrial wastes, possibility of septicity, soil characteristics, exceptionally-heavy external loadings, abrasion, and similar problems.

Material and installation specifications for all pipe, except cleanouts, shall conform to the Standard Specifications, current edition. Cleanouts shall be according to City of Ferndale Standard Details SS-5 (DOT B-18b). Unless otherwise stated, all materials specifications shall conform to the Standard Specifications, current edition. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling so as not to damage the pipe or its joints, impede cleaning operations and future tapping, nor create excessive side fill pressure or ovulation of the pipe, nor seriously impair flow capacity.

All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer shall be made based on the width of depth of trench. When standard-strength sewer pipe is not sufficient, the additional strength needed may be obtained by using extra-strength pipe or by special construction, such as improving bedding conditions or encasing the pipe in concrete. When extra-strength pipe is required, the design criteria (loading requirements, soil strengths, etc.) shall be supplied to the City.

- ix. **Connection to Existing Sewer Main.** When a sewer service or main must be connected to an existing sewer main, installation shall conform to City of Ferndale Standard Detail SS-12.
- x. **Specifications for Sewer Pipe.** The following specifications are to be used in conjunction with the Standard Specifications for Road, Bridge, and Municipal Construction.

Material to be used for bedding of these flexible conduits shall conform to materials listed in WSDOT Standard Specifications. No bedding material shall be used unless accepted by the Public Works Director. Samples shall be submitted by the Contractor at least 72 hours in advance of its intended use to enable it to be inspected and tested.

Bedding shall be placed in more than one lift as shown in Standard Detail SS-1 (DOT B-18c). The first lift to provide at least 4 inch thickness under any portion of the pipe (6 inches in the case of solid rock excavation) to be placed before the pipe is installed. This bedding layer shall extend the full width of the trench bottom to the specified thickness after being consolidated by the use of a "flat tamper". This lift shall be spread smoothly and bell holes dug where necessary to ensure uniform support along the full length of the pipe barrel.

Subsequent lifts of not more than 6 inches shall be placed up to the spring line of the pipe. These lifts shall be consolidated first by the use of tamping bars, taking care to work the material under the pipe haunches so that no voids are left, then a flat tamping bar shall be used to compact the bedding material along the side of the pipe to the trench walls to provide lateral support for the pipe. These lifts shall be individually compacted to 90 percent density, as determined by ASTM D698, Method "D".

Further lifts of moderately-compacted bedding material shall be placed, not more than 6 inches thickness to a minimum of 8 inches, above the crown of the pipe (a minimum of 12 inches above the crown of pipe where rock is encountered in trench excavation).

xi. **Bank-Run Gravel for Trench Backfill.** Whenever a trench is excavated in the existing or newly-paved roadway, sidewalk or other areas where minor settlement would be detrimental, the entire trench shall be backfilled with Bank-Run Gravel, Class "B", and compacted to a 95 percent density as defined by ASTM D-1556. Selected native materials may be used for trench backfill in other areas if approved by the Public Works Director.

xii. **Joints and Infiltration.** The method of making joints and materials used shall be included in the specifications. Leakage tests shall be according to Washington State Department of Transportation Standard Specification for Road, Bridge and Municipal construction SE-7-17.3(4)F for non-air-permeable materials and SE-7-17.3(4)D for air-permeable materials.

The use of television camera or other visual methods for inspection prior to placing the sewer in service is required.

(b) **Pressure Systems.** Pressure sewer systems are considered developmental technology. All pressure systems will be designed by a professional engineer and will be judged on a case-by-case basis.

(c) **Manholes.** Manholes shall conform to City of Ferndale Standard Details SS-2 (DOT B-23a) through SS-4 (DOT B-23c).

Manholes shall be installed at the end of each line of 8 inch diameter or greater unless the 8 inch line is expected to be extended in the foreseeable future in which case, a cleanout shall be installed at the end of the line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400 feet for sewers 15 inches or less and 500 feet for sewers 18 inches to 30 inches. Cleanouts may be used in lieu of manholes at the end of lines 8 inches in diameter and not more than 150 feet long if they are accessible to the City's maintenance equipment. Cleanouts shall conform to City of Ferndale Standard Detail SS-5 (DOT B-18b).

Drop manholes shall conform in all respects to City of Ferndale Standard Details SS-10 and SS-11. An outside drop connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

The minimum diameter of manholes shall be 48 inches, although larger diameters are preferable. The minimum clear opening in the manhole frame shall be 23 inches. Manholes connecting significant industries to the system should be larger, to provide space for monitoring and sampling equipment.

Flow channels in manholes shall be of such shape and slope to provide a smooth transition between inlet and outlet sewers and to minimize turbulence. Channeling height shall be to the crowns of the sewers. Benches shall be sloped from the manhole wall toward the channel to prevent accumulation of solids.

Watertight manhole covers shall be used wherever the manhole tops may be flooded. Manholes of brick or segmented block shall be waterproofed on the exterior with plaster coatings, supplemented by a bituminous waterproof coating where groundwater conditions are unfavorable.

Direct-line connections to the manholes or to short stubs integral with the manholes shall be made with flexible joints. Flexible joints are those which permit the manholes to settle without destroying the watertight integrity of the line connections.

Ventilation of gravity sewer systems should be considered where continuous watertight sections greater than 1,000 feet in length are incurred.

Frames and covers shall conform to the current City of Ferndale Standard Detail SS-9 (DOT B-25). Frames and covers of aluminum material will be allowed if approved by the Public Works Director.

All covers located in an easement or constructed of aluminum material shall be the locking type.

Materials used for manhole steps shall be highly corrosion resistant. The use of galvanized steel should be avoided. Manhole steps and ladders shall conform to Standard Detail SS-4 (DOT B-24).

4. **Special Details**

- (a) **Protection of Water Supplies.** There shall not be a physical connection between a public or private potable water supply system and a sewer, or appurtenance thereto, which would permit the passage of any sewage or polluted water into the potable supply.

No sewer shall be constructed within 100 feet of a potable water supply well or other potable water source or structure without approval of the City and the Washington State Department of Health.

Relation to water mains shall be as follows:

- i. **Horizontal Separation.** Whenever possible, sewers should be laid at least 10 feet, horizontally, from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a water main if the sewer is constructed of cast-iron or ductile-iron pipe with watertight joints, and:
- a. It is laid in a separate trench; or
 - b. It is laid in the same trench with the water mains located at one side on a bench or undisturbed earth.

In either case, the elevation of the crown of the sewer is at least 18 inches below the invert of the water main and in no case will the sewer be separated horizontally from the water main less than 4 feet.

- ii. **Vertical Separation.** Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main.

When the elevation of the sewer cannot be buried to meet the above requirements, the water main shall be relocated to provide this separation or the sewer constructed with slip-on or mechanical-joint cast-iron pipe, or pre-stressed-concrete cylinder pipe for a distance of 10 feet on each side of the water main. One full pipe length of water main shall be centered over the sewer so that both joints will be as far from the sewer as possible.

- (b) **Easements.** Prior to commencement of construction, any sewer lines located within an easement shall be properly dedicated to the City of Ferndale and recorded. Access roads to manholes on easements shall be 10 feet wide, 8 inch thick bank-run gravel with 15 percent maximum grade. (See Section 5.05 for easement description.)
- (c) **Stream Crossings.** Sewers entering or crossing streams shall be constructed of watertight pipe. The pipe and joints shall be tested in place, shall exhibit "0" infiltration, and shall be designed, constructed, and protected against anticipated hydraulic and physical, longitudinal, vertical, and horizontal loads, erosion, and impact. Sewers laid on piers across ravines or streams shall be allowed only when it can be demonstrated that no other practical alternative exists. Such sewers on piers shall be constructed in accordance with the requirements for sewers entering or crossing under streams. Construction methods and materials shall be such that sewers will remain watertight and free from change in alignment or grade.

Permits from other agencies or departments are required for work in or adjacent to waterways.

Inverted siphons shall have not less than two barrels with a minimum pipe size of 6 inches, and shall be provided with necessary appurtenances for convenient flushing and maintenance. The manholes shall be designed to facilitate cleaning, and, in general, sufficient head shall be provided and pipe size selected to secure velocities of at least 3.0 feet per second for average flows. A rock catcher and coarse screen shall be provided to prevent plugging of the siphons. The inlet and outlet details shall be arranged so that normal flow can be diverted to one barrel and so that either barrel may be removed from service for cleaning or other maintenance.

- (d) **Side Sewer Installation.** Four or six inch side sewer installations and as-builts shall conform to City of Ferndale Standard Details SS-6 through SS-8. For new sewer main construction, 4 or 6 inch tees shall be placed on sewer mains as shown on plans or as the Public Works Director designates. Double services shall conform to City of Ferndale Standard Detail SS-13.
- (e) **As-built information required.** Location of manholes, cleanouts, inverts, side sewer saddles on sewer main, side sewer ends with distances to the right-of-way, property corners & depths.

Sec. 707. ILLUMINATION

Illumination plan requirements and design criteria are listed below.

A. Criteria for when streetlighting is required.

1. On all principal arterial streets.
2. On secondary arterial streets with a considerable amount of vehicular stopping, turning, or crossing.
3. In a central business district (CBD) or in a commercial zone with high traffic volumes.
4. On a residential street being constructed within a plat.

B. Streetlighting Design Requirements.

1. Lighting plans shall be submitted to the Public Works Director by a person qualified to do illumination design. Plans shall be approved by both the City of Ferndale and Puget Power in accordance with the following standards.
2. Illumination specifications to be used are shown in the WSDOT Standard Plan J-11a, unless otherwise approved by the Public Works Director. In some situations, "matching" an existing system will be permitted.
3. Street lighting shall be standard concrete octagon or round with a variety of colors and texture. Minimum bracketed height of 25 feet, luminare shall be high pressure sodium with flat glass lens.
4. Street lighting installations shall be located in reference to the dimensions of full grown trees and in accordance with the determination and standards of the Director of Public Works.

Table 7-4

Illumination Design Criteria

<u>Roadway Class.</u>	<u>Lamp Type</u>	<u>Intial Lumens</u>	<u>Average Footcandles</u>	<u>Width</u>	<u>Pavement Spacing</u>	<u>Pole</u>
Residential	100W HPS	5,800	0.17	36'	250'	
Collector	250W HPS	30,000	1.00	36' 44'	240' 196'	
Arterial	250W HPS	30,000	1.40	36' 44' 56'	171' 140' 110'	
Central Bus. District	250W HPS	30,000	2.00	44' 56'	98' 77'	