CITY OF ST. HELENS
ENGINEERING STANDARDS MANUAL
MUNICIPAL CODE TITLE 18

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Title 18
ENGINEERING STANDARDS MANUAL

Chapters:

Chapter 18.04
ABBREVIATIONS AND DEFINITIONS

Sections:

18.04.010 Abbreviations and definitions.

"AASHTO" means American Association of State Highway and Transportation Officials.

"AC" means asphaltic concrete.

"ACI" means American Concrete Institute.

"ADA" means Americans with Disabilities Act of 1990.

"ADT" means average daily traffic.

"ALTA Survey" means American Land Title Association Survey.

"ANSI" means American National Standards Institute.

"APWA" means American Public Works Association.

"ASTM" means American Society for Testing and Materials.

"AWWA" means American Water Works Association.

"Bicycle" means a vehicle having two tandem wheels, propelled solely by human power.

"Bicycle facilities" is a general term denoting improvements and provisions which accommodate or encourage bicycling, including parking facilities, maps, signs, pathways, bike lanes, widened sidewalks, bikeways and shared roadways designated for bicycle use.

"Bicycle lane (bike lane)" means a portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.

"Bicycle path (off-street pathway)" means a paved pathway physically separated from motorized vehicular traffic by an open space or barrier within an independent right-of-way.

"Bicycle route (bike route)" means a segment of a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational markers, with or without a specific bicycle route number or as designated on a bicycle map, brochure or guidebook.

"Bikeway" means any road, path or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

“CARV” means combination air and vacuum release valve.

CBE. “Crushed base equivalent (CBE)” is the number that directly relates the traffic coefficient to the required number of inches of rock for street structural sections.

“CBR” means California bearing ratio.

“City engineer” means city engineer or designated representative.

“DEQ” means Oregon Department of Environmental Quality.

“Development Code” refers to the city of St. Helens Development Code (SHMC Title 17, Ordinance 2875 and amendments).

“DSL” means Division of State Lands.

“Engineer” means the design engineer, stamping engineer, or engineer of record.

“EPA” means U.S. Environmental Protection Agency.

“FEMA” means Federal Emergency Management Agency.

“GPS” means global positioning system.

“IE” means invert elevation.

“Intersection” refers to the area jointed by two or more roads intersecting. For approaches of a continuous street at an acute curve or some other angle point with different street names.

“MUTCD” means Manual on Uniform Traffic Control Devices.

“NEC” means National Electric Code with Oregon amendments.

“OAR” means Oregon Administrative Rules.

“ODOT” means Oregon Department of Transportation.

“ORS” means Oregon Revised Statutes.

“OSHA” means Occupational Safety and Health Administration.

“OSHD” means Oregon State Highway Division.

“Parking lot” means paved surfaces on private property intended for the movement and storage of six or more vehicles.

“PRV” means pressure-reducing valve.

"Review authority" means city staff that the city engineer consults when a decision regarding a design standard modification is made. For the purposes of this title, these staff include the public works director, fire marshal, planning director, and engineering staff.

"Sidewalk" means the portion of a street designed for preferential or exclusive use by pedestrians.

"Street" means a public way which affords the principal means of access to abutting property.

"TCDH" means Traffic Control Device Handbook.

"Temporary parklet" means the use of a vehicle space (e.g., on-street parking space) or curb extension for public use, social interaction, and passive or active recreation. Temporary parklets in an on-street parking space are typically comprised of a platform, barriers to traffic, and seating, yet creativity in incorporating landscaping, art, and other elements is encouraged, given safety requirements are met. The duration of temporary parklets and the design vary accordingly. See SHMC 18.12.190.

"Traffic coefficient" means a number used in determining the structural section of a street.

"Transportation plan" refers to the city of St. Helens transportation plan which is an element of the comprehensive plan.

"UBC" means Uniform Building Code with Oregon amendments.

"UFC" means Uniform Fire Code with Oregon amendments.

"UL" means Underwriter's Laboratory.

"UMC" means Uniform Mechanical Code with Oregon amendments.

"UPC" means Uniform Plumbing Code with Oregon amendments.

"Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Identification and delineation of jurisdictional wetlands and wetland boundaries shall be done by a qualified biologist using applicable state and federal guidelines. (Ord. 3181 § 4 (Att. C), 2015; Ord. 2875 Appx., 2003)

Chapter 18.08
GENERAL DESIGN REQUIREMENTS

Sections:

Article I. Requirements for Public Improvements

18.08.005 Requirements for public improvements.

The exclusion of any topic, specification, detail, etc., does not relieve the designer, engineer, and/or contractor from the responsibility of following proper design and construction procedures. (Ord. 2875 Appx. § 110, 2003)

18.08.010 General.

The purpose of this title is to set standards for the construction of public improvements to serve new and future developments and for the reconstruction of existing facilities to upgrade existing infrastructure. These standards shall apply to all improvements within the public right-of-way, to all improvements required within the proposed public right-of-way of new subdivisions, for all improvements intended for maintenance by the city, and for all other improvements for which the city code requires approval of the city engineer or designee. These include street, bikeway, drainage, water, and sanitary sewer improvements as required by the development review process, city ordinance, and other city policies adopted by the city council. Standards for site grading, erosion control, parking lot and driveway construction on private property are also contained in this title. Designs submitted shall be stamped by a registered professional engineer licensed to practice in the state of Oregon. At the discretion of the city engineer, registered architects licensed to practice in the state of Oregon may be approved to stamp site grading, erosion control, parking lot, sidewalk, and driveway construction plans. In this case, an architect's Oregon registration number must appear on or next to their professional stamp on each page submitted.

The standards contained in this title are intended as guidelines for designers and developers in preparing their plans, and for city staff in reviewing plans. Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used where practical. In some locations, due to existing development or unusual topography, conformance to these standards may impose an unusual hardship. In such locations, the city may approve modifications to the standards, or a variance from the standard, as allowed by law.

All public improvements and private streets, parking lots, sidewalks, and driveways shall be designed and constructed in such a manner as to be readily accessible to and usable by individuals with disabilities as per the requirements of the Americans with Disabilities Act of 1990. This includes providing curb ramps at intersections

with pedestrian crosswalks to allow a smooth transition between street and sidewalk elevations. (Ord. 2875 Appx. § 110.1, 2003)

18.08.020 Precedence of documents.

If there is a conflict between approval documents, the document highest in precedence shall control. The precedence shall be:

First: Permits from other agencies or jurisdictions, as may be required by law.

Second: Engineering review and planning commission conditions of approval.

Third: "City of St. Helens Engineering Design Manual" and standard drawings.

Fourth: City of St. Helens Development Code (SHMC Title 17, Ordinance 2875 and supplements).

Fifth: Plans and details prepared by the design engineer.

Sixth: ODOT/APWA Oregon Standard Specifications for Construction.

Seventh: Reference specifications.

Supplemental written agreements and approved revisions to plans and specifications by the appropriate jurisdictions will take precedence over documents listed above. Detailed plans shall have precedence over general plans. In any event, the determination of the city engineer shall be final. (Ord. 2875 Appx. § 110.2, 2003)

Article II. Submittal Requirements

18.08.030 General.

(1)(a) Submittal requirements consist of design plans, grading plans (where required), erosion control plans (where required), drainage calculations, and other information as required. An engineer's estimate shall be included with the plan submittal.

(b) The Oregon Standard Specifications and Standard Drawings for Construction are hereby adopted and incorporated as part of this title by reference except as modified herein.

(c) The plans shall be submitted in entirety for review. No portion of a full set of plans will be accepted.

(2) Phased Development Submittal. Submittal for a phased development shall include all items under subsection (1) of this section for each phase of the development. No multiple phase submittals will be accepted for review of a single phase. (Ord. 2875 Appx. § 120.1, 2003)

18.08.040 Design plan format.

(1)(a) The plans shall be submitted on 24-inch by 36-inch sheets.

(b) Vicinity maps shall be located on the first sheet of all plans and shall show the location of the project in respect to the nearest major street intersection.

(c) A north arrow shall be shown on each plan view sheet of the plans and adjacent to any other drawing that is not oriented the same as other drawings on the sheet.

(d) Site development plans shall be organized as follows:

(i) Title sheet to include project name, vicinity map, name and mailing address of developer/owner and engineering firm, general notes, notice to excavators, index, space for city approval stamp (five-inch by five-inch) in the lower right quadrant, the city of St. Helens project numbers in the very bottom of the lower right-hand corner, and a summary of quantities of all public infrastructure.

(ii) Composite utility plan: include existing public and private utilities, and proposed public improvements.

(iii) Street and storm sewer plan and profiles, showing existing and finished contours at two-foot intervals. Profile views shall include shaded locations of all other proposed and existing utilities to verify potential conflicts.

(iv) Sanitary sewer and water plan and profiles. Profile views shall include shaded locations of all other proposed and existing utilities to verify potential conflicts.

(v) Grading and erosion control plan showing existing and finished contours with maximum contour intervals of two feet. Contours shall extend off site a minimum of 50 feet. This sheet shall also note the source of information, date of fieldwork, and location of original document.

(vi) Details may be listed by calling out the city of St. Helens standard detail number and title. If the detail drawings are to be included on the plan sheets, all city standard details shall be full size, 75 percent or 66 percent of original size. Any modifications to a city standard drawing or detail must be clearly marked and initialed by the engineer, along with the date of approval for modifications. Preapproval is required for modifications to city standard drawings and details.

(vii) Copy of the approved tentative plat.

(viii) Street lighting plan.

(e) The scale shall be one inch equals two feet, three feet, four feet, five feet, or 10 feet vertically and shall be one inch equals 10 feet, 20 feet, 30 feet, 40 feet, or 50 feet horizontally for all drawings except structural details. Scale shall be shown with north arrow and/or within a title block.

(f) Letter size shall not be smaller than one-tenth of an inch high.

(g) The location and elevation of a National Geodetic Survey, United States Geological Survey, Oregon State Highway, Columbia County, or city of St. Helens benchmark shall be shown. No other datum shall be used without permission of the city engineer. Temporary control benchmarks and elevations shall also be shown on the plans.

(h) A title block shall appear on each sheet of the plan set and shall be placed in the lower right-hand corner of the sheet, across the bottom edge of the sheet, or across the right-hand edge of the sheet. The title block shall include the names of the project, the engineering firm, the owner, the sheet title, and the sheet number.

(i) Below title block in bold text shall be the city of St. Helens project number on each sheet.

(j) The signed seal of the registered Oregon professional engineer (or architect as noted in SHMC 18.08.010) responsible for preparation of the plans shall appear on each sheet.

(k) The description and date of all revisions to the plans shall be shown on each sheet affected, and shall be approved and dated by the registered professional engineer of record as evidenced by an original signature or initial.

(l) Through use of standard drafting symbols, indicate the location and direction of view for all sections.

(2) Plan View. Plan views shall show the following:

(a) Right-of-way, property, tract, and easement lines (existing and proposed).

(b) Subdivision name, lot numbers, street names, and other identifying labels. Subdivision and street names are subject to the approval of the city planning department, and the county surveyor.

(c) Location and stationing of existing and proposed street centerlines and curb faces.

(d) Horizontal alignment and curve data of street centerlines and curb returns.

(e) Existing underground utilities and vegetation within the construction limits.

(f) Location of existing buildings, wells, septic tanks, drain fields, fuel tanks, and any other buried structures.

(g) Location, stationing, and size of all mains and service lines for storm drainage, sanitary sewer and water. Stationing shall be located in relationship to the street stationing at all manholes or other key locations.

(h) Match lines with sheet number references.

(i) Provisions for cross-connection control must be clearly shown on the plans, including any retrofitting of existing water service connections and existing auxiliary water supplies, conversions to city of St. Helens water service that are required as a condition of development approval, upgrading of existing service connections by replacement of same, and any other cross-connection control required by state and local rules and codes.

(j) Street stationing to be noted at a minimum of 100-foot intervals.

(k) Top of curb elevations along curb returns at quarter-deltas, and at 100-foot stations. Top of curb elevations can also be shown at each property corner to aid in preparation of lot drainage plans.

(l) Location of the low points of street grades and curb returns.

(m) Sidewalk locations. This shall include ramps, transitions in location or width, and relationship with driveways.

(n) Crown lines along portions of streets transitional from one typical section to another.

(o) Centerline stationing of all intersecting streets.

(p) Location and description of existing survey monuments, including but not limited to: section corners, quarter corners, donation land claim corners, and city benchmarks.

(q) Location of proposed street intersection monument boxes.

(r) FEMA-designated 100-year floodplains and floodways, or areas of flooding during a 100-year storm event.

(s) Wetland areas and storm water quality undisturbed corridors (buffer strips).

(t) Legend.

(u) Developer's name, address and phone number.

(v) Any additional information that the city deems necessary.

(3) Profile View. Profile views shall show the following:

(a) Stationing, elevations, vertical curve data (including curve k factors), and slopes for center of streets or top of curbs. For offset or superelevation cross-sections, both curbs shall be profiled. Where curbs are not to be constructed, centerline of street and ditch inverts shall be shown. Where curb lines (left and right of centerline) have vertical grades not conforming to the standard street detail on plans, both curb lines and centerline profiles shall be drawn.

(b) Original ground along the centerline and if necessary at the edges of the right-of-way if grade differences are significant.

(c) Centerline, top of curb, and gutter flow lines of existing streets for a distance of at least 300 feet each way at intersections with proposed streets. For stub streets that may be extended in the future, the vertical alignment shall be designed for at least 300 feet beyond the scope of the proposed construction. At the discretion of the city engineer, additional design information concerning the vertical and horizontal alignment of future street extensions may be required.

(d) Vertical alignment of streets, including existing centerline monumentation.

(e) The top of curb for all cul-de-sacs, eyebrows and curb returns.

(f) All proposed drainage facilities, all invert and top elevations, slopes, materials, bedding, and backfill.

(g) Existing drainage facilities, including off-site facilities, upstream and downstream that affect the design (i.e., downstream restrictions that back water on to project site). In addition, base flood elevations shall be shown on the profile.

(h) Profiles for ditch and creek flow lines shall extend a minimum of 200 feet beyond the project, both upstream and downstream. Typical cross-sections at 50-foot intervals shall also be submitted.

(i) Designate structures using alpha or numeric labels on profiles to correspond to plan view notation.

(j) Profile for all existing and proposed storm drain, sanitary sewer, water mains, and other utilities.

(k) All existing and proposed sanitary, water, storm lines and other utilities crossing the profile shall be shown on each profile. The utilities not being emphasized on a particular profile shall be shown in a shaded manner. For example, on a profile view emphasizing water and sanitary sewer lines and grade, the storm drain, street finished grade, natural gas, and any other existing or proposed utility within the cross-section shall be shown at its proper depth and grade in a shaded or faded manner on the profile. (Ord. 2875 Appx. § 120.2, 2003)

18.08.050 Site grading plan.

The city of St. Helens code requires a site grading plan as part of the application for any development that involves the excavation or fill of greater than 50 cubic yards of material. Grading contours (existing and proposed) shall be at no more than two-foot intervals, and shall extend off site a minimum of 50 feet. The site grading plan shall show how each lot in the development will be graded to avoid nuisance drainage on to adjacent properties. This sheet shall also note source of information, date of fieldwork, and location of original document.

The grading plan shall include notation depicting the intended discharge points and general drainage of each lot. A general note shall describe the intended discharge points for roof, foundation, and low point drains.

All soil-disturbing construction activity must adhere to the requirements of OAR 340-41-455. A detailed erosion control plan shall be shown in conjunction with the site grading plan. (Ord. 2875 Appx. § 120.3, 2003)

18.08.060 Drainage calculations.

Drainage calculations shall be presented in a clear, concise and complete manner. These calculations shall address all runoff into the drainage system. The drainage calculations shall be included with the plan submitted for plan review.

Initial time of concentration calculation with assumptions listed and charts or nomographs used shall be included with drainage calculations. (Ord. 2875 Appx. § 120.4, 2003)

18.08.070 Other requirements.

Other information to be shown on the construction drawings or the other submittals include:

(1) The design assumptions for each street (example: traffic coefficient, R-value).

(2) The design elements such as:

(a) Street classification;

(b) Design speed;

(c) Results of a traffic study, if necessary;

(d) Average daily traffic (ADT) or design hourly volume (DHV).

(3) Structural construction plans and the necessary calculations shall be submitted for proposed structures (example: walls, box culverts, bridges).

(4) Septic tank and/or septic field abandonment location(s). All septic tank and septic field abandonment shall follow the Uniform Building Code and the Uniform Plumbing Code as applicable.

(5) Any additional information that the city engineer deems necessary to review the plans and assure compliance with design standards. (Ord. 2875 Appx. § 120.5, 2003)

18.08.080 Standard details.

The standard details required for the project shall be called out and identified by title and drawing number on the cover sheet of the submitted plans, or on another sheet if they are logically placed and easily located. The contractor will be responsible for assuring that a copy of the most recent “City of St. Helens Engineering Department Public Facilities Construction Standards Manual” is on site at all times.

Any modifications to a city standard drawing or detail must be preapproved by the city engineer; see Article VI of this chapter. Modified drawings must be shown on the construction drawings along with the date of approval for the modification. (Ord. 2875 Appx. § 120.6, 2003)

18.08.090 Review procedure.

Three sets, or as directed by the city engineer, of complete plans shall be submitted for review. Supporting information and documentation, such as drainage and water system calculations, shall also be submitted.

Upon completion of the detailed review by the city, the city will return one set of plans with “red line” comments. After the private engineer has completed all revisions, three revised plans and the original “red line” plans shall be returned to the city.

Plan review priority will be given to plans submitted for final review. This plan review and approval is valid for one year.

"Plan approval" means that the plans have been reviewed for reasonableness and compliance with minimum city specifications and standards. This approval does not supersede those standards and specifications, unless specifically varied by the city. Plan approval does not relieve the developer and/or engineer from responsibility for errors, omissions, or deficiencies in the plans. (Ord. 2875 Appx. § 120.7, 2003)

18.08.100 As-built drawings.

Following completion of construction, the engineer shall submit one complete set of mylar as-built drawings. As-built drawings shall contain any and all revisions to the previously approved construction plans, and shall be accompanied by a stamped and signed completion certification letter from the engineer. If specialists were required in the design of the project (soils engineer, surveyor, arborist, wetland scientist, engineering hydrologist, etc.), then a stamped and signed completion certification from those individuals shall be required relating to their specialty. In addition, upon acceptance by the city, the site must either have all vegetation/landscaping established or all erosion control measures as needed and in good working order. Each sheet of the as-constructed drawings shall be stamped "As-Built," and signed and dated by the engineer. This signature constitutes a certification that the public improvements, grading, and other elements of the engineered drawings have been completed in accordance with the city-approved plans and to the standards of the city. As-builts shall be black ink on originals, fixed-line, four-mil opaque mylar, 24 inches by 36 inches in size and to engineering scale. Each sheet included in the construction plan shall be as-built. Sepia mylars or vellums will not be accepted.

(1) All public utility easements will be shown and identified on the as-built.

(2) Distance between main lines in shared easements will be shown.

(3) Type of main line, size, and material will be shown.

(4) All laterals shall include length, plan stationing, size, material, and depths.

(5) A summary of quantities of all public infrastructure shall be included on the cover sheet.

(6) The city also shall receive a copy of all as-built drawings and documents as printed in AutoCAD dwg R14 or higher format, on disk.

The city shall receive a copy of the surveyed plat, as recorded, on paper and on disk in AutoCAD dwg R14 or higher format. (Ord. 2875 Appx. § 120.8, 2003)

Article III. Street Design

18.08.110 Functional classification.

The functional classification of existing and proposed roads is established by the transportation master plan. Where the functional classification of a street is not defined by the transportation master plan, the existing land use and existing operational characteristics shall be used by the city to determine the functional classification of the street in question.

Transportation master plan classifies roads and streets as follows:

(1) Principal Routes. This system provides the backbone for the roadway network. It serves through trips entering and leaving the urban area, as well as the majority of movements bypassing the central city. This system includes interstates, freeways, expressways and other principal arterials.

(2) Major Arterials. These facilities are the supporting elements of both the principal routes and collector systems. Major arterials, in combination with principal routes, are intended to provide a high level of mobility for travel within the region. All trips from one subarea through an adjacent subarea traveling to other points in the region should occur on a major arterial or principal route. Access to major port facilities should be provided by major arterials.

(3) Minor Arterials. The minor arterial system complements and supports the principal and major systems, but is primarily oriented toward travel within and between adjacent subareas. An adequate minor arterial system is needed to ensure that these movements do not occur on principal routes or major arterials. These facilities provide connections to major activity centers and provide access from the principal and major arterial systems into each subarea.

(4) Collectors. The collector system is deployed nearly entirely within subregions to provide mobility between communities and neighborhoods or from neighborhoods to the minor and major arterial systems. An adequate collector system is needed to ensure these movements do not occur on principal routes or major arterials. Land is directly accessible with emphasis on collection and distribution of trips within an arterial grid.

(5) Local Streets. The local street system is used throughout developed areas to provide for local circulation and direct land access. It provides mobility within neighborhoods and other homogenous land uses, and comprises the largest percentage of total street mileage. In general, local traffic should not occur on major arterials and principal routes. (Ord. 2875 Appx. § 130.1, 2003)

18.08.120 Access.

Access to public streets shall conform to the requirements of the city of St. Helens transportation master plan and the Development Code. The city engineer shall have the authority to limit access and designate access locations on public streets under the jurisdiction of the city. Access to streets and highways under Columbia County or state of Oregon jurisdiction must be formally approved by those entities at the applicant's initiative and expense. (Ord. 2875 Appx. § 130.2, 2003)

18.08.130 Width.

The city of St. Helens Community Development Code contains a summary of road width standards by the functional classification of the road. It should be noted that public utility easements beyond the right-of-way are typically required. (Ord. 2875 Appx. § 130.3, 2003)

18.08.140 Number of lanes.

The number of lanes for each class of road is defined by the city of St. Helens transportation master plan. (Ord. 2875 Appx. § 130.4, 2003)

18.08.150 Easements.

(1) The minimum public utility and drainage easements for residential subdivisions shall be as follows:

(a) A six-foot public utility easement along all front lot lines and adjacent to all public rights-of-way.

(2) Public water, sanitary sewer, and storm drainage lines on private property shall be centered within a permanent easement granted to the city, with a minimum width of 15 feet along its entire length. Such easements, when directed by the city, shall be accompanied by temporary easements granted to the city of adequate width to allow construction of water and sewer. The engineer of record or developer's surveyor shall provide the city with documents necessary to record the easements. The width of combination easements is evaluated at the site development permit stage on a case-by-case basis, but is generally required to be seven and one-half feet from the center or the furthest outside utility. It is within the authority of the city engineer and/or city planner to refuse to approve or sign any land partition, partition plat, or subdivision plat for a development that has not installed or completed the construction of the necessary public infrastructure to serve the proposed and affected existing lots. Such approval may be withheld until it can be verified that the location and width of proposed rights-of-way and easements are adequate for the completed infrastructure.

(3) Easements are subject to the approval of the city attorney prior to recording. Variation from the city standard form of conveyance shall be allowed only when extraordinary circumstances warrant, as determined by the city engineer and city attorney.

(4) All recording costs for easements created by private development shall be borne by the developer unless specifically agreed to by the city.

(5) Easements for the purpose of any public utility shall allow the city reasonable access to construct, reconstruct, maintain, and repair the facility. No building or structure shall be constructed or maintained on or within the easement that would interfere with the right of reasonable access.

(6) The engineer should check building code requirements for required setbacks from buried utilities. (Ord. 2875 Appx. § 130.5, 2003)

18.08.160 City maps/plans not guaranteed.

From time to time the city may provide property owners, engineers, contractors, and other members of the public with information from the city's archives. The city cannot guarantee and makes no representation that it has verified the accuracy of the measurements, locations, or other information on such maps and plans. (Ord. 2875 Appx. § 130.6, 2003)

Article IV. Surveying

18.08.170 General.

All boundary surveys shall be tied to two GPS monuments and rotated around their basis of bearing.

This title, Part 100 of the Oregon Standard Specifications, and ORS 209.140 through 209.150 define the requirements for protection of existing survey monuments during any construction and setting new survey monuments following construction of new streets, sewers, water and related works.

The city engineer may not approve or sign any land partition, partition plat, or subdivision plat until the necessary public infrastructure to serve the proposed and affected existing lots has been installed or has been guaranteed by a security acceptable to the city attorney. It is within the authority of the city engineer to refuse to approve or sign any land partition, partition plat, or subdivision plat for a development that has not installed or completed the construction of the necessary public infrastructure to serve the proposed and affected existing lots. Such approval may be withheld until it can be verified that the location and width of proposed rights-of-way and easements are adequate for the completed infrastructure. (Ord. 2875 Appx. § 140.1, 2003)

18.08.180 Existing survey monuments.

Whenever an existing section corner, one-quarter section corner, or donation land claim corner monument or accessory, appears to be in danger of damage or destruction by any construction, the county surveyor shall be notified in writing, not less than 10 working days prior to construction. The county surveyor shall reference the monument prior to construction and replace it following construction. The county surveyor shall be reimbursed for all expenses from said replacement by the party responsible for the construction.

As per ORS 209.150, no person shall willfully or negligently remove, destroy, or deface any existing survey monument. If damage cannot be avoided, the monument shall be referenced and replaced, under the direction of a registered professional land surveyor, according to state law. A copy of the field notes referencing such monuments shall be provided to the city engineer. Failure to comply with this provision is subject to penalty according to ORS 209.990. (Ord. 2875 Appx. § 140.2, 2003)

18.08.190 New survey monuments.

All monuments within and adjacent to the public right-of-way shall not be offset unless prior approval from the city engineer is received in writing. Centerline monuments, as shown on Standard Drawing 266, shall be installed as required by Oregon Revised Statutes. The monuments shall be set by an Oregon-registered professional land surveyor. When monuments are set by a registered professional land surveyor, a record of survey shall be filed complying with ORS 209.250 and any additional requirements set forth by the city. If a monument box is used, or required to be used by the city, it shall not be less than eight inches inside diameter and shall be approved by the city engineer before its installation.

Other centerline monumentation shall be installed in accordance with current survey practices, and if within a hard-surfaced area shall have metallic caps stamped with the registered business name or the letters “L.S.” followed by the registration number of the surveyor in charge. Public street intersections or private street/public street intersections shall be monumented in a city standard monument box.

See SHMC 18.12.040(2) for monumentation for new streets. (Ord. 2875 Appx. § 140.3, 2003)

18.08.200 Global positioning system (GPS) specifications.

The following are the minimum requirements for work done utilizing global positioning system (GPS) surveying techniques:

All work shall conform to ORS 93.320, 93.330(1)(c) and 93.350 and to the use intended in ORS 92.050(9).

All work shall be performed under the direct supervision of a surveyor registered to practice in the state of

Oregon.

All work shall conform to the guidelines set forth in the latest version of the “Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques,” Federal Geodetic Control Committee.

All values shall be based on the North American Datum of 1983 (1991 Adjustment) (NAD 83(91)) and expressed both as geodetic coordinates and state plane coordinates and both in meters and international feet.

The minimum relative positional accuracy between all monuments established and the city of St. Helens horizontal control network, after the constrained adjustment, shall be what is generally referred to as second order, Class I; more specifically, a maximum of 20 parts per million (20 ppm). (First order accuracy requires a maximum of 10 ppm.)

All horizontal values shall be based on National Geodetic Survey (NGS) first order (or better) control monuments, equivalent monuments accepted by and recorded with the Columbia County surveyor. All vertical values shall be based on control points supplied by the city. A minimum of two horizontal and two vertical control monuments shall be used.

All monuments shall be a standard city of St. Helens “GPS monument” (Standard Drawing 265), unless an existing monument is specified at a certain location or an exception is granted by the city engineer. If the proposed location of a monument is in the same position as a monument that is to be set as a part of another aspect of the project, the work shall be coordinated so that the “standard GPS monument” is the physical monument used at that location. All monuments shall have a name designation provided by the city. All monuments are to be set by the contracting surveyor unless otherwise specified or arranged with the city.

Prior to commencement of fieldwork, the GPS surveyor shall visit each proposed monument location and perform those field and office checks required to ensure the acceptability of the monument locations. If any adverse conditions exist that might compromise the quality of the fieldwork, they shall be reported to the city engineer and corrective action discussed. These locations must be accepted by the city engineer.

The GPS surveyor shall file with the Columbia County surveyor a survey, separate from any others required on the project, showing the following minimum information:

(1) Description of the monuments set or utilized on the project.

(2) Location descriptions of the monuments set or utilized on the project.

(3) A network diagram.

(4) Values of all monuments established or utilized on the project.

(5) A statement of relative positional accuracy (in relation to the city of St. Helens horizontal control network) for each monument established, expressed in parts per million (ppm).

(6) All information that might be required by future work to conform to this specification.

(7) City of St. Helens standard eight-and-one-half-inch by 11-inch GPS point detail sheet.

(8) Any additional information that might affirm the integrity of the survey.

(9) Any additional information required or requested by the county surveyor.

The city engineer shall be provided with a digital and paper copy of the document filed and its assigned Columbia County survey number. (Ord. 2875 Appx. § 140.4, 2003)

Article V. Structural Design

18.08.210 General.

Structures not included in the standard drawings of this title shall be designed and constructed in accordance with the requirements of the Structural Design Section of the Oregon State Highway Division or ODOT. These standards are referenced in ODOT's "Bridge Design Manual and Accompanying Standard Drawing," "Standard Specifications for Highway Construction," and "Standard Drawings for Design and Construction."

The project special provisions shall specify the Oregon Standard Specifications for Construction requirements for bridges and other structures that apply to the specific project. The Uniform Building Code (UBC) and/or the American Concrete Institute Codes, Specifications, and Guidelines (ACI) shall govern those structures not addressed by the above. (Ord. 2875 Appx. § 150.1, 2003)

Article VI. Design Modifications

18.08.220 Modification process.

(1) Submittal. Requests to modify city standards shall be submitted in writing by the engineer to the city engineer. This written request shall state the desired modification(s), the reason(s) for the request(s) and a comparison between the specification(s), standard(s), and the modification(s).

Any request for modification or variance of city standards should be documented with reference to nationally accepted specifications/standards.

(2) Review. The request to modify shall be reviewed by the city engineer, who shall consult the appropriate review authorities and make one of the following decisions:

(a) Approve as is;

(b) Approve with changes; or

(c) Deny with an explanation.

The modification, if approved, is for project specific use. Approval of a request shall not constitute a precedent.

(3) Appeal. The applicant may appeal the city engineer's decision to the city council.

(4) Criteria for Modification of Specification Standards. The city engineer may grant a modification to the adopted specifications or standards when any one of the following conditions are met:

(a) The specification or standard does not apply in the particular application.

(b) Topography, right-of-way, or other geographic conditions impose an economic hardship on the applicant and an equivalent alternative which can accomplish the same design is available that does not compromise public safety or accessibility for the disabled.

(c) A change to a specification or standard is required to address a specific design or construction problem which if not enacted will result in an undue hardship.

(5) Amendments to This Title.

(a) Minor Modifications. Additions, deletions, or minor modifications to the details and/or engineering specifications may be made with the written approval of the engineering manager or designee. The justification will be attached to the back of the master manual and kept on file at the city engineering department. Changes made by the engineering manager can be appealed to the city council in writing. No notice of change is required for engineering manager changes or exceptions. The city council can rule on an appeal of the engineering manager's decisions in a regular meeting at their discretion with or without cause. All decisions of the engineering manager have a 14-day maximum appeal time limit from the date the written decision or change is made.

(b) Major Modifications. Substantive changes to this title shall be made as with all amendments to the code. (Ord. 2875 Appx. § 160.1, 2003)

Article VII. Construction Specifications

18.08.230 General.

All public improvements shall be inspected by an Oregon-registered professional engineer or a qualified individual under the supervision of an Oregon-registered professional engineer (exceptions to this are as noted in SHMC 18.08.010). The city will not authorize work to begin on public improvements, site grading, or parking lot construction without designation of an engineer's inspector at the city's preconstruction conference. All inspection costs, including required testing, shall be paid by the owner or developer.

Engineering firms, and all employees of such firms, must be financially independent of the owner or developer and have no actual or perceived financial interest that is contingent on the outcome of its work. The engineer's relationship to the project must be solely that of an independent, professional service nature.

It shall be the policy of the city of St. Helens engineering and public works departments to provide "spot check only" inspection services for privately funded public improvements.

One set of plans shall be kept on site at all times during construction. Any changes or modifications to the approved plans shall be noted and kept as "red line" drawings to be submitted to the city at the completion of the

project.

(1) Work Hours. The work hours for all items covered by the site development permit shall be from 8:00 a.m. to 6:00 p.m. Monday through Friday. The city engineer may allow longer or require shorter work hours depending on site-specific conditions. The city shall observe the following holidays: New Year's Day, Martin Luther King, Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, day after Thanksgiving, and Christmas Day.

(2) Substitution of Materials. It is not the intent of this title to exclude other equipment or materials of equal value, quality, or merit. Whenever a product is designated, or manufacturer's name, brand, or item designation is given or described, it shall be understood that the words "or approved equal" follows such name, designation, or description, whether in fact they do so or not. Determination of quality in reference to the project design requirement will be made by the city engineer. A contractor shall not use an "equal" product without prior written approval of the city engineer. A similar process as outlined in Article VI of this chapter will need to be followed. (Ord. 2875 Appx. § 170.1, 2003)

18.08.240 City inspector's activities.

Inspecting services provided by the city shall include, but are not limited to:

(1) Acting as a liaison between the inspecting engineer and the city.

(2) Monitoring both work progress and performance testing results.

(3) The performance of administrative and coordination activities as required to support the processing and completion of the project.

(4) The issuance of a stop work order by notice to the engineer's inspector to stop the work at the direction of the building official, the city attorney, or the planning administrator. If the engineer's inspector is not available, the city's project inspector, at the discretion of the city engineer, may post a stop work order.

(5) Maintaining a completion file containing the following:

(a) The original of the project completion certification;

(b) A complete copy of the log book initialed by the engineer's inspector;

(c) The results of material tests, compaction tests, and soil analysis as detailed in the log book.

(6) Inform the city engineer of all proposed plan changes, material changes, stop work orders, or errors or omissions in the approved plans or specifications as soon as practical. Any revision to approved plans must be under the direction of the engineer. It shall be at the discretion of the city's project inspector as to whether the revision is significant enough to warrant review by the city engineering plan review/permits unit. If so, the engineer shall submit three copies of the proposed revision; no work affected by the revision shall be done until approval by the city engineer. (Ord. 2875 Appx. § 170.2, 2003)

18.08.250 Inspecting engineer's activities.

The following minimum activities are required of the designated inspecting engineer:

(1) Maintain a project log book of daily inspection reports which contain the following information:

(a) Job number and name of engineer and designees.

(b) Date and time (arrival and departure) of site visits.

(c) Weather conditions, including temperature.

(d) A description of construction activities.

(e) Statements of directions to change plans, specifications, stop work, reject materials, or other work quality actions.

(f) Public agency contacts which result in plan changes or other significant actions.

(g) Perceived problems and action taken.

(h) Final and staged inspections.

(i) Record all material and soil types and conditions.

(j) Test results.

(k) Record all pavement grade and depth measurements by street stationing.

(l) General remarks including citizen contact or complaints.

(m) Maintain an on-site red line set of plans noting changes to plan for as-builts. This shall include rock depths.

All active site development projects will be required to turn in daily inspection reports to the city on a weekly basis containing information as outlined above. If the compiled reports become more than two weeks in arrears, or are significantly deficient as determined by the city engineer, a stop work order may be posted on the project site.

(2) Obtain and use a copy of city-approved construction plans, specifications, and a copy of this title.

(3) Review and approve all pipe, aggregate, Portland cement concrete, asphaltic concrete, and other materials to ensure their compliance with city standards.

(4) Approve all plan or specification changes in writing and obtain city approval (see SHMC 18.08.240, City inspector's activities). All changes to the approved plans or specifications must be with the approval of the city engineer, or his representative, prior to the commencement of work affected by the revision.

(5) Monitor construction activities to ensure end products meet city specifications.

(6) Perform (or have performed) material, composition, and other tests required to ensure city specifications are met.

(7) For pavement construction, perform the following stage inspections and record date of each:

(a) Curbs are built to line and grade.

(b) Subgrade meets grade and compaction specifications.

(c) Base rock meets depth/thickness, grade, and compaction specifications.

(d) Leveling course meets depth/thickness, grade, and compaction specifications.

(e) Wearing course meets depth/thickness, grade, and compaction specifications.

(f) Provide the city with 24-hour notice of impending stage inspections.

(g) Complete a prepaving meeting with the contractor and the city.

(8) Prior to requesting any building occupancy, the engineer shall certify that all necessary public improvements have been installed and accepted in compliance with the city-approved site development plan. The engineer shall indicate what items, if any, have been bonded for in lieu of completion (i.e., sidewalks, wearing course of asphalt, etc.). This certification shall also indicate that all items required (at or before occupancy of the first building) through the land use process have been completed, including the recording of all easements. (Ord. 2875 Appx. § 170.3, 2003)

18.08.260 Safety requirements.

The contractor is responsible for observing the safety of the work and of all persons and property coming into contact with the work. The contractor shall conduct his work in such a manner as to comply with all the requirements prescribed by OSHA. Traffic control in work zones shall conform to the MUTCD. At the city's discretion, a traffic control plan shall be submitted and approved prior to construction.

The city project inspector's role is not one of supervision or safety management, but is one of observation only. Nothing contained in this section or elsewhere in this title shall be interpreted to obligate the city to act in any situation, nor shift the owner's responsibility for safety compliance to the city. No responsibility for the safety of the work or for construction means, methods, techniques, sequences, or procedures shall attach to the city by virtue of its action or inaction under this section. (Ord. 2875 Appx. § 170.4, 2003)

18.08.270 Scheduling.

(1) Sequence of Operations. The contractor shall plan construction work and execute his operations with a minimum of interference with the operation of the existing public facilities. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions, and it shall

be the obligation of the contractor to do this work at such times. This scheduling, however, is subject to the city's approval and does not relieve the contractor from making work available for inspection.

The contractor shall notify the city at least 48 hours (two full working days) prior to any city inspection. Connections between existing work and new work shall not be made until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the plans and specifications.

(2) Progress of Construction. Construction shall proceed in a systematic manner that will result in a minimum of inconvenience to the public.

In the case of a pipe-laying job for sanitary sewer, storm drainage, and water improvements the trenching equipment at no time shall be greater than 300 feet ahead of the pipe-laying crew, unless given permission by the city engineer. The trench shall be backfilled so that no section of the trench or pipe is left open longer than 24 hours. Trenches located in a right-of-way or public street shall be completely backfilled or plated before the contractor leaves the site each day. (Ord. 2875 Appx. § 170.5, 2003)

18.08.280 Testing.

It is the responsibility of the contractor to complete all testing required throughout construction. The contractor shall provide all necessary equipment and materials to perform such tests properly. If testing is provided by a subcontractor, the subcontractor shall be licensed and qualified to certify the test results for the services provided. The inspecting engineer or their designee shall be witness to all required testing and provide copies of all test results to the city. (Ord. 2875 Appx. § 170.6, 2003)

18.08.290 Preservation, restoration, and cleanup.

(1) Site Restoration and Cleanup. The contractor shall keep the premises clean and orderly at all times during the work and leave the project free of rubbish or excess materials of any kind upon completion of the work. During construction, the contractor shall stockpile excavated materials so as to do the least damage to adjacent lawns, grassed areas, gardens, shrubbery, trees, or fences, regardless of the ownership of these areas. All excavated materials shall be removed from these areas, and these surfaces shall be left in a condition equivalent to their original condition and free from all rocks, gravel, boulders, or other foreign material. Stockpiling of construction materials shall not be allowed on existing sidewalks or the driving surface of existing streets.

All existing storm systems shall be cleaned and flushed, and original drainage restored. Sediment, rock, and other debris shall be collected and disposed of in a proper manner. In no case shall debris be flushed down a storm or sanitary sewer for disposal. All damaged irrigation and house drainage pipe, drain tiles, sewer lateral, and culverts shall be repaired expeditiously.

All areas disturbed by the contractor's operations inside dedicated rights-of-way or easements shall be restored to original condition. Areas outside of the easements or rights-of-way which are disturbed by the contractor's operations shall be graded and reseeded in a method acceptable to the property owner. The contractor shall obtain a written release from such property owners for any claims of injury or property damage prior to final acceptance of the work by the city.

(2) Street Cleanup. The contractor shall clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation. Cleaning shall be by grader and front-end loader, supplemented by power brushing, and hand labor, unless otherwise approved by the city. The contractor shall follow the city's control procedures.

As soon as practical after completion of all paving and gravel shoulder resurfacing, the contractor shall remove all dirt, mud, rock, gravel, and other foreign material from the paved surface and storm drainage system.

(3) Dust Prevention. During all phases of the work, the contractor shall take precautions to abate any dust nuisance by cleaning up, sweeping, sprinkling with water, or other means as necessary to accomplish results satisfactory to the city. Dust prevention measures shall be continuous until final acceptance by the city. Obtaining water from a hydrant will require specific authorization from the public works department.

(4) Stream and Creek Crossings. The contractor shall comply with all provisions of the permits required by the Oregon Division of State Lands, Department of Fish and Wildlife, and the U.S. Army Corps of Engineers.

Before any work may be performed in any stream, the method of operation and the schedule of such work shall be approved in writing by the engineer. Work within major streams shall be scheduled to take place as specified in the applicable permits for such work and, once started, shall be completed without interruption of the work. Mechanized equipment shall enter streams only when necessary and only within the immediate work area as approved by agencies having jurisdiction. (Ord. 2875 Appx. § 170.7, 2003)

18.08.300 Interferences and obstructions.

(1) General. Various obstructions may be encountered during the course of the work. Although maps and information regarding underground utilities should be obtained from the utility owning and operating such utilities, the location of such utilities is not guaranteed. A minimum of 48 hours' notice shall be given to all utility operators which may be affected by the construction operation. Should services of any utility be interrupted due to the construction operation, the proper authority shall be notified immediately.

(2) Protection. The contractor shall exercise all due care in protecting property along the route of the improvement. This protection shall include, but not be limited to, trees, yards, fences, drainage lines, mailboxes, driveways, shrubs, lawns, and survey monuments. If any of the above have been disturbed, they shall be restored to as near their original condition as possible.

(3) Survey Monuments. Any property corner, right-of-way monument, centerline monument, or other legal corner disturbed by the contractor (moved from its original position) shall be reset by a licensed surveyor in the state of Oregon at the contractor's expense. (Ord. 2875 Appx. § 170.8, 2003)

18.08.310 Railroad crossings.

(1) General. Crossings of railroad rights-of-way shall be done in a manner which conforms with the requirements of the railroad having jurisdiction. If any bonds and/or certificates of insurance protection are required, they shall be furnished by the contractor or owner to the railroad company with the city as an additionally named insured.

(2) Permits or Easements. Crossing agreements, permits, and/or easements for such crossings will be obtained by the applicant and all the terms of such permits or easements shall be met by the owner and contractor. (Ord. 2875 Appx. § 170.9, 2003)

18.08.320 Building permits.

The minimum requirements of public improvements in a new development to be completed before a building permit can be issued are, but may not be limited to:

(1) Public utilities are installed, tested as required, and accepted by the city.

(2) Curb and gutter is installed.

(3) Minimum street section has been constructed, including a hard surface.

(4) All improvements must be approved by the city.

(5) Any uncompleted public improvements must be protected by a surety to ensure completion of items, including, but not limited to, sidewalks, street lights, and/or the second lift of asphalt pavement. (Ord. 2875 Appx. § 170.10, 2003)

Article VIII. Environmental Protection During Construction

18.08.330 General policy and requirements.

(1) It is the policy of the city of St. Helens to require temporary and permanent measures for all construction projects to lessen the adverse effects of construction on the environment.

The contractor shall properly install, operate, and maintain both temporary and permanent works as provided in this section or in an approved plan, to protect the environment during the term of the project.

The city may, in addition, require that a construction project be scheduled so as to minimize erosion or other environmental harm.

Nothing in this section shall relieve any person from the obligation to comply with the regulations or permits of any federal, state, or other local authority.

(2) For any project having slopes equal to or greater than 10 percent, or where any portion of the work will occur within 200 feet of a lake, stream, river, or riparian area, an environmental protection plan shall be required. The plan shall be submitted together with construction plans.

(3) The plan shall describe all areas of the subject property affected by the project, and shall include all measures to be taken by the contractor to prevent or minimize erosion, loss of vegetation, water pollution, loss of fish or wildlife habitat, or other damage to the environment. The plan shall include all schedules, construction methods, structures, revegetation, and other actions affecting environmental quality, and shall address the criteria of SHMC 18.08.350 through 18.08.410.

(4) For all projects, whether or not an environmental protection plan is required, the prohibitions and regulations of this section shall apply. Notwithstanding the terms of any approved environmental project plan, the city may temporarily suspend the work or require additional protection measures if it appears, based upon observed conditions of the project, that the approved plan is insufficient to prevent environmental harm, and that such suspension or additional measures will prevent or minimize such harm. (Ord. 2875 Appx. § 180.1, 2003)

18.08.340 Air pollution control.

(1) Dust. Dust shall be minimized to the extent practicable, utilizing all measures necessary, including, but not limited to:

(a) Sprinkling haul and access roads and other exposed dust-producing areas with water. Obtaining water from a hydrant will require specific authorization from the public works department.

(b) Applying DEQ-approved dust palliatives on access and haul roads.

(c) Establishing temporary vegetative cover.

(d) Placing wood chips or other effective mulches on vehicle and pedestrian use areas.

(e) Maintaining the proper moisture condition on all fill surfaces.

(f) Prewetting cut and borrow area surfaces.

(g) Use of covered haul equipment.

(2) Fumes, Smoke, and Odors.

(a) Tires, oils, paints, asphalts, coated metals, or other such materials will not be permitted in combustible waste piles, and will not be burned at the construction site.

(b) Open burning shall not be permitted unless approved by the Department of Environmental Quality and the city fire marshal's office.

(c) Open burning shall not be permitted within 1,000 feet of a structure or within 250 feet of the drip line of any standing timber or flammable growth.

(d) Open burning shall not be permitted during a local air inversion or other climatic conditions that may result in a smoke pall hanging over a built-up area or community.

(e) Open burning shall not be permitted when climatic and moisture conditions are contributing to high danger of forest or range fires as determined by city, state, or federal authorities.

(f) All open burning shall be constantly attended by a crew with a supply of fire fighting tools and equipment. The number and size of fires shall be limited such that the burning crew can adequately control them. (Ord. 2875 Appx. § 180.2, 2003)

18.08.350 Erosion control.

(1) Measures to prevent erosion at construction sites shall be incorporated into the construction drawings and specifications.

(2) All earth and soft or broken rock areas that have been disturbed by construction operations such as during stripping, excavation, and by traffic shall be protected from erosion by the action of concentrated runoff, by the impact of falling rain, by wind action, by vehicular tracking, or a combination of actions.

(3) The concentration of runoff on or across slopes shall be prevented.

(4) Sections of bare earth and the length of time of their exposure to potential erosion shall be minimized by proper scheduling, limiting the work areas, and placement of appropriate cover.

(5) Precautions shall be taken in the use of construction equipment to prevent operations that increase the potential for erosion. Wheel tracks or ruts, particularly down slopes, that permit concentration of surface flows, shall be avoided. Fording of live streams that accelerate erosion and damage aquatic animal habitat shall be avoided. Where frequent stream crossings are necessary, temporary bridges shall be installed.

(6) Areas for borrow pits and waste disposal shall be selected with full consideration of erosion control needs during and after borrow operations. (Ord. 2875 Appx. § 180.3, 2003)

18.08.360 Maintaining surface water quality.

(1) Construction between stream banks shall be kept to a minimum.

(2) Pollutants such as fuels, lubricants, bitumens, raw sewage, and other harmful materials shall not be discharged into or near rivers, streams, or impoundments. Sterilizing water from water line construction activities shall not be directly discharged into the public storm drainage system. Activities and construction practices must comply with all Oregon DEQ rules and regulations regarding discharge of chlorinated water.

(3) The use of water from a stream or impoundment shall not result in altering the temperature of the water body enough to affect aquatic life. (Ord. 2875 Appx. § 180.4, 2003)

18.08.370 Fish and wildlife habitat preservation.

(1) The construction shall be done in a manner to minimize the adverse effects on wildlife and fishery resources.

(2) The requirements of local, state, and federal agencies charged with wildlife and fish protection shall be adhered to by the entire construction work force. (Ord. 2875 Appx. § 180.5, 2003)

18.08.380 Control of noise levels.

Noise levels shall conform to the current city of St. Helens nuisance ordinance regarding noise.

Construction noise shall be minimized by the use of proper engine mufflers, protective sound-reducing enclosures, and other sound barriers as necessary. Construction activities producing excessive noise that cannot be reduced by mechanical means shall be restricted to locations where their sound impact is reduced to a minimum at the edge of the work area. (Ord. 2875 Appx. § 180.6, 2003)

18.08.390 Natural vegetation.

(1) As far as is practicable, the natural vegetation shall be protected and left in place. Work areas shall be carefully located and marked to reduce potential damage. Trees shall not be used as anchors for stabilizing working equipment.

(2) During clearing operations, trees shall not be permitted to fall outside the work area. In areas designated for selective cutting or clearing, care in falling and removing trees and brush shall be taken to avoid injuring trees and shrubs to be left in place. (Ord. 2875 Appx. § 180.7, 2003)

18.08.400 Historical and archaeological areas.

When burial sites, buried camp areas, village sites, and other distinctive archaeological or historical items are uncovered, or other items suspected of being of historical or archaeological significance are encountered, the contractor shall report the matter to the city and the State Liaison Officer. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work.

Under the Natural Historical Preservation Act, State Liaison Officers shall be notified when historical or archaeological items are unearthed.

The Oregon Criminal Code prohibits disinterment of a corpse without permission of the appropriate authorities. (Ord. 2875 Appx. § 180.8, 2003)

18.08.410 Use of pesticides.

(1) The use of pesticides, including insecticides, herbicides, defoliants, soil sterilants, and so forth, must strictly adhere to federal, state, county, and local restrictions. Time, area, method, and rate of application must be approved by all relevant authorities and their requirements followed.

(2) All materials delivered to the job site shall be covered and protected from the weather. None of the materials shall be exposed during storage. Waste material, rinsing fluids, and other such material shall be disposed of in such a manner that pollution of ground water, surface water, or the air does not occur. In no case shall toxic materials be dumped into drainageways.

(3) All personnel shall stay out of sprayed areas for the prescribed time. All such areas should be fenced, appropriately signed, or otherwise protected to restrict entry. (Ord. 2875 Appx. § 180.9, 2003)

Article IX. Revisions

18.08.420 Revisions.

Any revisions to the city-approved plans shall come from the engineer of record. The submittal shall include three copies of the 24-inch by 36-inch revised pages with the revisions clearly identified, along with a copy of any revised calculations. Applicants are cautioned that revisions must be reviewed for coordination with the entire plan set and that such review will be conducted in the order they are received, on a first-come, first-served basis. (Ord. 2875 Appx. § 190, 2003)

Chapter 18.12
STREETS

Sections:

Article I. Street Design

Article I. Street Design

18.12.010 Street section design.

All street sections shall be designed by the engineer or a geotechnical engineer based on the on-site soil conditions and shall meet the minimum standards as outlined in SHMC 18.12.030. (Ord. 2875 Appx. § 210.1,

2003)

18.12.020 Subgrade evaluation.

Soil testing to obtain the strength of the soil may be required in order to analyze and design the structural section for streets and roads. Soil tests are needed on undisturbed samples of the subgrade materials that are expected to be within three feet of the planned subgrade elevation. Samples are needed for each 500 feet of roadway and for each visually observed soil type. Soil tests are required from a minimum of three locations.

The selected design structural strength of the soil needs to be consistent with the subgrade compaction requirements. The strength and compaction moisture content, at optimum to slightly over optimum, needs to be specified. The soils report shall address subgrade drainage and ground water considerations for year-round conditions. Recommendations for both summer and winter construction shall be included. The required density of treated and untreated subgrade materials shall not be less than 95 percent maximum density as determined by AASHTO T-99. (Ord. 2875 Appx. § 210.2, 2003)

18.12.030 Structural section.

(1) Streets may be constructed of the following:

(a) Full depth asphaltic concrete.

(b) Asphaltic concrete with crushed rock base or treated bases.

(c) Portland cement concrete with cushion course of crushed rock or on a base of crushed rock or treated base.

(2) Aggregate Base. All aggregate shall meet OSHD specifications for base rock.

The minimum aggregate section, unless otherwise approved by the city engineer, shall be an eight-inch base course of one-and-one-half-inch to zero-inch with a two-inch leveling course of three-fourths-inch to zero-inch. This equals a total minimum section of 10 inches of aggregate.

During compaction, materials shall be maintained within two percent of the optimum moisture content. The contractor shall begin compaction of each layer immediately after the material is spread, and continue until a density of not less than 95 percent of the maximum density has been achieved. Maximum density will be determined by AASHTO T-180, or OSHD TM-106.

(3) Asphalt Pavement Design. If asphalt pavement is to be placed in a single lift, the wearing course shall be no less than three inches of OSHD Class “C.”

If asphalt pavement is to be placed in two lifts, the street section including the aggregate base and first lift of AC pavement must be designed to support the loads expected throughout all construction and/or building phase(s) until permanent wearing course is installed. The base course of asphalt concrete (AC) streets may be a minimum of two inches of OSHD Class “B” or Class “C” and the wearing course shall be one and one-half inches of OSHD Class “C” for a total minimum thickness of three and one-half inches in two lifts. For asphalt thickness greater than three and one-half inches, the Oregon Standard Specifications for Construction guidelines shall be

followed.

The compaction shall be at least 91 percent based on a Rice theoretical maximum density, as determined in conformance with AASHTO T-209, as modified by OSHD.

Asphalt pavement may be designed using any nationally recognized procedure; both the OSHD and the Asphalt Institute methods are discussed below:

(a) Oregon State Highway Division Method.

(i) Test the soil to determine the R-value by AASHTO T-190.

(ii) Determine the 18 kip equivalent axle load (EAL) constant. Use a traffic analysis worksheet (see Figure 2-1) to calculate 18 kip EAL and the traffic coefficient. The two-way traffic should be based on vehicle classification counts and functional classification of the street. The expansion factor for a 20-year period and the daily traffic for each project shall be determined by a traffic study or provided by the city.

(iii) Calculate the total structural thickness for the roadway section in terms of the crushed aggregate base. This is the crushed base equivalent in inches (CBE).

CBE = 0.03546 (TC) (100-R)

(iv) Choose the structural section for the street using Table IIa.

(b) Asphalt Institute Method. Design of asphalt concrete pavement structures by this method shall conform to the guidelines of the Asphalt Institute publication, “Thickness Design – Asphalt Pavements for Highways and Streets, Manual Series No. I.”

(i) AASHTO T-193 (CBR Method); or

(ii) AASHTO T-190 (R-Value Method); or

If the CBR value of the subgrade exceeds 20 or the R-value of the subgrade exceeds 60 then CBR and R-value methods shall not be used.

(4) Design Example.

AC STRUCTURAL SECTIONS EXAMPLE (OSHD METHOD)

FIND:	STRUCTURAL SECTION (Asphaltic Concrete)
Given:	24-HOUR TRAFFIC MIX (90 2-axle trucks, 45 3-axle trucks, 5 4-axle trucks, 90 5-axle trucks, 0 6-axle trucks)
R = 6	(OSHD Method)
STEP I.	Complete the traffic analysis worksheet, Figure 2-1, as

	shown in Figure 2-2
STEP II.	TC = 8.9 (from Step I)
STEP III.	Go to Table II, with R = 6, and TC = 8.9, find CBE = 28.2″
STEP IV.	Using CBE factors from Table II, go to CBE factors Table II and find that:
Alternative I	
4-inch AC x 2 =	8.0-inch CBE
2-inch 3/4-inch-0 x 0.8 =	1.6-inch CBE
11-inch CTB x 1.8 =	19.8-inch CBE
	29.4-inch CBE
or we find an alternate structural section could be:	
Alternate II	
8-inch AC x 2 =	16.0-inch CBE
2-inch 3/4-inch-0 x 0.8 =	1.6-inch CBE
14-inch 2-inch-0 x 0.8 =	11.2-inch CBE
	28.8-inch CBE

FIGURE 2-1 TRAFFIC ANALYSIS WORKSHEET

PRESENT ADT:	_____	STREET:	_____
PRESENT NUMBER OF:		FROM:	_____
2-Axle trucks	_____	TO:	_____
3-Axle trucks	_____		
4-Axle trucks	_____	D = B x C	
5-Axle trucks	_____	E = B + D	
6-Axle trucks	_____	2	
		F = One-Way Annual	
		G = E x F	

TC = 9 x (20-Year 18 kip EAL) 0.119 1,000,000

A	B	C	D	E	F	G
2		1.48			36.5	
3		1.48			119.5	
4		1.48			157.0	
5		1.48			296.0	
6		1.48			325.0	

TOTAL – AVG. ANNUAL 18 kip EAL =	_____
18 kip EAL/day =	_____
20-Year 18 kip EAL =	_____
Traffic Coefficient, TC =	_____

FIGURE 2-2 – TRAFFIC ANALYSIS WORKSHEET
(EXAMPLE)

PRESENT ADT:	3800	STREET:	A Street
PRESENT NUMBER OF:		FROM:	X Road
2-Axle trucks	90	TO:	Y Road
3-Axle trucks	45		
4-Axle trucks	5	D = B x C	
5-Axle trucks	90	E = B + D	
6-Axle trucks	0	2	
18 kip EAL		F = One-Way Annual	
		G = E x F	
TC = 9 x (20-Year 18 kip EAL) 0.119 1,000,000			

A	B	C	D	E	F	G
2	90	1.48	133.2	111.6	36.5	4,073.4
3	45	1.48	66.6	55.8	119.5	6,668.1
4	5	1.48	7.4	6.2	157.0	973.4
5	90	1.48	133.2	111.6	296.0	33,033.6
6	0	1.48	0	0	325.0	0
						44,748.5

TOTAL – AVG. ANNUAL 18 kip EAL	= 44,748.5
18 kip EAL/day	= 122.6
20-Year 18 kip EAL	= 894,970.0
Traffic Coefficient, TC	= 8.9

TABLE IIa – CRUSHED BASE EQUIVALENT ALL ROADS

MINIMUM TRAFFIC COEFFICIENT	R=4 MIN. "CBE" REQRMNT	R=8 MIN. "CBE" REQRMNT	R=12 MIN. "CBE" REQRMNT	R=18 MIN. "CBE" REQRMNT	R=22 MIN. "CBE" REQRMNT	R=26 MIN. "CBE" REQRMNT	R=30 MIN. "CBE" REQRMNT
12.0 – 13.0	42.5″	41.0″	39.0″	36.5″	34.5″	33.0″	31.0″
11.0 – 12.0	39.0″	37.5″	36.0″	33.5″	32.0″	30.0″	28.5″
10.0 – 11.0	36.0″	34.5″	33.0″	30.5″	29.0″	27.5″	26.0″
9.0 – 10.0	32.5″	31.0″	29.5″	27.5″	26.5″	25.0″	24.0″
8.0 – 9.0	29.0″	27.5″	26.5″	24.5″	23.5″	22.5″	21.0″
7.0 – 8.0	25.5″	24.5″	23.5″	22.0″	21.0″	20.0″	18.5″
6.0 – 7.0	22.0″	21.0″	20.0″	19.0″	18.0″	17.0″	16.0″
4.8 – 6.0	18.5″	17.5″	17.0″	15.5″	15.0″	14.0″	13.5″
Below 4.8	16.5″	15.5″	15.0″	14.0″	13.5″	12.5″	12.0″

CBE FACTORS	
1.0″ Asphaltic Concrete Wearing Surface or Base	=2.0″ Aggregate Base
1.0″ Emulsion Treated Wearing Surface or Base	=2.0″ Aggregate Base
1.0″ Cement Treated Base*	=1.8″ Aggregate Base

1.0″ Plant Mix Bituminous Base	=1.8″ Aggregate Base
1.0″ Oil Mat	=1.8″ Aggregate Base
1.0″ Cement Treated Existing Roadway Material	=1.5″ Aggregate Base
1.0″ Lime or Cement Treated Subgrade	=1.0″ Aggregate Base
1.0″ Aggregate Subbase	=0.8″ Aggregate Base

Above factors apply to materials that comply with Columbia County standard specifications and special provisions.

Use fabric mat where moisture is present in the subgrade, or use fabric mat plus excavate an additional 12 inches and replace with rock for unusually wet subgrade conditions.

* Lime treated base is to be considered to have the same aggregate base equivalent as cement treated base (1.8 inch).

(5) Portland Cement Concrete Pavement. The design of Portland cement concrete streets shall be governed by the guidelines and requirements of the Portland Cement Association (PCA) design procedures found in the below-listed publications:

“Concrete Streets: Typical Pavement Sections and Jointing Details.” Portland Cement Association (1S211.01P), Skokie, Illinois: 1980.

“Thickness Design for Concrete Highway and Street Pavements.” Portland Cement Association (EB109.01P), U.S.A.: 1984, p.7.

“Joint Design for Concrete Highway and Street Pavements.” Portland Cement Association (1S059.03P), Skokie, Illinois: 1980.

(a) All field testing shall follow ACI and OSHD procedures.

(b) All other design criteria shall follow ACI and the Oregon Standard Specifications for Construction, including revisions. (Ord. 2875 Appx. § 210.3, 2003)

18.12.040 Horizontal alignment.

(1) Alignments shall meet the following requirements:

(a) Centerline alignment of improvements should follow the centerline of the right-of-way. If this is not practical, then the alignment should parallel the centerline of the right-of-way.

(b) Centerline of a proposed street extension shall be aligned with the existing street centerline.

(c) Horizontal curves in alignments shall meet the minimum radius requirements as shown in Table IIb.

(d) Reversing horizontal curves shall be separated by no less than 50 feet of tangent, unless otherwise approved by the city engineer. On arterials, the separation shall be no less than 100 feet.

TABLE IIb – CENTERLINE RADIUS – MINIMUMS

Minimum Centerline Radii	
Street Classification	**Minimum Radius, Ft.**
Arterials	300
Collectors	200
All Other Classifications	100

(2) Monumentation. Monuments shall be set in accordance with the standard details. See SHMC 17.140.110 (centerline monumentation).

Centerline monuments shall be set at the PI if it falls within the paved section of roadway. If the PI falls outside of the paved section, then the PC and PT of the curve shall be monumented. On tangent sections where sight between monuments is not possible, a POT shall be set. All intersections shall be monumented including intersections of the project on existing roadways. These monuments shall be set at the intersection of the surveyed right-of-way centerlines. (Ord. 2875 Appx. § 210.4, 2003)

18.12.050 Vertical alignment.

Alignments shall meet the following requirements:

(1) Minimum tangent street gradients shall be one-half percent along the crown and curb.

(2) Maximum street gradients shall be six percent for arterials, 10 percent for collectors, and 12 percent for all other streets. Grades in excess of 12 percent may be allowed on local or residential streets for short segments of no greater than 250 feet as approved by the city engineer. In no case shall grades be allowed to exceed the State Fire Marshal's maximum grade guidelines.

(3) Local streets intersecting with a minor collector or greater functional classification street or streets intended to be posted with a stop sign shall provide a landing averaging five percent or less. Landings are that portion of the street within 20 feet of the projected curb line of the intersecting street at full improvement.

(4) Grade changes of more than one percent shall be accomplished with vertical curves.

(5) At street intersections, the crown of the major (higher classification) street shall continue through the intersection. The roadway section of the minor street will flatten to match the longitudinal grade of the major street at the projected curb line.

(6) Street grades, intersections, and superelevation transitions shall be designed to not allow concentrations of

storm water to flow across the travel lanes.

(7) Streets other than arterials shall be constructed with a minimum crown of two percent from the centerline to the flow line, and a maximum crown of three percent, unless otherwise approved by the city engineer.

(8) Offset crowns shall be allowed only with the specific prior approval of the city engineer and must conform to the standard drawing for offset crowns.

(9) Slope easements shall be dedicated or obtained for the purposes of grading outside of the right-of-way.

(10) Streets intersected by streets not constructed to full urban standards shall be designed to match both present and future (as far as practicable) vertical alignments of the intersecting street. The requirements of this title shall be met for both present and future conditions.

(11) Curbs shall be placed as monolithic curb and gutter unless otherwise approved by the city engineer.

When new streets are built adjacent to or crossing drainageways, the following standards shall govern the vertical alignment:

Functional Classification	**Vertical Standard**
Principal routes and arterials	Travel lanes at or above the 100-year flood elevation.
Major collectors	Travel lanes at or above the 50-year flood elevation but not lower than six inches below the 100-year flood elevation.
Minor collectors and local streets (residential)	Travel lanes at or above the 25-year flood elevation but not lower than six inches below the 100-year flood elevation.
Local streets (nonresidential)	Travel lanes at or above the 25-year flood elevation but not lower than six

	inches below the 50-year flood elevation.

If alternate access is available for properties served by a particular local street, a design could be considered for approval by the city engineer that would set the travel lanes at or above the 10-year flood elevation but not lower than six inches below the 25-year flood event.

Vertical curves shall conform to the values found in Tables IIc and IId.

TABLE IIc – DESIGN CONTROLS FOR CREST VERTICAL CURVES BASED ON STOPPING SIGHT DISTANCE

Design Speed	Minimum k
25	20 – 20
30	30 – 30
35	40 – 50
40	60 – 80
45	80 – 120
50	110 – 160
55	150 – 220

k =	L = feet	A = Algebraic difference in grades, percent
A	percent	L = Length of vertical curve, feet.

TABLE IId – DESIGN CONTROLS FOR SAG VERTICAL CURVES BASED ON STOPPING SIGHT DISTANCE

Design Speed	Minimum k
25	30 – 30
30	40 – 40
35	50 – 50
40	60 – 70
45	70 – 90

50	90 – 110
55	100 – 130

k =	L = feet	A = Algebraic difference in grades, percent
A	percent	L = Length of vertical curve, feet.

(Ord. 2875 Appx. § 210.5, 2003)

18.12.060 Intersection sight distance policy.

It is the policy of the city of St. Helens to have the engineer evaluate safe intersection sight distance using the principles and methods recommended by AASHTO. The following minimum standards shall apply:

(1) Intersection (and Driveway) Sight Distance. The following table is for intersection and driveway sight distances:

TABLE IIe – CORNER SIGHT DISTANCE

Design Speed (MPH)	Minimum Corner Sight Distance (Feet)
20	210
30	310
40	415
50	515
60	650

For purposes of this calculation, the driver's eye is assumed to be 15 feet from the near edge of the nearest lane of the intersecting street, and at a height of three and one-half feet above the approach street pavement. The top of the vehicle on the intersecting street is assumed to be four and one-fourth feet above the cross-street pavement. There shall be nothing to block observation of objects between six inches and four and one-fourth feet above grade in both directions. The only exceptions should be for luminaire or utility poles, conforming traffic control devices, and fire hydrants. Cumulative effects must be considered by the engineer, and all efforts taken to minimize sight obstructions.

In some locations, maintenance of the required sight distance may require restrictions to potential development outside the public right-of-way. If so, the project engineer shall demonstrate that adequate restrictions are in place (and enforceable by the city) to ensure that the required sight distance can be maintained in the future.

Modifications or exceptions to these standards shall be approved by the city engineer. (Ord. 2875 Appx. § 210.6,

2003)

18.12.070 Angles between intersecting streets.

The following specifies the minimum requirements for intersections:

(1) The interior angle at intersecting streets shall be kept as near to 90 degrees as possible and in no case shall it be less than 60 degrees. A tangent section shall be carried a minimum of 25 feet each side of intersecting right-of-way lines.

(2) Intersections which are not at right angles shall have a minimum corner radius of 20 feet along the right-of-way lines of the acute angle. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the lower classified street.

(3) Minimum radius at the curb line for any intersection shall be 20 feet. Larger curb line radii may be required when intersecting a higher classified street.

(4) Sidewalk access ramps shall be provided at all corners of all intersections, regardless of curb type, and shall conform to the standard drawings. (Ord. 2875 Appx. § 210.7, 2003)

18.12.080 Cul-de-sacs, eyebrows, turnarounds.

The following specifies the minimum requirements for cul-de-sacs, eyebrows, and turnaround areas. Other turnaround geometrics may be used when conditions warrant and city engineer approves the design and application of its use.

(1) Cul-de-sacs, eyebrows, and turnaround areas shall be allowed only on local streets and commercial/industrial streets.

(2) Cul-de-sacs shall not be more than 400 feet in length, except as approved by the fire marshal. The length of a cul-de-sac shall be measured along the centerline of the roadway from the near side right-of-way of the nearest through traffic intersecting street to the farthest point of the cul-de-sac right-of-way.

(3) Minimum radius for cul-de-sac and turnaround right-of-way in residential zones is 42 feet. Minimum roadway radius is 35 feet.

(4) Minimum radius for cul-de-sac and turnaround right-of-way in commercial and industrial zones is 50 feet. Minimum roadway radius is 42 feet.

(5) The minimum curb radius for transitions into cul-de-sac bulbs shall be 20 feet, and the right-of-way radius shall be sufficient to maintain the same right-of-way to curb spacing as in the adjacent portion of the road.

(6) An eyebrow corner may be used on a local street where expected ADT will not exceed 500 vehicles per day or as otherwise approved by the city engineer. Minimum curb radius on the outside of an eyebrow corner is 36 feet; minimum right-of-way radius is 45 feet. Eyebrow geometry shall be evaluated on the basis of turning requirements for fire department vehicles. (Ord. 2875 Appx. § 210.8, 2003)

18.12.090 Driveway approaches.

The city engineer has the authority to limit access and access locations. Access to streets and highways under Columbia County or state of Oregon jurisdiction must be formally approved by those entities at the applicant's initiative and expense.

The following specifies the minimum requirements for driveways:

(1) Driveways shall not be permitted on streets with existing or proposed nonaccess reserve strips.

(2) Driveways shall be located a minimum of 25 feet from any intersection, measured from the flow line of the intersecting street when fully improved to the nearest side of the driveway.

(3) Driveway width shall be a minimum of 12 feet and a maximum of 18 feet. Wider driveways may be allowed under special circumstances if approved by the city engineer.

(4) The spacing requirements shall conform to the requirements of the city of St. Helens Development Code.

(5) Concentrated surface runoff shall not be allowed to flow over any driveway or sidewalk into the street.

(6) Driveways shall meet the minimum intersection sight distance requirements.

(7) Water meter boxes shall not be located in a driveway or the driveway wing. (Ord. 2875 Appx. § 210.9, 2003)

18.12.100 Curbs and grading.

When new curbing is being placed, a stamp or tag shall be placed to mark where each water and sanitary sewer service crosses the curb line. An imprinting stamp shall be used and the impression left for a water service shall be the letter "W"; for a sanitary service, it shall be the letter "S." These impressions shall be two inches high, placed on the top of the curb.

(1) The following specifies the requirements for curbs and cross-slope grading for streets:

(a) All streets shall include monolithic curb and gutters on both sides.

(b) Mountable curb and gutter shall be used only in cul-de-sacs with a radius less than 45 feet.

(c) Cross-slope of the street section shall be no less than two percent and no greater than five percent.

(2) Grading outside the improved areas shall be as follows:

(a) Minor collectors or higher functional classifications shall have a maximum two percent upward grading to the right-of-way line, and no steeper than one and one-half to one up, or two to one down, outside the right-of-way.

(b) Local street and commercial/industrial functional classifications shall have a maximum two percent upward grading to the right-of-way line, a four to one upward or downward grading within the public utility easement, and no steeper than one and one-half to one up, or two to one down outside the public utility

easement.

(c) Retaining walls shall be used if slopes are greater than the one and one-half to one requirement in subsections (2)(a) and (b) of this section or where slope stability is a problem. If slopes are to be maintained (mowed) by the city, a maximum of four to one slope will be required. Retaining walls shall be constructed to a height where the slope is no more than one and one-half to one. (Ord. 2875 Appx. § 210.10, 2003)

18.12.110 Sidewalks and clustered mailboxes.

(1) The location of neighborhood mailboxes, or clustered mailboxes, must be determined before installation of the sidewalk. Where clustered mailboxes or other objects larger than single mailboxes are within a sidewalk, the walk shall be widened to provide clearance equal to the required sidewalk width in accordance with the standard details.

(2) In no case shall the sidewalk clear space be smaller than 36 inches.

(3) Ramps, landings, changes in level, and protruding objects along the accessible route to the clustered mailbox shall comply with the applicable ANSI standards.

(4) Edge protection along an accessible route to the clustered mailbox shall be in accordance with the applicable ANSI standards.

(5) At least one turning space shall be provided at the front of each clustered mailbox unit. The turning space shall conform to the applicable ANSI standards and shall either be:

(a) A circular space having a 72-inch (1,829 mm) minimum diameter; or

(b) A T-shaped space within a 72-inch (1,829 mm) minimum square, with arms and base 48 inches minimum (1,219 mm) in width. Each arm of the T shall be clear of obstructions 24 inches (610 mm) minimum in each direction, and the base shall be clear of obstructions 36 inches (914 mm) minimum.

(6) The sidewalk clear space and turning space may overlap. (Ord. 3164 § 3 (Att. B), 2012; Ord. 2875 Appx. § 210.11, 2003)

18.12.120 Guardrails.

(1) The decision of whether to install a guardrail or not shall be based on information found in AASHTO publication, “Guide for Selecting, Locating, and Designing Traffic Barriers.”

(2) Guardrails shall be designed and constructed per ODOT’s “Standard Drawings for Design and Construction.” (Ord. 2875 Appx. § 210.12, 2003)

18.12.130 Transitions.

(1) Street width transitions from a narrower width to a wider width shall be designed with a 10 to one taper.

(2) For street width transitions from a wider width to a narrower width, the length of transition taper shall be

designed with a 30 to one taper.

(3) Delineators, as approved by the city engineer, may be installed to define the configuration. Maximum spacing of delineators shall be the numerical value of the design speed, in feet (i.e., 35-foot spacing for 35 mph).

(4) In situations where a tapered transition cannot be provided, a barricade shall be installed at the end of the wider section of the street and a taper shall be appointed and delineated as approved by the city engineer. The barricade shall conform to the standard drawings. If the wider section does not provide an additional travel lane, only a barricade is required without the transition. (Ord. 2875 Appx. § 210.13, 2003)

18.12.140 Superelevation cross-sections.

(1) Offset crown cross-sections are not acceptable as superelevation sections.

(2) Superelevation sections shall be designed using AASHTO guidelines.

(3) Superelevation transitions shall be designed to not allow concentrations of storm water to flow over the travel lanes. (Ord. 2875 Appx. § 210.14, 2003)

18.12.150 Stub streets.

Stub streets that are to allow for future extensions shall be barricaded and signed as per the standard drawings. (Ord. 2875 Appx. § 210.15, 2003)

18.12.160 Private streets, parking lots, and common driveways.

Streets, parking lots, and driveways on private property shall meet the requirements of the Development Code. The engineer shall provide a pavement section design which provides a minimum loading capacity of 12,500 pounds per tire (considered to be one-half square feet). This design must meet or exceed the following minimum standards:

Areas used for required parking or maneuvering of vehicles shall have a durable, hard surface. In all residential areas, a minimum of two and one-half inches asphalt over four inches of aggregate base will be provided or four inches of Portland cement concrete over two inches of aggregate base. In commercial and industrial areas, either three inches of asphalt over four inches of aggregate base or five inches of Portland cement concrete over two inches of aggregate base is required. The parking surface shall be placed on a well-compacted subgrade. All required parking spaces shall be striped.

The elevation for short-term parking will be no lower than one foot below the 10-year floodplain. The elevation for long-term parking will be no lower than the 100-year floodplain. Long-term parking is defined as an unoccupied vehicle being left in one location for a period of greater than 12 hours.

Private streets serving residential areas shall be designed with travel lanes at or above the 25-year flood elevation but not lower than six inches below the 100-year flood elevation.

Access drives in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus. (Ord. 2875 Appx. § 210.16, 2003)

18.12.170 Utilities.

Utilities shall be located outside of the paved area of the street if at all possible to avoid future street cuts. On all phased street improvements, the necessary utilities shall be stubbed across the interim improvement to ensure that cuts are not necessary when the road is expanded to its full width.

Except for sanitary sewer, storm sewer, and water, underground utilities intended to provide direct service to adjacent properties with future connections shall not be located in the full-width paved section of a street to be constructed. If all service connections are existing and extend beyond the full-width section of a partially improved street, underground utilities can be located in the future paved section of the street, if approved by the city engineer.

Underground utilities being constructed along existing paved streets shall not be located under the existing pavement unless approved by the city engineer.

Utilities other than public water, public sanitary sewer, and public storm drain, shall be buried in a designated public utility easement.

Underground utilities within the public right-of-way shall be buried a minimum depth of 30 inches as measured from finished grade to top of utility.

When new curbing is being placed, a stamp shall be placed to mark where each water and sanitary sewer service crosses the curb line. The impression left for a water service shall be the letter “W”; for a sanitary sewer service, it shall be the letter “S.” These impressions shall be two inches high, placed on the top of the curb.

Street cuts must have the final pavement repair (matching existing material type) completed within 30 days from the date the pavement is cut unless an extension is approved by the city engineer. The use of “cold patch” and steel plates will be allowed for up to the first 30 days after the pavement is cut, provided a daily inspection by the applicant is made and any necessary repairs are made on a timely basis. If the temporary patch is not monitored and maintained, the city engineer may shorten the 30-day time limit. (Ord. 2875 Appx. § 210.17, 2003)

18.12.190 Temporary parklets – In on-street parking spaces.

The following are procedures for establishing a temporary parklet in an on-street parking space in the city. Applications are received and processed by city administration. The city administrator, or his or her designee, issues a temporary parklet application permit upon review and approval by the city public works, engineering, planning and building departments. The city administrator, or his or her designee, may revoke an approved temporary parklet permit if it is being conducted contrary to this section or any condition of the temporary parklet permit approval, or if the temporary parklet and associated use or activities are otherwise found to be contrary to public health, safety and welfare. The temporary parklet application steps and regulations are as follows:

(1) The maximum duration for a temporary parklet permit is six months; permits can be renewed subject to city approval. The maximum renewal duration is six months per renewal. If a temporary parklet permit becomes void due to revocation, expiration or otherwise, the related improvement shall be immediately removed and the location restored to its original condition.

(2) The applicant selects a location according to location criteria.

(a) Temporary parklets shall only be allowed along nonresidential uses. Temporary parklets along and/or associated with residential uses are prohibited.

(b) Temporary parklets are not permitted on streets where parking lanes become tow-away zones during morning or afternoon hours, in front of fire hydrants, in active bus zones, across driveways, or over manholes or public utility valves or covers.

(c) The proposed site should be located at least one standard-size parking space in from a corner. Otherwise, a protected bollard, curb extension, or other similar feature as approved by the city must be present if located at the corner.

(d) The proposed site should be located on a street with a speed limit of 25 MPH or less. Locations on streets with higher speeds will be considered on a case-by-case basis.

(e) The location of the proposed site shall be generally consistent with potential locations and guidance provided in the St. Helens US 30 and Columbia Boulevard/St. Helens Street corridor master plan.

(f) The street grade shall be less than five percent.

(3) The applicant develops a preliminary conceptual design, using the general design guidelines, design criteria, and design elements below.

(a) General Design Guidelines.

(i) Design for Easy Removal. Because the temporary parklet sits on top of critical infrastructure and utilities, it needs to be designed for easy removal in case of emergency or other needed access to the infrastructure. Some applicants elect to remove the temporary parklet during colder months.

(ii) No Advertising. Logos, advertising, or other branding is prohibited.

(iii) Be Creative. There are possibilities beyond the standard tables and chairs on a platform.

(b) Design Criteria.

(i) Design Quality. What is the level of quality and creativity of the design?

(ii) Public Seating. Does the proposal provide open public use of the space and is not just an extension of a business?

(iii) Streetscape Enhancement. How will the proposal enhance the aesthetic quality of the streetscape?

(iv) Quality of Materials. What is the quality and durability of proposed materials and furniture?

(v) Appropriateness of Location. Is the proposed temporary parklet likely to be well-used and active?

(vi) Community Support. Is there demonstrated neighborhood support for proposal at the proposed location (including neighboring businesses and properties)?

(c) Design Elements.

(i) Platform should be on the same plane as and flush with the sidewalk height. At least 12 feet of the platform must be flush with the adjacent sidewalk for wheelchair access.

(ii) Platform must be designed to accommodate the crown and cross slope of the street surface. Close attention must be paid to existing curb condition and height to ensure platform is flush with curb.

(iii) The use of high quality, durable materials capable of withstanding the elements of any season and extended use (with proper permit renewals) is required.

(iv) The design should not include any bolts/anchors or other elements that require disturbing the street surface or sidewalk. No temporary parklet component may weigh more than 200 pounds per square foot.

(v) The platform may not extend beyond six feet from the curb line where there is parallel parking to allow some separation from vehicle travel lanes. Angled or perpendicular parking locations and associated dimensions may be approved on a case-by-case basis, but still must allow some separation from vehicle travel lanes.

(vi) The maximum length of the platform must not be longer than the frontage of the applicant's/permit holder's establishment. A platform may be located along the frontage of multiple properties/businesses provided all applicable parties are applicants/permit holders.

(vii) Design must maintain a minimum six-foot clear pedestrian through zone in the sidewalk corridor.

(viii) Platform must be designed to allow for curbline stormwater drainage.

(ix) Platform design must include a physical barrier along the street while maintaining clear visual sightlines to the street. Vertical elements, such as planters and umbrellas, should be included so that the facility is visible to vehicles.

(x) A setback on either end of the platform, adjacent to parallel parking, will need to be reserved for wheel stops with embedded reflective candlesticks or other similar features that reflect light and protect the platform from parking maneuvers. These may be installed by the public works department as deemed necessary after facility construction is complete. Additional features may be added to the final design by city staff for safety.

(xi) Temporary parklet furniture shall be subject to city approval. Furniture must be able to accommodate those with disabilities, wheelchairs, or mobility devices.

(xii) Proposed covers or shelters may be subject to additional structural engineering requirements.

(xiii) Loose surface materials, such as sand or loose stone, are not permitted in the temporary parklet.

(xiv) Public temporary parklets must be clearly posted with signs to differentiate them from private business temporary parklets and restaurant/cafe seating. Such signage shall not conflict with the city sign regulations.

(4) The applicant begins gathering and documenting community support (meetings, letters, petitions, site posting, etc.) to be submitted as part of the application package.

(5) The applicant prepares a detailed design document and plan package. It is recommended to contract or consult with professional design assistance.

(a) Parklet location and context plan;

(b) Detailed site plan;

(c) Elevations;

(d) Sections (profile drawings);

(e) Renderings and perspectives (optional).

(6) An application package consists of the following:

(a) A completed right-of-way encroachment permit application form;

(b) Design document and plan package;

(c) Community support documentation. The applicant shall provide written support of the proposed temporary parklet from adjacent businesses and/or property owners.

(7) The applicant completes the application package and submits for review by the city.

(8) Business and property owners within the immediate vicinity of the proposed temporary parklet will be notified and will have the opportunity to submit comments within 14 days to be included in the evaluation of an application.

(9) If the application is approved, the applicant will finalize and submit construction drawings.

(10) The city will schedule a preconstruction site visit.

(11) The applicant submits payment and provides proof of liability insurance, and the public works department issues a right-of-way encroachment permit, which includes conditions for maintenance.

(a) Fees. The applicable fees, as set by resolution of the city council, may include but not be limited to addressing the following components:

(i) Application/encroachment permit fee.

(ii) Cafe seating permit fee, if applicable.

(iii) Additional costs (e.g., changing/removing loading zone sign), if applicable.

(b) Insurance. Evidence of at least $1,000,000 in liability insurance naming the city as additional insured must be provided. Most businesses already carry this insurance.

(c) Encroachment Permit and Maintenance Terms. The permit requires that the facility is swept daily and debris is removed from under and around the platform a minimum of once a week.

(12) The applicant must install the temporary parklet within 90 days of permit issuance. Failure to do so voids any temporary parklet permit approval.

(13) The applicant must notify the city within 48 hours of completing construction to schedule a post-construction site inspection.

(14) Post-construction, the city will monitor the temporary parklet for compliance with the permit, design guidelines, and maintenance agreement as applicable. (Ord. 3181 § 4 (Att. C), 2015)

Chapter 18.16
STORM DRAINAGE

Sections:

Article VIII. Engineering

Article IX. Technical Specifications

Article I. General

18.16.005 General.

The city of St. Helens Municipal Code, and the Development Code (SHMC Title 17, Ordinance 2875), have established the requirements for the design of facilities intended to protect the public health, safety, and welfare from damage due to flooding. Beyond that level of protection, additional measures are specified in this chapter that are intended to minimize any potential flooding damage and allow for efficient operation, repair, and maintenance of the storm drainage system.

Provisions must be made for gravity drainage of roofs and foundation (footing) drains for all new buildings and

structures in accordance with the Uniform Building Code (UBC) and Council of American Building Officials (CABO). For multifamily, residential, commercial, or industrial developments, these drains shall be piped directly to the storm drain system. In single-family residential developments, these drains shall be piped to the street gutter or directly to the public storm drain system. The connection to the street gutter must be through a three-inch plastic pipe set in the curb during construction or bored through an existing curb (see standard drawings). In single-family residential developments where topography prevents connecting foundation and roof drains as required above, drains for each lot shall be directly piped to the public storm drain system; pipe and easement requirements shall conform to SHMC 18.08.150.

These requirements shall apply to all storm drainage facilities in existing and proposed public right-of-way, public drainage easements, and tracts of common ownership in the city. Storm drainage systems include, but are not limited to: inlets, pipes, ditches, creeks, rivers, wetlands, and storm water quality and quantity facilities. (Ord. 2875 Appx. § 310, 2003)

18.16.010 Scheduling.
As specified in SHMC 18.24.010. (Ord. 2875 Appx. § 310.1, 2003)

18.16.020 Preservation, restoration, and cleanup.
As specified in SHMC 18.24.020. (Ord. 2875 Appx. § 310.2, 2003)

18.16.030 Interferences and obstructions.
As specified in SHMC 18.24.030. (Ord. 2875 Appx. § 310.3, 2003)

18.16.040 Permanent survey monuments.
As specified in SHMC 18.24.040. (Ord. 2875 Appx. § 310.4, 2003)

Article II. Trench Excavation and Backfill

18.16.050 Trench excavation and backfill.
As specified in Chapter 18.24 SHMC, Article II. (Ord. 2875 Appx. § 320, 2003)

Article III. Pavement Restoration

18.16.060 Pavement restoration.
As specified in Chapter 18.24 SHMC, Article III. (Ord. 2875 Appx. § 330, 2003)

Article IV. Drainage Report

18.16.070 Drainage report.
The drainage report shall be prepared by and bear the seal and original signature of a professional engineer registered in the state of Oregon and shall contain the following information:

(1) Project name, developer's name, address, and telephone number, project engineer, and date.

(2) Vicinity map.

(3) Project description: size and location of project, address or tax lot number, zoning, proposed land use, proposed site improvements, and any special circumstances.

(4) Existing conditions: hydrological conditions, topography, land use, off-site drainage to property, natural and constructed channels, sensitive areas, wetlands, creeks, ravines, gullies, steep slopes exceeding 20 percent, springs or other environmentally sensitive areas on or adjacent to the project site.

(5) General soils conditions present within the site, using SCS soil classifications.

(6) Points of discharge for existing drainage from the project site.

(7) References to relevant reports such as flood studies, ground water studies, wetland designation, storm water master plans, sensitive area designation, environmental impact statements, water quality reports, or other relevant documents. Where such reports impose additional conditions on the proponent, those conditions shall be included in the report.

(8) Soils report(s), where applicable.

(9) Hydrologic analysis.

(10) Basin maps, showing boundaries of the project, any off-site contributing drainage basins, on-site drainage basins, and approximate locations of all major drainage structures within the basin(s).

(11) Describe the drainage basin(s) to which the project site contributes runoff, and identify the receiving waters for each of these drainage basins.

(12) Describe the land cover resulting from the proposed project; describe the potential storm water quantity and quality impacts resulting from the proposed project; describe the proposal for the collection and conveyance of site runoff from the project site, for the control of any increase in storm water quantity resulting from the project, and for the control of storm water quality.

(13) Description of upstream basins, identifying any sources of runoff to the project site. This should be based on field investigation. Any existing drainage or erosion issues upstream that may have an impact on the proposed development should be noted.

(14) Downstream analysis.

(15) Hydraulic design computations, supporting the design of the proposed storm water conveyance, quantity and quality control facilities, and verifying the capacity of existing and proposed drainage facilities. These computations may include capacity analysis required either as part of the proposed drainage design or as part of the downstream drainage investigation, and flood routing computations required for the design of detention/retention storage facilities, for wetland impact analysis, or for floodplain analysis. Maintenance and operation manual: required for privately owned and maintained storm water quantity and quality control facilities. (Ord. 2875 Appx. § 340, 2003)

Article V. Drainage Plans

18.16.080 Drainage plans.

It is the responsibility of the design engineer to ensure that engineering plans are sufficiently clear and concise to construct the project in proper sequence, using specified methods and materials, with sufficient dimensions to fulfill the intent of the design guidelines contained in this title.

All engineered drainage plans shall be stamped and signed by a professional engineer registered in the state of Oregon. The drainage plan can be submitted as part of the construction drawings and shall contain the following:

(1) At least one sheet will contain a plan view of the entire project site. In the event the project site is sufficiently large that detailed drainage plans on any given sheet do not encompass the entire project site, then a sheet containing the plan view of the entire site must serve as an index to subsequent detailed plan sheets.

(2) Plans shall include a topographic map showing existing conditions for the site, including:

(a) Existing topography for the site.

(b) Adjacent streets, including street names.

(c) Existing utilities, including franchised utilities located above or below ground and drainage facilities that transport surface water onto, across, or from the project site. Existing drainage pipes, culverts, and channels shall include the invert or flow line elevations.

(d) Existing environmentally sensitive areas (e.g., ravines, swales, steep slopes in excess of 20 percent, springs, wetlands, creeks, lakes, etc.). For natural drainage features, show direction of flow, drainage hazard areas, and 100-year floodplain boundary (if applicable).

(3) Plans for proposed drainage improvements shall include the following:

(a) Finished grades. Show the extent of cut and fill by existing and proposed contours, profiles, or other designations.

(b) Proposed structures including roads and road improvements, parking surfaces, walkways, landscape areas, etc.

(c) Proposed utilities, showing exact line and grade of all proposed utilities at crossing with the proposed drainage system.

(d) Setbacks from environmentally sensitive areas.

(e) Proposed drainage structures, including pipes, open channels, culverts, ponds, vaults, biofiltration swales, detention/retention facilities, outfalls, riprap treatment, energy dissipaters, etc.

(f) Plan and profile of drainage conveyance facilities will include the following information: pipe sizes, pipe types and materials, lengths, slopes, location and type of structures, invert elevations in and out of

structures, and top elevations of structures.

(g) Indicate any proposed phasing of construction.

(4) A detailed grading plan will be provided for all open storm water quantity and/or quality control facilities. This plan shall include the following:

(a) Existing ground contours and proposed ground contours at a minimum of a two-foot contour interval. Slopes steeper than six horizontal to one vertical shall be identified.

(b) Location of top and toe of slope.

(c) Limits of embankment designed to impound water.

(d) Location of all drainage structures as well as any other piped utilities in vicinity.

(e) Flow route of the secondary/emergency overflow system.

(f) Maintenance access, as applicable.

(5) Cross-sections shall be provided for at least the following:

(a) Detention/retention ponds, wet ponds, and sediment ponds. This cross-section shall graphically illustrate:

(i) The design maximum water surface for the 10-year and 25-year storm.

(ii) The proposed dead storage water surface.

(b) Proposed ditches and swales, including vegetated swales and privately maintained drainage or cut-off ditches. (Ord. 2875 Appx. § 350, 2003)

Article VI. Water Quantity Standards

18.16.090 General.

All development on sites within the McNulty Creek Drainage Basin that are one-half acre or greater in area shall be required to provide on-site detention. For sites smaller than one-half acre in area or where storm detention would have an adverse effect upon the receiving storm drainage system, as determined by the city engineer, a system development charge will be assessed in lieu of a constructed facility. Detention for sites within the Milton Creek Drainage Basin or other basins shall be provided when proposed development will cause increased flows that could overwhelm downstream facilities in a large storm event. A complete drainage report is required for all proposed developments greater than one-half acre in area addressing the existing and proposed conditions and any detention requirements.

Storm detention facilities shall be designed to provide storage using a 25-year event, with the safe overflow conveyance of the 100-year storm. Calculations of site discharge for both the existing and proposed conditions

shall be required. Approved software programs for calculating storm conditions include the King County Hydrograph (HYD), Hec-1, Hydraflow, SWMM, or other approved software.

If a site is proposed to be constructed in phases, the first phase shall have a storm water quantity facility designed and built to accommodate the ultimate development of the site if only one facility is planned for all phases. (Ord. 2875 Appx. § 360.1, 2003)

18.16.100 Hydrologic analysis.

This section presents acceptable methodology for estimating the quantity and characteristics of surface water runoff, as well as the assumptions and data required as input to the methods. These methods should be used to analyze existing and design proposed drainage systems and related facilities.

(1) Rational Method. The rational method for analyzing small drainage basins is allowed with the following limitations:

(a) Only for use in predicting a conservative peak flow rate to be used in determining the required capacity for conveyance elements.

(b) Drainage subbasin area cannot exceed 25 acres for a single calculation.

(c) The time of concentration shall be five minutes when computed to be less than five minutes.

(d) Rainfall intensities shall be from the Oregon Department of Transportation Rainfall Intensity-Duration-Frequency Curves, Zone 8.

(2) Unit Hydrograph Methods. To obtain a realistic and consistent hydrologic analysis for each development site, the hydrograph analysis method for drainage planning and design shall be used. The physical characteristics of the site and the design storm shall be used to determine the magnitude, volume and duration of the runoff hydrograph. The Santa Barbara Urban Hydrograph (SBUH) will be the primary acceptable unit hydrograph method.

The “HYD” computer program, developed by King County, Washington, in its “Surface Water Design Manual,” January 1990, uses these methods to generate, add and route hydrographs.

(3) Runoff Parameters.

(a) The physical drainage basin characteristics listed below shall be used to develop the runoff hydrograph:

(i) Area.

(ii) Curve number.

(iii) Time of concentration.

(b) Selection of Area. To obtain the highest degree of accuracy in hydrograph analysis requires the proper

selection of homogenous basin areas. Significant differences in land use within a given basin must be addressed by dividing the basin area into subbasin areas of similar land use and/or runoff characteristics. Hydrographs should be computed for each subbasin area and superimposed to form the total runoff hydrograph for the basin.

(c) Selection of Curve Number. The National Resource Conservation Service (NRCS, formerly referred to as the Soil Conservation Service (SCS)) has developed "curve number" (CN) values based on soil type and land use. The combination of these two factors is called the "soil-cover complex."

The soil-cover complexes have been assigned to one of the four hydrologic soil groups, according to their runoff characteristics. The following are important criteria and considerations for selection of CN values:

(i) Many factors may affect the CN value for a given land use. For example, the movement of heavy equipment over bare ground may compact the soil so that it has a lower infiltration rate and greater runoff potential.

(ii) CN values can be area-weighted when they apply to pervious areas of similar CN (within 20 CN points). However, high CN areas should not be combined with low CN areas (unless the low CN areas are less than 15 percent of the subbasin).

(d) Time of Concentration. Time of concentration (T_c) is the time for runoff to travel from the hydraulically most distant point of the watershed to the point where the hydrograph is to be calculated. Travel time (T_t) is the time it takes water to travel from one location to another in a watershed. T_t is a component of T_c. T_c is computed by summing all the travel times for consecutive components of the drainage conveyance system. T_c influences the shape and peak of the runoff hydrograph.

(i) Sheet Flow. "Sheet flow" is flow over plane surfaces. It usually occurs in the headwater of streams. For sheet flow up to 300 feet, the kinematics solution below can be used to directly compute T_t:

$$T_t = \frac{(0.93L^{0.6} \times n^{0.3})}{(I^{0.4} \times S^{0.3})}$$

Where:

T_t = travel time (min)

n = Manning's effective roughness coefficient for sheet flow

L = flow length (ft)

I = rainfall intensity in inches per hour

S = slope of hydraulic grade line (ft/ft)

Sheet flow shall not be used for distances exceeding 300 feet.

(ii) Shallow Concentrated Flow. After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from Figure 3.1 (see the standard details), in which average velocity is a function of watercourse slope and type of channel. Figure 3.1 was taken from the 1972 "Soil Conservation Service Handbook."

(iii) Channel Flow. When concentrated flow reaches an identifiable conveyance system (pipe, ditch, stream, etc.) it becomes channel flow. A commonly used method of computing average velocity of flow, once it has measurable depth, is the following equation:

$$V = (1.486/n) \times R^{2/3} \times S^{0.5}$$

Where:

V = velocity (ft/s)

n = Manning's roughness coefficient

S = slope of flow path (ft/ft)

R = Hydraulic radius, area/wetted perimeter.

(Ord. 2875 Appx. § 360.2, 2003)

18.16.110 Water quantity facility design.

(1) Mitigation Requirement for Quantity. Each new development is responsible for mitigating its impacts on the public storm water system. One of the following techniques may be used to satisfy this mitigation requirement:

(a) Construction of permanent on-site storm water quantity detention facilities; or

(b) Enlargement or improvement of the downstream conveyance system.

(2) Criteria for Requiring On-Site Detention. Some criteria for requiring on-site detention facilities include, but are not limited to:

(a) There is an identified downstream deficiency, and detention rather than conveyance system enlargement is determined to be the more effective solution.

(b) There is an identified regional detention site within the boundary of the development.

(c) There is a site within the boundary of the development, which would qualify as a regional detention site under criteria or capital plan adopted by the city.

(d) Water quantity facilities are required by city-adopted storm water management master plans.

(3) Hydraulic Design.

(a) Detention design shall be assessed by dynamic flow routing through the basin. Documentation of the proposed design shall be included in the drainage report. Acceptable analysis programs include:

(i) HYD.

(ii) HEC-1.

(iii) HEC-HMS.

(iv) SWMM.

(v) HYDRA.

(vi) Others as approved.

(b) Peak release rates shall not exceed predevelopment rates for the 10-year, 24-hour storm.

(c) A pond overflow system shall provide for discharge of the 100-year storm event without overtopping the pond embankment or exceeding the capacity of the emergency spillway.

(d) Provide an emergency spillway sized to pass the 100-year storm event. Emergency spillway to be located in existing soils when feasible and armored with riprap or other approved erosion protection extending to the toe of the embankment.

(4) Design Criteria. The following are minimum requirements for detention facility design. For more complete guidelines to design criteria, refer to the King County, Washington, “Surface Water Design Manual.”

(a) The facility can be a combined water quality and quantity facility provided it meets all relevant criteria.

(b) Maximum interior side slopes up to the maximum water surface shall be three horizontal to one vertical.

(c) If interior slopes need to be mowed, maximum side slope shall be four horizontal to one vertical.

(d) Maximum exterior side slopes shall be two horizontal to one vertical, unless analyzed for stability by a geotechnical engineer.

(e) Retaining walls may serve as pond walls if the design is prepared and stamped by a registered professional engineer and a fence is provided along the top of the wall. At least 25 percent of the pond perimeter will be vegetated.

(f) Overexcavate to allow one-half foot of dead storage for sediment deposition.

(g) Minimum freeboard shall be one foot from the 25-year design water surface elevation.

(h) Provide an approved outlet structure for all flows. (Ord. 2875 Appx. § 360.3, 2003)

Article VII. Water Quality

18.16.120 General concepts and principles.

As an area is developed, impervious area and surface runoff increase. This runoff collects and transports pollutants to downstream receiving waters. Pollutants of concern include:

(1) Suspended solids (sediment).

(2) Heavy metals such as lead, copper, zinc, and cadmium.

(3) Nutrients such as nitrogen and phosphorus.

(4) Bacteria and viruses.

(5) Organics such as oil, grease, hydrocarbons, and pesticides.

Pollution reduction facilities can greatly improve the quality of runoff collected and released to our waterways. Several water quality facility concepts are described further in this article. (Ord. 2875 Appx. § 370.1, 2003)

18.16.130 Dual-use facilities.

Many facilities may be designed and used as dual-use facilities, which are used to meet both pollution reduction and flow control requirements. Common examples are a pond for flow control with a swale at the bottom for pollution reduction, or a wet pond with additional capacity for flow control. Dual-use facilities are encouraged. The design standard for such facilities is that the dual-use facility must meet the design standards for both pollution reduction and flow control. (Ord. 2875 Appx. § 370.2, 2003)

18.16.140 Pollution reduction facilities.

(1) Constructed Wetlands. Constructed wetlands, like natural wetlands, remove pollutants through sedimentation, filtration, and biologic processes. Wetlands typically have shallower water depths than ponds. Wetlands also provide plant and animal habitat.

(a) General Requirements. The detention time of the storm water volume shall be no less than 36 hours. A design team comprising a hydrologist, wetlands specialist, wetlands plant specialist, and an engineer may be needed to develop a successful wetland pollution reduction facility. A water balance analysis should be performed with the design of the facility.

The configuration of a constructed wetland shall be tailored to each site, rather than limited to one design. Major elements of a wetland can include channels or trenches, shallow marshes, and deeper ponded areas. These elements shall be combined to take advantage of the site topography. All wetland design shall address habitat, planting, and aesthetic issues.

General design requirements include, but are not limited to:

(i) Soils requirement: C, D (A and B with liners).

(ii) Maximum maintained side slopes: four horizontal to one vertical.

(iii) Where wetland vegetation is to be planted, side slopes shall be no steeper than five horizontal to one vertical. Wetland plant selection shall be consistent with anticipated soil hydrology. Other side slopes shall be no steeper than four horizontal to one vertical.

(iv) Flow velocity through the wetland shall average less than 0.01 feet per second for the design storm event. If natural slope does not allow for this velocity, berms shall be used to create ponded benches.

(v) Flow through the wetland shall be distributed as uniformly as possible across the marsh and ponded section.

(2) Storm Water Filters. Storm water filters include grassy swales and sand filters. Filters work by settling and straining water, which allows the capture of sediments and the pollutants that adhere to them. Swales also remove pollutants through nutrient uptake and soil absorption.

(a) Grassy Swales. Grassy swales are vegetated open channels that trap pollutants through filtration. General design requirements include, but are not limited to:

(i) Shall serve an area less than 10 acres in size.

(ii) Maximum maintained side slopes shall be four horizontal to one vertical.

(iii) The swale cross-section and grade shall be designed to convey the required storm event at:

(A) Maximum design depth of 0.33 feet, unless swale is part of dual-use facility.

(B) Maximum design velocity of 1.0 feet per second.

(C) Hydraulic residence time (time for Q_{max} to pass through swale) of nine minutes.

(D) Minimum longitudinal slope of 1.5 percent, maximum slope of five percent. For slopes greater than five percent, check dams shall be used.

(E) Designed using a Manning “n” value of 0.25.

(F) Four horizontal to one vertical or flatter side slopes in the treatment area.

(G) Minimum length of 100 feet, maximum bottom width of eight feet.

(iv) A minimum of one foot of freeboard above the standard storm design water surface shall be provided for facilities not protected by high-flow storm diversion devices.

(v) Woody or shrubby vegetation shall not be planted in the active treatment area of the swale.

(vi) The swale shall incorporate a flow-spreading device at the inlet. The flow spreader shall provide a uniform flow distribution across the swale bottom. In swales with a bottom width greater than six feet, a flow spreader shall be installed at least every 100 feet.

(vii) To minimize flow channelization, the swale bottom shall be smooth, with uniform longitudinal slope, and with a minimum bottom width of two feet. Check dams may need to be installed to reduce flow channelization.

(viii) Grasses shall be established as soon as possible after the swale is completed. The native seed mix described below is recommended, but not required:

NATIVE SEED MIX	
Blue Wild Rye	47%
Native Red Fescue	40%
Tufted Hairgrass	10%
Western Mannagrass	2%
American Sloughgrass	1%

(ix) Biodegradable erosion control matting appropriate for low velocity flows shall be installed in the flow area of the swale prior to allowing water to flow through the swale.

(b) Sand Filters. “Sand filters” are a layer of sand in a sedimentation chamber used to trap pollutants. The water runs into an underdrain system that conveys the filtered storm water to the discharge point. The sand filter consists of an inlet structure, sand bed, underdrain piping, and basin liner. The design of sand filters is based on Darcy’s Law:

$A = Q / (k \times i)$	where	A = area of sand filter Q = peak flow rate from hydrograph k = sand permeability (= 3.5 feet/day) i = hydraulic gradient
$i = (h + L) / L$	where	h = height of water column over sand filter

L = thickness of sand filter

General design requirements include, but are not limited to:

(i) Maximum area to be served is 80 acres.

(ii) Sand filters are appropriate for any soil classification.

(iii) Maximum maintained side slopes are three horizontal to one vertical.

(iv) No drainage shall be allowed directly to the filter; it must first go through a catch basin, inlet, sedimentation manhole, or similar large debris collection device.

(v) The sand filter shall infiltrate the entire design storm without overflow.

(vi) The drawdown period for sand filters shall not exceed 24 hours.

(vii) The inlet structure shall spread the flow of incoming water uniformly across the surface of the filter medium during all anticipated flow conditions. This flow shall be spread in a manner that prevents roiling or otherwise disturbing the filter medium.

(viii) The filter bed medium shall consist of clean medium to fine sand with no organics, frozen pieces, or other deleterious materials. Sand used as a filter medium shall be certified by a certified testing laboratory as meeting or exceeding the following gradation:

Sieve Size	**Percent Passing**
3/8″	100
#4	95 – 100
#8	80 – 100
#16	45 – 85
#30	15 – 60
#50	3 – 15
#100	<4

(3) Storm Water Ponds and Settling Basins. Ponds include wet ponds and extended wet ponds. They work primarily through settling of pollutants; some biological processes also help remove pollutants.

(a) Wet Ponds. “Wet ponds” are constructed ponds with a permanent pool of water called pool storage or dead storage. Pollutants are removed from storm water through gravitational settling and biologic processes.

Design requirements include, but are not limited to:

(i) Wet ponds can serve areas from five to 50 acres in size.

(ii) Requires group C or D classified soils (A and B with liners).

(iii) Maximum ground slope shall be eight percent.

(iv) Maximum maintained side slopes shall be three horizontal to one vertical.

(v) The pond configuration, as well as the inlet and outlet locations, shall maximize water travel time through the facility.

(vi) The maximum depth of the permanent pool shall be six feet.

More specific design criteria can be found in the King County, Washington, “Surface Water Design Manual.”

(b) Extended Wet Ponds. “Extended wet ponds” are constructed ponds that have both a permanent pool of water and extended detention.

The general requirements and design parameters are the same as for wet ponds in subsection (3)(a) of this section, with the following additional criteria:

(i) Permanent pool volume shall be no less than 50 percent of the design storm volume.

(ii) The remainder of the volume shall be released through an orifice.

(4) Infiltration Facilities. Infiltration facilities include infiltration trenches and infiltration basins. These facilities rely on the percolation of storm water into the existing soils for water quality improvement. As such, infiltration facilities are dependent on the ability of the native soil to drain the storm water. Ground water protection issues need to be evaluated when considering infiltration facilities.

The Oregon Department of Environmental Quality (DEQ) has identified drywells, sumps, and other infiltration-type facilities that inject untreated storm water below the ground surface as “Class V Injection Wells” under the federal Underground Injection Control (UIC) Program. Since the UIC Program states that these types of wells have a direct impact on ground water, storm water pollution controls will apply. More information about the UIC program can be obtained from DEQ.

(a) Infiltration Trenches. An “infiltration trench” is a shallow trench in permeable soil that is backfilled with sand and coarse stone and lined with filter fabric. The trench surface may be covered with grating, stone, gabion, sand, or a grassed cover with a surface inlet.

General design requirements include, but are not limited to:

(i) The maximum area to be served shall not exceed 15 acres.

(ii) Maximum ground slopes shall be five percent for surface trenches, 16 percent for buried trenches.

(iii) Maximum maintained side slopes shall be three horizontal to one vertical.

(iv) The infiltration trench shall infiltrate the entire design storm without overflow.

(v) Infiltration facilities shall not be accepted in soils with a tested infiltration rate of less than 0.50 inches per hour.

(b) Infiltration Basins.

(i) The maximum area to be served shall not exceed 50 acres.

(ii) Maximum ground slope shall be five percent.

(iii) Maximum maintained side slopes shall be three horizontal to one vertical.

(iv) The infiltration basin shall infiltrate the entire design storm without overflow.

(v) Infiltration facilities shall not be accepted in soils with a tested infiltration rate of less than 0.50 inches per hour.

(vi) There shall be no less than three feet of undisturbed depth of infiltration medium between the bottom of the facility and any impervious layer (i.e., solid rock, high ground water levels, impervious clay, etc.). (Ord. 2875 Appx. § 370.3, 2003)

Article VIII. Engineering

18.16.145 Generally.

All storm water system elements shall be designed and constructed in accordance with all applicable rules and regulations of the city, and any city interpretations thereof, and with all applicable federal, state, and local statutes and rules. (Ord. 2875 Appx. § 380, 2003)

18.16.150 Extension of public storm sewer systems.

Public storm sewer systems shall be extended to the most distant upstream parcel boundary(ies) to accommodate current and future storm flows entering the property. Except as otherwise provided, the extension of the public storm water systems to serve any parcel or tract of land shall be done by and at the expense of the property owner, developer, or applicant. The city may require that a storm pipeline that serves or may serve more than one property be a public system. (Ord. 2875 Appx. § 380.1, 2003)

18.16.160 Surveying.

The owner’s engineer or surveyor shall be responsible for establishing the location of the storm sewer system by means of construction stakes offset along the centerlines prior to commencement of construction. (Ord. 2875 Appx. § 380.2, 2003)

18.16.170 Railroad crossings.

Crossing of railroad rights-of-way shall be done in a manner that conforms to the requirements of the railroad having jurisdiction. If any bonds and/or certificates of insurance protection are required, they shall be furnished by the contractor or owner to the railroad company concerned naming the city as an additional insured.

Actual permits or easements for such crossing shall be obtained by the owner and all the terms for such permits or easements shall be met by the owner and contractor. (Ord. 2875 Appx. § 380.3, 2003)

18.16.180 Hydrologic analysis.

The hydrologic analysis shall be consistent with the guidelines outlined in this chapter. The engineer may use various computer models or formulas for the hydrograph analysis but the city may verify the design flows and volumes based on King County's SBUH program "HYD." (Ord. 2875 Appx. § 380.4, 2003)

18.16.190 Hydraulic analysis.

The method of hydraulic calculations shall be consistent with the guidelines outlined in this chapter.

(1) System Design Considerations. Site development improvement projects shall address on-site and off-site drainage concerns, both upstream and downstream of a project, including but not limited to the following:

(a) Modifications to the existing on-site storm drainage facilities shall not restrict flows creating backwater onto off-site property to levels greater than the existing situation.

(b) Storm drainage facilities shall be designed and constructed to accommodate all future full build-out flows generated from upstream property based upon the most recent approved city and/or county comprehensive land use plan and applicable storm water master plan.

(c) The design of storm drainage facilities shall analyze the impact of restrictions downstream of the project site.

(d) If the projected increase in surface water runoff leaving a proposed development will cause or contribute to damage from flooding to existing buildings or dwellings, the developer must construct an on-site detention facility.

(2) Review of Downstream System. The design engineer for each development constructing new impervious surface of more than 5,000 square feet shall submit documentation of the downstream capacity of any existing storm facilities impacted by the proposed development.

(3) Conveyance System Hydraulic Standards. The conveyance system shall be designed to convey and contain at least the peak runoff for the 25-year design storm. Open channel systems shall be designed for minimum one-foot freeboard from top of bank provided no structures are impacted by the design water surface elevation.

(4) Catch Basin System Standards. Catch basins and area drains collect water from an adjacent ditch, gutter line, or pavement and convey the water to a storm sewer system or culvert. Inlet systems shall be designed to catch and convey a 25-year storm event. For methodology for locating catch basins, refer to the ODOT "Hydraulics Manual."

(a) Spacing. Maximum spacing between catch basins shall be 300 feet.

(b) Standard System. All catch basins shall be sumped. The main storm line shall not pass through any catch basin unless approved by the city. No more than three catch basins may be connected in series before connecting to the main storm line. A ditch inlet or field inlet may be connected in the same manner as a catch basin.

(c) Series System. Unsumped catch basins are allowed, provided a sumped manhole is constructed below the unsumped catch basins before the flow enters the main storm line. No more than three unsumped catch basins may be constructed above a sumped manhole. The main storm line may not pass through the catch basins or sumped manhole(s). No ditch inlet or field inlet may be part of a series of unsumped catch basins. (Ord. 2875 Appx. § 380.5, 2003)

18.16.200 Storm manhole and pipe design standards.

For pipe systems which convey flows from or through water quality sensitive areas, a local representative of Oregon Department of Fish and Wildlife (ODFW) or other applicable state or federal agency shall be contacted to determine if fish passage is required and to identify site-specific design criteria. All culverts shall be designed for fish passage in accordance with ODFW guidance for fish passage unless otherwise exempted by ODFW and the city.

(1) Manhole Design.

(a) Manholes shall be provided at least every 500 feet, at every grade change, and at every change in alignment. Unless an exception is approved by the city, manhole lids shall have a minimum of six inches of clearance from the edge of a curb and/or gutter.

(b) All manholes shall be a minimum of 48 inches in diameter.

(c) All piped inside drop manholes shall be at least 60 inches in diameter.

(d) Detail(s) shall be submitted with the plans where pipes into or out of a manhole are larger than 24 inches or where more than four main line connections are made.

(e) Connections to an existing manhole, elevation of the existing ledge, location of steps, and elevations of existing inlets and outlets shall be submitted with the plans.

(f) All manhole bases shall be properly channelized. There shall be a minimum of eight inches separating connections as measured from the outside diameter of the pipe.

(g) Standard or oversize gutter or curb and gutter catch basins will not be allowed in lieu of manholes in any system.

(h) A manhole may have a maximum free fall of two feet.

(2) Water Quality Manholes. Water quality manholes shall be as shown in the standard detail drawings.

(3) Pipe Size. The design size shall be based on hydraulic calculations provided by the design engineer. The minimum diameter of public storm pipe is identified as follows:

(a) Pipe from the catch basin to the main line in the public right-of-way shall be a minimum 10-inch diameter pipe.

(b) Main line pipe shall be a minimum 12-inch diameter pipe.

(c) Storm pipes located out of a public street right-of-way, with no reasonable need to be extended, and with roof drains and/or area drains connected, shall be a minimum 10-inch diameter pipe.

(4) Location of Pipe. When storm drain pipes are located within a local public street right-of-way with curbs, the storm pipe shall be located between the curbs but no closer than five feet to either curb unless an exception is approved by the city.

Storm pipes in easements shall be located in the center of the easement unless an exception is approved by the city. The centerline of a storm pipe shall be at least seven and one-half feet from an easement side line.

(5) Alignment. Public storm pipe shall be laid on a straight alignment and at uniform grade unless an exception is approved by the city.

(6) Grade. All storm lines shall have sufficient slope to maintain a minimum flow velocity of three feet per second when flowing full.

(7) Steep Slopes. Storm pipes on slopes in excess of 20 percent shall be secured with approved anchor walls.

(8) Pipe Cover. Minimum pipe cover shall be in compliance with this section unless an exception is approved by the city.

In paved areas, pipe cover shall be measured from the bottom of the subbase to the upper surface of the pipe barrel. In pavement areas, the pipe bell shall not intrude in to the subbase. In areas without pavement, pipe cover shall be measured from finish grade to the upper surface of the pipe barrel. Minimum cover requirements are as follows:

Type of Pipe	**Cover (in)**
Nonreinforced Pipe	36
Ductile Iron	18

(9) Headwalls. Pipe end protection shall be required where pipe material other than ductile iron is exposed in design of an outlet or inlet pipe or where required to stabilize slope.

(10) Trash Racks/Debris Barriers. Trash racks/debris barriers are required over all pipe inlets over 12 inches in diameter and outlets over 18 inches in diameter. The engineer shall submit the trash rack/debris barrier system

design to the city for approval. (Ord. 2875 Appx. § 380.6, 2003)

18.16.210 Inlet design standards.

(1) Inlet and Catch Basin Capacity. All inlets and catch basins shall be designed to accept a 25-year storm event. Grates shall, as far as practical, be designed to avoid failure due to accumulation of debris.

(2) Design Criteria.

(a) Precast and poured in place catch basins and gutter inlets are allowed.

(b) All catch basins shall be constructed with an 18-inch minimum sump unless part of a series catch basin system with a sumped manhole.

(c) A main storm line shall not pass through a sumped catch basin.

(d) The spacing of catch basins shall be determined by the capacity of each catch basin to pass a 25-year storm event. Maximum spacing shall be 300 feet. In addition, catch basins shall be provided just prior to curb returns on streets with a centerline gradient of three percent or more and a street gutter drainage run of 100 feet or more.

(e) Catch basins shall be a maximum depth of six feet from the top of grate to flow line of the lowest pipe invert.

(f) The maximum length of pipeline between the inlet and main line structure shall be 40 feet for 10-inch pipe and 60 feet for 12-inch pipe.

(g) Blind tee connections to the main line are not allowed.

(3) Area Drains and Ditch Inlets.

(a) The standard area drain and ditch inlet shall be as shown in the standard details, unless an exception is approved by the city.

(b) A main storm line shall not pass through an area drain or ditch inlet. (Ord. 2875 Appx. § 380.7, 2003)

18.16.220 Constructed channel design standards.

Open channels may be constructed to convey runoff to the existing public storm system. Open channels are not allowed in the public right-of-way. They may be used as cut-off or diversion ditches along lot lines to prevent runoff from spilling on to an adjoining lot. Open channels must be privately maintained.

(1) Design Criteria.

(a) All constructed channels located on private property must be within an easement.

(b) Open channels that ultimately drain in to the public storm system must show line, grade, and a typical cross-section on the construction drawings.

(c) Constructed open channels shall be sized to pass the required flows and have side slopes no steeper than two horizontal to one vertical.

(d) Channels and connections shall be designed to prevent scouring. All pipe connections shall match side slopes and incorporate a headwall. (Ord. 2875 Appx. § 380.8, 2003)

18.16.230 Culvert design standards.

Culverts provide for passage of water under or through obstructions placed across streams and drainageways. Culverts shall be designed to pass the required flows without compromising public safety or causing new or additional flooding.

Culverts within FEMA floodplains shall be reviewed and approved by the local FEMA-designated authority.

For culverts which convey flows from or through water quality sensitive areas, a local representative of Oregon Department of Fish and Wildlife (ODFW) or other applicable state or federal agency shall be contacted to determine if fish passage is required and to identify site-specific design criteria. All culverts shall be designed for fish passage in accordance with ODFW guidance for fish passage unless otherwise exempted by ODFW.

(1) Design Criteria.

(a) Culverts will be designed to safely pass the 25-year flow.

(b) For culverts 18 inches in diameter and larger, the embankment around the culvert inlet shall be protected from erosion by lining around inlet with rock or other protection. The lining shall extend upstream from the culvert a minimum of five feet.

(c) For culverts 12 inches in diameter and larger, the receiving channel of the outlet shall be protected from erosion by rock lining, bioengineering, or other approved energy dissipater.

(d) For culverts 18 inches in diameter and larger, the inlet and outlet shall require grating. (Ord. 2875 Appx. § 380.9, 2003)

18.16.240 Outfall design standards.

Outfalls shall be above the mean low-water level unless an exception is approved by the city.

All outfalls shall be provided with a rock splash pad or other approved erosion control measure. Outfalls will be designed to prevent scouring at the outfall discharge and provide velocity reduction prior to discharge to the receiving channel. (Ord. 2875 Appx. § 380.10, 2003)

Article IX. Technical Specifications

18.16.245 Generally.

The technical specifications contained in this chapter, together with the Oregon Department of Environmental Quality, the Federal Environmental Protection Agency, and the American Public Works Association standards

and any other applicable requirement(s) of the city, shall govern the character and quality of material, equipment, installation, and construction procedures for gravity flow portions of public storm sewer systems. (Ord. 2875 Appx. § 390, 2003)

18.16.250 Manholes and structures.

Refer to SHMC 18.24.140. (Ord. 2875 Appx. § 390.1, 2003)

18.16.260 Catch basins and inlets.

(1) Materials.

(a) Aggregate, cement, and concrete shall meet the requirements set forth in SHMC 18.16.250.

(b) Frame and grate shall be as shown in the standard details.

(2) Workmanship.

(a) Excavation and backfill will conform to the requirements of SHMC 18.24.060.

(b) Bedding. The contractor shall remove all water and debris from ditch area and provide eight inches minimum layer of compacted three-fourths-inch minus crushed rock for a base.

(c) Cast-in-place catch basins shall have a minimum of six inches of concrete between the compacted gravel and the lowest invert. The forms used for cast-in-place catch basins shall be tight and well braced. The storm pipe material being used shall extend into the poured concrete of the catch basin. All corners shall be chamfered. Immediately after placement, the concrete shall be consolidated with an approved vibrator. The top surface shall be screed and exposed surfaces troweled to a smooth finish free from marks or irregularities. After forms are removed, the contractor shall patch any defects in the concrete with approved material.

(d) Precast. After the base is prepared, the contractor shall set the precast catch basin to the proper line and grade. The storm pipe material being used shall connect to the precast catch basin.

(e) Contractor shall clean the ends of all pipes and sections that come in contact with the catch basin. All inverts, stub outs and sections shall be installed according to the details using a nonshrinking grout, making sure all sharp edges or rough sections are removed, to prevent obstruction of the flow. (Ord. 2875 Appx. § 390.2, 2003)

18.16.270 Pipe and fittings.

All pipe and culverts shall have a minimum design service life of 75 years per Oregon Department of Transportation standards.

(1) Materials. Materials shall be the following types or approved equal:

(a) High density polyethylene (HDPE), SDR-26, ASTM F-667, D-1245.

(b) Ductile iron pipe (DIP).

(2) Pipe Installation. Refer to SHMC 18.24.160. (Ord. 2875 Appx. § 390.3, 2003)

18.16.280 Testing and acceptance.

All gravity storm systems shall pass a deflection test for plastic pipes. All details of testing procedures shall be subject to approval of the city.

(1) Deflection Test for Flexible Pipe. Storm systems constructed of flexible pipe materials shall be deflection-tested. The test shall be conducted by pulling an approved mandrel through the completed pipeline. The diameter of the mandrel shall be 95 percent of the nominal pipe diameter. The mandrel shall be a rigid, nonadjustable, odd-numbering leg (nine legs minimum) mandrel having an effective length of not less than its nominal diameter.

Testing shall be conducted after the line has been completely balled and flushed out with water, and compaction tests have been completed and accepted.

The contractor will be required to locate and repair any sections failing the test and to retest the section. (Ord. 2875 Appx. § 390.4, 2003)

Chapter 18.20
TRAFFIC DEVICES AND STREET ILLUMINATION

Sections:

18.20.010 Traffic signs.

Traffic signs shall be furnished and erected in conformance with MUTCD and the standard specifications supplemented by the state of Oregon, and/or modified as follows. (Ord. 2875 Appx. § 410, 2003)

18.20.020 Street name signs.

(1) Sign Placement. In business districts and on major arterials, street name signs should be placed in diagonally opposite corners so that they will be on the right-hand side of the intersection for traffic on the minor street.

In residential districts, at least two sets of street name signs will be mounted at each intersection.

On T-intersections, the street name signs will be designated at two locations. One set of street name signs shall be placed at end of a T-intersection, and the second set placed at the right-hand corner of the intersecting street.

(2) Signs. Street name signs shall be ordered through the public works department. To ensure compliance with current city standards, the contractor or developer shall order all necessary signs by contacting public works.

Contractor will provide V-locks per the standard details, verifying that the V-lock is installed plumb. City crews will install signs and contractor shall be billed for time and materials. Final approval will not be given until all street signs are ordered, paid for, and properly installed unless bonded for or otherwise satisfied. (Ord. 2875 Appx. § 420, 2003)

18.20.030 Traffic signals.

(1) Design and Installation Requirements. Traffic signal installation shall conform with MUTCD and the Oregon State Department of Transportation revisions.

Manuals to consider as text are:

(a) MUTCD.

(b) Oregon amendments.

(c) “Standard Specifications for Highway Construction” (ODOT).

(d) “Standard Specifications for Microcomputer Signal Controller” (ODOT).

(e) “Standard Drawings for Design and Construction” (ODOT).

(f) “Field Inspector’s Manual for Signal Construction” (ODOT). (Ord. 2875 Appx. § 430, 2003)

18.20.040 Traffic marking.

Traffic marking shall follow the MUTCD and TCDH as revised by ODOT.

Material specifications shall conform to ODOT standard specifications for construction.

(1) Stencils. Contact public works for correct stencil applications.

(2) Materials. All thermoplastic material shall conform to state specifications. All hot thermoplastic shall be alkyd based.

(3) Application. Existing surfacing which is to receive the thermoplastic material shall be mechanically wire brushed to remove all dirt and contaminants. Surfaces of new Portland cement concrete pavement to receive the thermoplastic material shall be mechanically wire brushed or abrasive blast cleaned to remove all lattice and curing compound.

Existing pavement markers which are damaged by blast cleaning or wire brushing shall be removed and replaced by the contractor at his expense.

Thermoplastic material shall be applied only to dry pavement surfaces and only when the pavement surface temperature is above 50 degrees Fahrenheit.

A primer, of the type recommended by the manufacturer of the thermoplastic material, shall be applied to all Portland cement concrete surfaces. The primer shall be applied immediately in advance of, but concurrent with, the application of thermoplastic material. The primer shall be applied at the application rate recommended by the manufacturer and shall not be thinned.

(4) Hot Thermoplastic Application. In addition to the applications listed above, the following shall apply to hot thermoplastic applications:

Preheaters with vertical mixers having 360 degree rotation shall be used to preheat granular form material.

The thermoplastic material shall be applied to the pavement at a temperature between 400 and 425 degrees Fahrenheit unless a different temperature is recommended by the manufacturer.

The thermoplastic material shall be applied by either spray or extrusion methods in a single uniform layer.

Stencils shall be used when applying thermoplastic material for pavement markings.

The pavement surface to which thermoplastic material is applied shall be completely coated by the material and the voids of the pavement surface shall be filled.

Unless otherwise specified in the special provisions, the thermoplastic material for traffic stripes shall be applied at a minimum thickness of 0.060 inch. Thermoplastic material for pavement markings shall be applied at a thickness of 0.100 inch to 0.150 inch. Glass beads shall be applied immediately to the surface of the molten thermoplastic material at a rate of not less than eight pounds per 100 square feet. The amount of glass beads applied shall be measured by stabbing the glass bead tank with a calibrated rod.

(a) Permanent marking shall consist of raised markers, cold or hot thermoplastic, the specific layout of which is to be approved by the city engineer.

(b) Painting or foil-back tape may be used for temporary marking.

(c) Hot thermoplastic shall be used for all permanent marking installed on all concrete streets.

(d) Cold thermoplastic 3M or equivalent tape rolled into the surface shall be used on new asphalt streets, including overlays.

(e) Raised markers (reflectors and buttons) shall be used in conjunction with permanent marking layouts.

(f) Approved striping material and layout shall be submitted to and approved by the city engineer prior to installation.

(g) Policies for marking patterns are detailed in the TCDH and in the city standard drawings. (Ord. 2875 Appx. § 440, 2003)

18.20.050 Street illumination.

Street lighting shall be designed by Columbia River People's Utility District (CRPUD), except within the Columbia Boulevard/St. Helens Street corridor master plan area; see SHMC 17.152.030(24). This shall be done at the applicant's initiative and expense. The lighting plan shall be included with the submittals to the city. Lamp type used should be uniform. (Ord. 3181 § 4 (Att. C), 2015; Ord. 2875 Appx. § 450, 2003)

Chapter 18.24
SANITARY SEWERS

Sections:

Article I. General

18.24.005 General.

All sewers shall be designed and constructed so as to conform to the requirements of the Oregon State Department of Environmental Quality, the Oregon Standard Specifications for Construction, and the city of St. Helens. Public sewerage facilities shall be designed to allow the logical service of all parcels or tracts of land within the basin being considered. Sewer lines shall be extended to adjacent parcels to best facilitate future development. The extension of the public sanitary sewer systems to serve any parcel or tract of land shall be done by and at the expense of the property owner or developer. (Ord. 2875 Appx. § 510, 2003)

18.24.010 Scheduling.

(1) Sequence of Operations. The contractor shall plan and execute construction work to cause a minimum of interference to the operation of existing city facilities. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions, and it shall be the obligation of the contractor to make this change to the work schedule. This scheduling, however, is subject to city approval, and does not relieve the contractor from making its work available for inspection.

(a) Connection to Existing System. When installing a new manhole to make a connection to an existing system, the existing main line shall be diverted around the new structure until all testing of the new pipe and manhole(s) has been completed. This can be accomplished by installing a section of temporary pipe and 45 degree bends around the new manhole and backfilling until testing is completed to the city's satisfaction.

Connections between existing work and new work shall not be made until necessary inspections and tests have been completed on the new work and it is found to conform in all respects to the requirements of the plans and specifications.

(2) Progress of Construction. Construction shall proceed in a systematic manner that will result in minimum inconvenience to the public. Construction staking for the work being performed shall be completed prior to the start of excavation. The contractor shall limit its operations to a small length of work area per crew. At no time shall the trenching equipment be farther than 300 feet ahead of the pipe laying crews, unless advance written permission is given by the city. The trench shall be backfilled so that no section of trench is left open longer than 24 hours. Trenches located in a right-of-way shall be completely backfilled before the contractor leaves the site for the day unless the trench is adequately secured with steel plates.

Cleanup of all construction debris, excess excavation, excess materials, and complete restoration of all fences,

mailboxes, ditches, culverts, signposts, and similar items shall be completed immediately following the final backfilling of the trench.

Any area disturbed by the contractor's operations inside dedicated easements shall be restored to its original condition. Any area that is disturbed by the contractor's operations outside the dedicated easement shall be restored to the property owner's satisfaction. (Ord. 2875 Appx. § 510.1, 2003)

18.24.020 Preservation, restoration, and cleanup.

(1) Site Restoration and Cleanup. The contractor shall keep the premises clean and orderly at all times during the job and leave the project free of rubbish or excess materials of any kind upon completion of the work. During construction, the contractor shall stockpile the excavated trench materials so as to do the least damage to adjacent lawns, grassed areas, gardens, shrubbery, trees, or fences, regardless of the ownership of these areas. All excavated materials shall be removed from these areas, and these surfaces shall be left in a condition equivalent to their original condition and free from rock, gravel, boulders, or other foreign material. Stockpiles shall be removed or tarped during wet weather conditions throughout the entire construction process. The contractor shall replace topsoil areas over all trenches with a minimum finished depth of 12 inches of topsoil. All existing drainage ditches and culverts shall be reopened and graded, and original drainage restored. All damaged irrigation and house drainage pipe, drain tiles, sanitary sewer or storm laterals, and culverts shall be repaired expeditiously. The finished surface shall conform to the original surface and shall be free-draining, free from holes, rough spots, or other surface features detrimental to a seeded area.

(2) Preservation of Irrigation and Drainage Ditches. Following the backfill of the trenches, the contractor shall restore all public and private irrigation and storm drain ditches that have been destroyed, damaged, or otherwise modified during construction to the condition of the ditch before construction. Ditches shall be built in their original locations unless otherwise redesigned as part of the project.

(3) Stream and Creek Crossings. The contractor shall comply with all provisions of the permits required by the Oregon Division of State Lands, the U.S. Army Corps of Engineers, Oregon Department of Environmental Quality, Department of Fish and Wildlife, Columbia County, and any other agencies having jurisdiction. (Ord. 2875 Appx. § 510.2, 2003)

18.24.030 Interferences and obstructions.

(1) General. Various obstructions may be encountered during the course of the work. Maps and information regarding underground utilities shall be obtained from the utility owning and operating such utilities, but the location of such utilities is not guaranteed. At least two but not more than 10 business days shall be given to the Oregon Utility Notification Center prior to commencement of the construction operation. The contractor shall comply with the Oregon "locate law," ORS 757.557. If services of any utility are interrupted due to the construction operation, the proper authority shall be notified immediately.

(2) Protection. The contractor shall exercise all due care in protecting property along the route of the improvement. This protection shall include, but not be limited to, trees, yards, fences, drainage lines, mailboxes, driveways, shrubs, and lawns. If any of the above have been disturbed, they shall be restored to as near their original condition as possible. (Ord. 3186 § 24, 2015; Ord. 2875 Appx. § 510.3, 2003)

18.24.040 Permanent survey monuments.

The contractor shall not disturb permanent survey monuments, property corners, stakes, or benchmarks without prior written consent of the appropriate county surveyor. It shall be the responsibility of the contractor to protect such survey markers. Survey markers that are disturbed or lost shall be replaced by a registered land surveyor. When a change is made in the finished elevation of the pavement, or any roadway in which a permanent survey monument is located, the monument cover shall be adjusted to the new grade. (Ord. 2875 Appx. § 510.4, 2003)

Article II. Trench Excavation and Backfill

18.24.050 Materials.

(1) Pipe Bedding. Pipe bedding material shall be clean crushed rock with a maximum size of three-fourths inches, uniformly graded from coarse to fine or as approved by the city.

(2) Trench Backfill. Above the pipe zone will be divided into the following classifications:

(a) Class A Backfill. Class A backfill shall be native or common material, which in the opinion of the city meets the desired characteristics required for the specific surface loading.

(b) Class B Backfill. Class B backfill shall be three-fourths-inch to zero-inch granular grade of crushed rock material, unless otherwise approved. Class B backfill will be required in all public rights-of-way. (Ord. 2875 Appx. § 520.1, 2003)

18.24.060 Construction.

(1) Excavation.

(a) Clearing the Right-of-Way. Clearing shall be completed prior to the start of trenching. The contractor shall observe all federal, state, and local laws relating to fire permits, burning materials, and other requirements. Under no condition shall brush be covered by excavated materials prior to being cleared and removed.

Excavated material shall be placed at locations and in such a manner that it does not create a hazard to pedestrian or vehicular traffic, nor interfere with the function of existing drainage facilities. During wet weather conditions, stockpiles shall be removed or tarped throughout the construction process.

(b) Open Trench Limit. The length of the open trench shall always be kept to a minimum. The city shall determine the amount of the open trench allowed based upon work conditions of the area. In normal cases, the open trench length shall not exceed 300 feet.

(c) Trench Width. The trench width at the surface of the ground shall be kept to a minimum necessary to install the pipe in a safe manner. In all cases, trenches must be of sufficient width to allow for shoring, proper joining of the pipe, and backfilling of material along the sides of the pipe. The minimum trench width in the pipe zone must provide a clear working space of six inches outside the maximum outside diameter of the pipe.

Excavation for manholes and other structures shall be wide enough to provide a minimum of 12 inches

between the structure's surface and the sides of the excavation.

(2) Installation.

(a) Shoring. The contractor shall provide all materials, labor, and equipment necessary to adequately shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions, in compliance with all OSHA requirements. (Ord. 2875 Appx. § 520.2, 2003)

Article III. Pavement Restoration

18.24.070 General.

The stricter of the requirements of this article or the standards of the jurisdiction having authority over the road being repaired shall be followed.

If an existing street that is classified as a collector or an arterial has been paved within five years or any other classification of street has been paved within three years, the trench patch shall be made with a "T" cut and will be fog sealed from the lip of gutter to lip of gutter or flow line to flow line to ensure that the structural integrity of the existing street is maintained. The street shall be milled if necessary to maintain proper crown. (Ord. 2875 Appx. § 530.1, 2003)

18.24.080 Materials.

(1) Crushed Rock. The following rock specifications shall be required unless modified by the local jurisdiction:

(a) Base course rock for the street shall be one and one-half inches and shall conform to the applicable portions of the "Standard Specifications for Highway Construction" of the Oregon Department of Transportation for course aggregate base material.

(b) Rock for the leveling course shall be three-fourths-inch minus, conforming to the applicable portions of the "Standard Specifications for Highway Construction" of the Oregon Department of Transportation for leveling course.

(2) Asphalt Concrete.

(a) Material for prime coat shall be emulsified asphalt-type CMS-2 or approved equal.

(b) Materials for tack coat shall be emulsified asphalt-type RS-1, CRS-1, or approved equal.

(c) When more than three inches of asphalt concrete is required, the asphalt concrete shall be placed in two or more courses. The base course may be Class B asphaltic concrete mix conforming to the "Standard Specifications for Highway Construction" of the Oregon Department of Transportation in lieu of Class C mix.

(d) Asphaltic concrete for the surface course shall be Class C mix conforming to the Standard Specification of the Oregon Department of Transportation. All surface course mix design is subject to final approval by the city.

(e) If multiple lifts are used, the base course shall be a minimum thickness of two inches, and the wearing course shall be Class C OSHD mix with a minimum thickness of one and one-half inches. (Ord. 2875 Appx. § 530.2, 2003)

18.24.090 Workmanship.

(1) Subgrade. The contractor shall:

(a) Bring the trench to a smooth, even grade at the correct distance below the top of the existing pavement surface, allowing for base rock, leveling rock and asphalt concrete.

(b) Trim existing pavement so that the trench width plus 12 inches of asphalt is removed creating a “T” cut section as shown in the standard drawings.

(c) Remove any pavement that has been damaged or that is broken and unsound and provide a smooth, neat cut with a sound edge for joining the new pavement.

(d) Compact the top four feet of pavement subgrade to 95 percent relative density, ASTM D2049.

(e) Accomplish supplementary compaction where required with approved mechanical vibrating or power tampers.

(2) Base Aggregate Course and Leveling Course. The contractor shall obtain certification of the subgrade material prior to placing any base course material on the subgrade.

(3) Tack Coat. After the leveling course has been compacted, the contractor shall apply the tack coat to the edges of all surfaces being paved at a rate of 0.06 to 0.12 gallons per square yard. The surface upon which the tack coat is applied shall be dry and clean of dirt, dust, and other matter inhibiting asphalt adherence.

(4) Weather Conditions. Asphaltic concrete placement shall conform to Part 700 of the Oregon Standard Specifications for Construction and in no instance shall be placed when the surface temperature is lower than 40 degrees Fahrenheit, during rainfall, or when the surface is frozen or wet.

(5) Protection of Structures. The contractor shall provide whatever protective coverings may be necessary to protect the exposed portions of bridges, culverts, curbs, gutters, posts, guard fences, road signs, and any other structures from the paving operations. All oil, asphalt, dirt, or other undesirable matter that may come upon these structures by reason of the paving operations shall be removed.

Existing and new water valve boxes, manholes, catch basins, or other underground utility appurtenances shall be made level with the finish asphalt grade. The city or other appropriate authority shall be contacted prior to any facility adjustments for guidance as to the appropriate procedures, standards and materials to be used. All covers shall be protected during asphalt application.

Existing monuments shall have paving rings for monument boxes placed over each monument to allow for ease of future access as shown in the standard details. The contractor shall be responsible for all costs associated

with this work.

(6) Rock Surfacing. Where so directed by the city, the contractor shall place a minimum of two inches of level course rock, as specified in this chapter, for the full width of all streets, driveways, parking areas, street shoulders, and other areas disturbed by the construction.

(7) Contractor's Responsibility. The contractor shall repair all settlement of pavement over trenches within the warranty period at no charge to the city.

(8) Driveways. Driveways shall be replaced to original conditions following the work. Such replacement shall be done in accordance with all applicable legal standards for road shoulders within the limits of the work.

Existing drainage patterns shall not be altered unless approved by the city engineer to correct a drainage problem. (Ord. 2875 Appx. § 530.3, 2003)

Article IV. Engineering

18.24.100 Sewage flows.

The Manning's coefficient value ("n") to be used in calculating sewage flows is 0.013. Sewers of sizes that are obviously larger than are necessary for satisfactory carrying capacity, but that are specified in order to meet grade requirements, are not allowed. (Ord. 2875 Appx. § 540.1, 2003)

18.24.110 Pipe design.

No public sanitary sewer shall be less than eight inches in diameter unless otherwise approved by the city. Six-inch sanitary sewer may be approved by the city if the line is no more than 250 feet long and is located at the end of a system with no possibility of being extended. Building sewers shall have a minimum of four-inch inside diameter.

(1) Location. Sanitary sewers, whenever possible, shall be installed within five feet of the centerline of the public right-of-way or on the centerline of easements unless otherwise approved by the city. Sewers shall be installed no closer than five feet to an easement side line or 10 feet to the edge of a public right-of-way. The city may require maintenance access easements.

(2) Alignment. Sanitary sewer lines shall be laid on a straight alignment and uniform grade between manholes.

(3) Grade. All sanitary sewers shall be laid on a grade which will produce a minimum velocity of two feet per second when flowing full or half-full. The minimum grades for various sizes of pipe are listed below:

Inside Pipe Diameter (inches)	Grade (feet per 100 feet)
6	0.60
8	0.40
10	0.28

12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06

(4) Steep Slopes. Sanitary sewers on slopes in excess of 20 percent shall be secured through the use of concrete anchor walls. Spacing for anchors shall be as follows:

Minimum Anchor Spacing	
Grade (%)	**(Center to Center)**
20 – 34	35 feet
35 – 50	25 feet
51+	15 feet or concrete encasement

(5) Pipe Cover. Minimum pipe cover shall be in compliance with this section unless an exception is approved by the city.

In paved areas, pipe cover shall be measured from the bottom of the subbase to the upper surface of the pipe barrel. In pavement areas, the pipe bell shall not intrude in to the subbase. In areas without pavement, pipe cover shall be measured from finish grade to the upper surface of the pipe barrel. Minimum cover requirements are as follows:

Type of Pipe	**Cover (in.)**
Nonreinforced Pipe	36
Ductile Iron	18

(6) Sanitary Sewer in Vicinity of Water Supplies. No sanitary sewer shall be less than 10 feet from any well, spring, or other source of domestic water supply. All sanitary sewers that are located within 50 feet from any such source of domestic water supply shall be constructed of ductile iron water pipe with watertight joints, C-900 PVC, or other city-approved pipe. Sanitary sewers and domestic water lines shall not be laid in the same trench. Parallel water and sanitary sewer lines shall be at least 10 feet apart horizontally. Wherever it is necessary for sanitary sewer and water lines to cross each other, the crossing should be at an angle of approximately 90 degrees. The sanitary sewer shall be located 18 inches or more below the water line or be constructed of ductile iron pipe, have a concrete encasement, or other city-approved pipe material. In such cases, the length of the sanitary sewer pipe shall be centered at the crossing. (Ord. 2875 Appx. § 540.2, 2003)

18.24.120 Manhole design.

Manholes shall be provided at least every 400 feet, at every change in alignment, and at every grade change. A manhole shall be located at the upstream end of the pipe except as allowed in SHMC 18.24.130. Manholes shall not be closer than five feet to a curb line.

All manholes shall be a minimum of 48 inches in diameter. All manholes shall have a minimum 12-inch ledge in the base.

Building sewers are allowed to be connected directly into a manhole providing that they are properly channelized. No more than three building sewers are allowed to be connected to a manhole unless otherwise approved by the city. If any building sewer is connected into a manhole at an elevation more than 12 inches above the top of the ledge, it shall be constructed with an inside drop.

Manholes constructed on lines with 12-inch or smaller pipe shall have at least 0.2 foot of fall through the manhole or as allowed by Oregon DEQ and approved by the city. (Ord. 2875 Appx. § 540.3, 2003)

18.24.130 Clean outs.

Clean outs shall be allowed only on pipelines where the sewer line has no possibility for future extension. The maximum distance between the clean out and a manhole is 150 feet, unless otherwise approved by the city. The standpipe shall be the same size as the pipeline up to a maximum of eight inches.

Temporary clean outs may be installed within the right-of-way at the end of a stub street where the street is expected to be extended in the future and the design of the sewer system does not warrant that a manhole be constructed at this location. When the sewer is extended, the temporary clean out shall be removed. (Ord. 2875 Appx. § 540.4, 2003)

Article V. Technical Specifications

18.24.135 Technical specifications.

The technical specifications contained in this chapter, together with the Oregon Department of Environmental Quality, the Federal Environmental Protection Agency, and the American Public Works Association standards and any other applicable requirement(s) of the city, shall govern the character and quality of material, equipment, installation, and construction procedures for gravity flow portions of public sanitary sewer systems. (Ord. 2875 Appx. § 550, 2003)

18.24.140 Manholes and structures.

(1) Materials.

(a) Aggregate and Portland Cement. Aggregate and Portland cement shall meet the standards set forth in Section 756 of the Oregon Standard Specifications for Construction.

(b) Concrete. Concrete shall conform to the requirement of ASTM C94, Alternate 2. Compressive field strength for manhole bases and miscellaneous concrete structures shall be not less than 3,000 psi at 28 days. Maximum size of aggregate shall be one and one-half inches. Slump shall be between two and four

inches.

(c) Manhole Frames and Covers. Casting shall be tough, close-grained gray iron, smooth and clean, free from blisters, blowholes, and all defects, and conform to ASTM A48, Class 30. Covers shall be true and set within ring at all points. Frames and covers shall be standard or suburban, solid, depending upon the type and location of the manhole and as approved by the city. Watertight frames and covers shall be installed on manholes located within floodplain areas, along stream corridors, or where excess surface water may cause inflow problems. Tamper-proof frames and covers shall be installed on manholes in easement areas.

(d) Precast Manholes. Precast manholes shall be concrete. Materials shall conform to the requirements of ASTM C478. Minimum wall thickness shall be five inches. Cones shall have the same wall thickness and reinforcement as riser sections. Joints shall be tongue and groove, rubber ring, or keylock-type. Cones shall be eccentric.

(e) Precast Bases. Precast base sections or manhole bases may be used provided all the details of construction are approved prior to construction.

(f) Pipe Stub Outs for Future Connections. Pipe stub outs for future connections shall be of the same type as approved for use in the lateral, main, or trunk lines. Rubber-gasketed watertight plugs shall be furnished with each stub out and shall be adequately braced against air test pressures.

(g) Manhole Steps. Manhole step material shall be plastic with reinforcing bar, a minimum one-half-inch Grade 60, meeting requirements of ASTM A615 encapsulated with injection-molded copolymer polypropylene with serrated surfaces.

(h) Nonshrink Grout. Nonshrink grout shall be Sika 212, Euco N-S, Five Star, or city-approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed or packed only with the use of an approved commercial concrete bonding agent. Unused grout shall be discarded after 20 minutes and shall not be used.

(i) Manhole Pipe Connector. Rigid pipe entering or leaving a manhole shall use a flexible connector that is designed to produce a positive watertight connection.

(2) Workmanship on Manholes.

(a) Foundation Stabilization. If unstable material exists that will not support the manhole or other structure, the contractor shall install geotextile fabric or excavate below grade and backfill with foundation stabilization material.

(b) Pipe Connections. Special care shall be taken to see that the openings through which sanitary sewer pipes enter the structure are completely watertight.

(c) Drop Manholes. The maximum fall without an inside drop as measured from the existing flow line to the new flow line is one and one-half feet and shall be constructed with a beaver slide as shown in the standard

drawings. When the drop is more than two feet, an inside drop shall be used as shown in the standard drawings.

(d) Poured in Place Concrete Bases. The contractor shall remove water from the excavated area, provide 12 inches minimum layer of compacted three-fourths minus crushed rock for a base, and construct the concrete base so that the first precast manhole section has a uniform bearing throughout the full circumference. There shall be a minimum of eight inches of concrete between the compacted gravel and the lowest invert of the manhole. The contractor shall deposit sufficient concrete on the base to assure a watertight seal between base and manhole wall. Twenty-four hours shall be allowed to elapse before placing the remaining sections on the base.

(e) Placing Manhole Section. The contractor shall clean the end of sections of foreign materials and install the preformed plastic gasket in conformance with the manufacturer's recommendations.

(f) Manhole Inverts. The contractor shall construct manhole inverts in conformance with details and with smooth transitions to ensure an unobstructed flow through the manhole, and remove all sharp edges or rough sections.

(g) Manhole Extensions, Rings, and Covers. The contractor shall install rings and covers on top of manholes to positively prevent all infiltration of surface or ground water into manholes. Rings shall be set in a bed of nonshrinking grout with the nonshrinking grout carried over the flange of the ring and shall be set so that tops of covers are flush with the surface of adjoining pavement, or one foot above natural ground.

(h) Manhole Taps. Taps into existing manholes shall be core drilled unless approved otherwise by the city. All nonconcrete pipe material used on a manhole tap shall be adapted with a watertight coupling compatible with concrete or approved equal (e.g., inserted manhole boot). The bonding material used to connect the pipe and/or coupling to the manhole must be nonshrink material to ensure no ground water infiltration occurs.

(3) Types of Connections.

(a) Connection to Existing Manholes. The contractor shall connect sanitary lines to existing manholes at locations indicated; provide all diversion facilities and perform all work necessary to maintain sanitary flow in existing sanitary systems during connection to the manholes; and break out existing manhole bases or grouting as necessary and regrout to provide smooth flow into and through existing manholes. The contractor shall allow no debris to enter the existing system while making the connection.

(b) Manholes over Existing Sanitary Sewer Systems. The contractor shall construct manholes over existing sanitary lines at locations shown on plans. Final connection to the existing sanitary sewer shall not be made until the system has been tested in accordance with the requirements of SHMC 18.24.180 and is ready for acceptance as outlined in this chapter. All broken edges shall be covered with nonshrinking grout and troweled smooth. The contractor shall prevent any debris from entering the manhole while breaking into the existing pipe. (Ord. 2875 Appx. § 550.1, 2003)

18.24.150 Sewer pipe and fittings.

(1) General. Sanitary sewer pipe shall have flexible gasket joints. Joints on all fittings shall be the same as the joints used on the pipe. Caps or plugs shall be furnished with each fitting, outlet, or stub as required with the same type gasket and/or joint in the pipe.

(2) Materials.

(a) Polyvinyl Chloride Pipe (PVC). PVC pipe shall be as follows:

Diameter	Type
4″ – 15″	ASTM 3034 SDR 35
18″ – 24″	ASTM F-679 SDR 35
4″ – 12″	ASTM C-900; D-1784 DR

Gaskets shall conform to the requirements of ASTM 477 and ASTM 3212.

Fittings shall conform to the applicable portions of the following specifications: ASTM D1785, ASTM D2729, ASTM D2466, ASTM 2467, ASTM D3033, and ASTM D3034. Fitting joints shall be the same as the pipe joints.

(b) Ductile Iron Pipe. Ductile iron pipe shall conform to the requirements of ANSI A21.50-1 or AWWA C150-1, cement lined push-on joint. The minimum thickness class shall be Class 50 (up through 12-inch diameter pipe) and Class 51 (for 14-inch diameter and larger pipe).

Fittings shall be mechanical or push-on of the class as specified. Mechanical joint cast iron fittings shall conform to AWWA C110 and shall be of a class at least equal to that of the adjacent pipe. Push-on joint fittings shall be gray iron with body thickness and radii of curvature conforming to ANSI A21.10.

(c) Line Tap Fittings. Service laterals installed with new construction of main line(s) shall be manufactured tee connections and will be installed as shown in the standard detail drawings.

PVC tee saddle shall be in accordance with ASTM D-3034 with minimum cell classification of 1245B-C or 12364-C as defined in ASTM D-1784. Elastomeric seals meeting ASTM F-477 specifications, and located at both the lead and skirt ends of the saddle. Stainless steel band shall be a full nine-sixteenths inch wide. This saddle is allowed on PVC, clay, IPS, concrete, asbestos cement, and PE pipe.

Inserta Tee shall meet the same standards as the PVC tee saddle. This saddle is allowed only on thick wall pipe material, e.g., concrete, ductile iron, or rib-type plastic.

(d) Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C-827 and CRD-C-621. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. (Ord. 2875 Appx. § 550.2,

2003)

18.24.160 Pipe installation.

(1) Workmanship.

(a) Line and Grade. The contractor shall establish line and grade for pipe by the use of lasers or by transferring the cut from the offset stakes to the trench at whatever intervals necessary to maintain the line and grade. The contractor shall check line and grade as necessary. In the event that the limits prescribed in this chapter are not met, the work shall be immediately stopped, the city notified, and the cause remedied before proceeding further with the work. Variance from the established line and grade shall not be greater than one-thirty-second inch per inch of pipe diameter and shall not exceed one-half inch for line and one-fourth inch for grade, providing that such variation does not result in a level or reverse-sloping invert. Variation in the invert elevation between adjoining ends of pipe shall not exceed one-sixty-fourth inch per inch of pipe diameter, or one-half-inch maximum.

(b) Pipe Handling. The contractor shall unload pipe only by approved means. Pipe shall not be dropped to the ground and shall not be dropped or dumped into trenches. The contractor shall inspect all pipe and fittings prior to lowering into trench to ensure no cracked, broken, or defective materials are used. The contractor shall clean ends of pipe thoroughly, remove foreign matter and dirt from inside of pipe, and keep it clean during laying and joining. The contractor shall lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. The contractor shall remove all damaged pipe from the job site.

(c) Tying to Existing Sanitary Sewer. When a contractor ties into a “live” line, the contractor shall keep the new line plugged at the downstream end of the construction to prevent entry of ground water and debris into the city sanitary sewer system.

(d) Foreign Material. The contractor shall take all precautions necessary to prevent excavated or other foreign material from entering into the pipe during the laying operation. At all times, when laying operations are not in progress, the contractor shall use a mechanical plug at the open end of the last laid section of pipe to prevent entry of foreign materials or creep of the gasketed joints.

(e) Pipe Laying. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of the flow. After a section of pipe has been lowered into the prepared trench, the contractor shall clean the end of the pipe to be joined, the inside of the joint, and the rubber ring (if required) immediately before joining the pipe, and make assembly of the joint in accordance with the recommendations of the manufacturer for the type of joint used. The contractor shall provide all special tools and appliances required for the jointing assembly. After the joint has been made, the pipe shall be checked for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Pipe should be rotated so that stenciling (pipe size, material, etc.) is on top and visible when pipe is exposed.

(f) Transition Fittings. When joining different types of pipes, the contractor shall use approved ridged fittings. No flexible fittings will be approved. Bell-type couplings are considered flexible and are not acceptable.

(i) Shear ring/ridge transition couplings meeting the ASTM C564 or equal shall be used.

(ii) PVC couplers or adapters shall meet the ASTM 3034-SDR 35/C-900-DR 18-D1784 specifications.

(iii) Ductile iron transition couplings shall meet the ASTM A536-80 for center and end rings, ASTM D2000 3 BA 75 for gaskets and AWWA C-111-80 for bolts and nuts.

(g) Pipe Bedding. The contractor shall install pipe zone material uniformly on both sides of the pipe up to the springline of the pipe. Material shall be compacted to ensure proper support within the haunching area.

(h) Line Taps.

(i) Line taps shall be core drilled unless approved otherwise by the city. Core-drilled holes shall be done using a cylinder-style hole saw for plastic pipe material or a diamond core bit for concrete and ductile iron pipes.

(ii) Prior to installation of the saddle, the area around the saddle installation shall be clean and free of all rough edges.

(iii) While installing the saddle, no rock, dirt, or debris shall be allowed to enter the main sewer line.

(iv) The contractor shall install three-fourths-inch minus gravel in the pipe zone around the line tap, from four inches below the pipe or to undisturbed ground and to six inches above the pipe.

(v) Magnetic tape shall be installed on all building sewers per the standard details. (Ord. 2875 Appx. § 550.3, 2003)

18.24.170 Building sewers.

(1) Service to Lots. Where streets or main line sewers are being constructed as part of a development, individual building sewers shall be constructed to serve each lot.

(a) Installation. All new building sewers being constructed as part of a development shall be installed with a permanent cap for testing purposes and to prevent migration of ground water and other unwanted materials from entering the line. The cap is to remain until the lateral is extended to new building.

Building sewers shall be installed in accordance with the Uniform Building Code (UBC) and Council of American Building Officials (CABO).

(b) Material. Pipes for building sewers shall be one of the following types:

(i) PVC (polyvinyl chloride), conforming to ASTM D3034 (green).

(ii) Ductile iron conforming to Class 50.

(c) Alignment and Grade. Building sewers shall be laid in a straight grade and alignment from the main sewer line to the edge of right-of-way or edge of permanent easement. The grade shall be a minimum of two

percent. The pipe shall be laid on a pipe base of four inches of three-fourths-inch minus crushed rock. All plastic pipe shall have three-fourths-inch minus rock placed six inches over the top of the pipe.

(d) Markings. Building sewers shall be marked with a detectable underground magnetic tape. The magnetic tape shall be placed from the main pipeline to the end of the side lateral with 18 inches separation between the tape and pipe. The magnetic tape shall be green in color and have the following marking:

CAUTION SEWER BURIED BELOW

A two-by-four stake shall be installed at the end of the sanitary lateral from the invert of the pipe to three feet above the ground surface. The stake shall be of outdoor wood and marked for sanitary sewer. A magnetic tape shall be placed alongside the two-by-four. (Ord. 2875 Appx. § 550.4, 2003)

18.24.180 Testing and acceptance.

(1) General. All gravity sanitary pipeline shall pass the required air tests, pass a deflection test, be video-inspected, and be free of visible leaks. All projects shall pass the required manhole tests. The contractor shall furnish all necessary testing equipment and perform the tests in a manner satisfactory to the city and Oregon DEQ.

(2) Line Cleaning. Prior to the internal pressure testing and inspection of the system, the contractor shall ball and flush and clean all parts of the system. The contractor shall remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the system at or near the closest downstream manhole.

(3) Manholes.

(a) General. Sanitary sewer manholes shall be tested for acceptance after the trench has been backfilled, compaction requirements have been met, road base rock has been installed and the street paved, and concrete manhole closure collars have been installed. If the manholes have passed the tests and the castings have been disturbed by construction activities and need to be reinstalled, the manholes shall be retested.

(b) Vacuum Testing. The test will consist of plugging all inlets and outlets. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches. Minimum time of test shall be 30 seconds. The manhole shall pass if the time for the vacuum reading to drop to nine inches meets or exceeds the values indicated in the table below:

Depth of Manhole (feet)	**Allowable Time (seconds)**		
	48-inch	**60-inch**	**72-inch**
8	20	26	33
10	25	33	41
12	30	39	49

14	35	46	57
16	40	52	65
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

(c) Hydrostatic Testing. The test will consist of plugging all inlets and outlets and filling the manhole with water to the rim. Leakage in each manhole shall not exceed 0.2 gallons per hour per foot of head above the invert. Leakage will be determined by refilling to the rim using a calibrated or known volume container.

(4) Air Testing Pipeline.

(a) General. After construction of the system, including service connections, required compaction testing, and backfilling, the contractor shall conduct a low-pressure air test. The contractor shall provide all equipment and personnel for the test. Tests shall be conducted during normal working hours. Air tests for storm lines will not be required.

(b) Safety. Only qualified personnel shall be permitted to conduct the test. All plugs used to close the sewer for the air test must be capable of resisting the internal pressures and must be securely braced, if necessary. All air testing equipment must be placed above ground and no one shall be permitted to enter a manhole or trench where a plugged line is under pressure. All pressure must be released before the plugs are removed.

(c) Method. All air testing shall be by the time pressure drop method. The test procedures are described as follows:

(i) Clean the lines to be tested and remove all debris.

(ii) The contractor has the option of wetting the lines prior to testing.

(iii) Plug all open ends with suitable test plugs; brace each plug securely.

(iv) Check the average height of ground water over the line. The test pressures required below shall be increased 0.433 psi for each foot of average water depth over the line.

(v) Add air slowly to the section of system being tested until the internal air pressure is raised to the test pressure specified below.

(vi) After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize, adding only the amount of air required to maintain pressure.

(vii) After the temperature stabilization period, disconnect the air supply.

(viii) Acceptance shall be based upon meeting or exceeding the requirements specified by Section 1140 of the Oregon Standard Specifications for Construction.

(ix) Record the diameter (inches), length (feet), end manhole number, time, pressure drop, and ground water level of the test on an inspection form. The recording form shall become a permanent record of the project.

(5) Deflection Test for Flexible Pipe. Sanitary sewers constructed of flexible pipe materials shall be deflection-tested. The test shall be conducted by pulling an approved mandrel through the completed pipeline. The diameter of the mandrel shall be 95 percent of the nominal pipe diameter. The mandrel shall be a rigid, nonadjustable, odd-numbering leg (nine legs minimum) mandrel having an effective length of not less than its nominal diameter.

Testing shall be conducted after the line has been completely balled and flushed out with water. The contractor will be required to locate and repair any section failing to pass the deflection test and to retest the section with air and deflection tests. Air test for storm lines will not be required.

(6) Video Inspection of Gravity Systems. All sanitary sewers shall be video-inspected and taped with an omni-view style camera prior to the city acceptance of the system(s). All pipes shall be thoroughly flushed immediately prior to the video inspection. A one-inch target ball shall be placed in format of the camera. A copy of the videotape and a written TV inspection report shall be supplied to the city. The videotape shall be recorded in color and on VHS format. Any and all problems, deficiencies, and imperfections discovered during the video inspection shall be noted on the videotape and the written report.

(7) Video Inspection for Warranty Acceptance. The city shall conduct video inspection of all sanitary sewer lines after one year of service to determine any defects in the system. Problems found shall be corrected/repaired by the contractor at the contractor/developer's expense. A new one-year warranty period will apply to all lines requiring repair.

If defects appear to be minor, an extended warranty period to be determined by the city will be required. (Ord. 2875 Appx. § 550.5, 2003)

18.24.190 Prohibited activities.

The discharge, placement, deposit, dumping, or otherwise contributing a solid or liquid material into the public sanitary sewer system, either directly or indirectly, which may obstruct flow or otherwise interfere with the operation or function of a public sanitary sewer facility is prohibited. This shall include, but is not limited to, placing of soil or rock without an approved fill permit, or the dumping of debris, rubbish, trash, or other waste material. (Ord. 2875 Appx. § 550.6, 2003)

Chapter 18.28
WATER SYSTEM

Sections:

Article I. Water System Design

Article II. Requirements for Water System Vault Installations – Vaults for Water Meters, PRVs, Fire Service and Domestic Backflow Devices

Article I. Water System Design

18.28.005 Water system design.

The following section is intended as a guide for the design, installation, and testing of water system improvements. An approved water system capable of supplying required fire flow for fire protection shall be provided to all premises upon which buildings are to be constructed. The required fire flow must be available with a minimum residual pressure of 20 pounds per square inch (psi). Questions on required fire flow may be referred to the fire marshal's office. The engineer may request that modifications be made for a specific project. In general, the following guidelines should be followed:

(1) All material shall be of new manufacture. No rebuilt, reconditioned, or used material will be allowed.

(2) Minimum size mains shall be six inches.

(3) Minimum pipe cover is 30 inches, measured from finish grade to the upper surface of the pipe barrel.

(4) Dead-end mains normally shall not be allowed. When they are permitted, a blow off assembly will be required.

(5) Main extensions shall be installed through new developments to allow a logical extension of the city water line grid and to allow future development of adjacent undeveloped or underdeveloped properties.

(6) Valves shall be located, whenever possible, at intersections. In general, sufficient valves should be provided to permit shutting down any section of the line, not exceeding 500 feet, with valve operations in not more than three locations.

(7) Valves shall be installed in clusters at pipeline intersections.

(8) Valves 10 inches and smaller shall be gate valves. All gate valves shall be resilient wedge valves conforming to AWWA C-505. The city accepts Clow R.W., Mueller, and Kennedy valves, or city-approved equal. Two-inch or smaller valves shall be as specified by public works or the city engineer.

(9) Valves 12 inches and greater shall be butterfly valves. All butterfly valves shall be rubber-seated valves conforming to AWWA C-504. The city accepts Mueller and Kennedy AWWA valves, or city-approved equal.

(10) Fire hydrants shall not be connected to mains less than six inches in diameter. As per the UFC, fire hydrants shall be located to allow a 36-inch clear space surrounding the hydrant. For example, streetlights, signposts, protective posts, or retaining walls shall be no closer than 36 inches from the nearest portion of a hydrant. There shall also be no obstructions directly in line with any of the ports of the hydrant.

(11) For required fire hydrant location and spacing, contact the fire marshal's office.

(12) All water system installation shall be designed to provide a pressure range of 50 psi to 90 psi at all times, including during peak demand.

(13) Pressure-reducing devices are to be approved on a per project basis to ensure compliance with the Uniform Plumbing Specialty Code.

(14) Water service size shall be one-inch type K copper.

(15) Water services are to be single runs from the main line to each meter.

(16) At high points in the water system, combination air and vacuum release valves (CARV) shall be installed as required by the city engineer. All Air-Vac, air evacuation, and vacuum prevention valves of sizes two inches and larger shall vent to the outside of the vault. If construction of the valve does not permit the venting of leakage to the outside of the vault, a screened drain to daylight of at least the supply line size must be provided at a level that will prevent cross-connection and/or backflow problems. This decision will be made by the city engineer prior to the plan approval. (Ord. 2875 Appx. § 610, 2003)

18.28.010 Materials.

(1) Water Pipes. Pipe shall be push-on joint ductile iron pipe. Fitting joints shall be mechanical joint ends. Push-on joint ductile iron pipe shall be cement-mortar lined and conform to ANSI/AWWA C104/A21.4 and ANSI A21.11, or city-approved equal. The type and thickness class shall be 50. The rubber ring gaskets shall conform to ANSI A21.11, be suitable for the specified pipe sizes and pressures, and shall be furnished with the pipe. A

nontoxic vegetable soap lubricant shall be supplied with the pipe in sufficient quantities for installing the pipe furnished.

(2) Pipe Fittings.

(a) Mechanical Joint Fittings. Mechanical joint ductile iron fittings shall conform to ANSI/AWWA C104/A21.4 and shall be of class at least equal to that of the adjacent pipe. Mortar lining for fittings shall be the same thickness specified for pipe.

(b) Flanged Ductile Iron Fittings. Flanged fittings shall conform to ANSI B16.12 and shall be faced and drilled 125-pound ANSI. The fittings shall be cement-mortar lined to same thickness specified for pipe, and shall meet ANSI/AWWA C110/A21.11 for all other aspects.

(c) Gaskets. Gasket material for flanged joints in ductile iron pipe shall be cloth-inserted sheet rubber gaskets conforming to AWWA/ANSI C207/B16.21, one-eighth inch thick. The gasket shall be full-cut, with holes to pass bolts. Gasket material shall be free from corrosive alkali or acid ingredients.

(d) Mechanical Couplings. Mechanical couplings, not a part of the pipe itself, shall be ductile iron couplings with rubber rings and ductile iron bolts and nuts. Couplings shall be Mueller, Kennedy, or as approved by the city engineer. (Ord. 2875 Appx. § 610.1, 2003)

18.28.020 Pipeline installation.

The work necessary to excavate, bed, and backfill water pipelines shall conform to the requirements of Articles VII and VIII of Chapter 18.08 SHMC, and the standard drawings of this title.

(1) Distributing Pipe. Distribute material on the job from the cars, trucks, or storage yard no faster than can be used to good advantage. In general, distribute no more than one week's supply of material in advance of the laying.

(2) Handling Material. Provide and use proper implements, tools, and facilities for the safe and proper prosecution of the work. Lower all pipe, fittings, and appurtenances into the trench, piece by piece, by means of a crane, slings, or other suitable tools or equipment, in such a manner as to prevent damage or contamination to the pipeline materials and protective coatings and linings. Do not drop or dump pipeline materials into the trench.

(3) Cleaning Pipe and Fittings. Remove all lumps, blisters, and excess coal-tar coating from the bell and spigot ends of each pipe. Wire brush the outside of the spigot and the inside of the bell and wipe clean, dry, and free from oil and grease before the pipe is laid. Wipe the ends of mechanical joint pipe and fittings and of rubber gasket joint pipe and fittings clean of all dirt, grease, and foreign matter. Check interior of pipe for obstructions or debris and, if found, remove from pipe.

(4) Placing of the Pipe in the Trench. Do not allow foreign material to enter the pipe while it is being placed in the trench. If because of trench configuration or shoring detail it is necessary to place pipe in such a manner that bedding material may enter pipe, then engineer shall require tight woven canvas boots be used and removed when placing pipe.

(5) Push-On Joint Pipe. After the first length of push-on joint pipe is installed in the trench, secure pipe in place with approved backfill material tamped under and along sides to prevent movement.

(6) Cutting Pipe. Cut pipe for inserting valves, fittings, or closure pieces in a neat and clean manner without damaging the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe.

Cut pipe with milling-type cutter or saw. Do not flame cut.

(7) Dressing Cut Ends. Dress cut ends of push-on joint pipe by beveling, as recommended by the manufacturer.

(8) Bell End to Face Direction of Laying. Unless otherwise directed, lay pipe with bell end facing in the direction of the laying. For lines on steep slopes, face bells upgrade only.

(9) Installation of mechanical joint pipe shall be as specified in AWWA C111, including bolt torque ranges. Mechanical joint gaskets shall be vulcanized rubber and no more than three years old.

(10) All material shall be of new manufacture. No rebuilt or reconditioned material will be allowed.

(11) Permissible Deflection of Joints. Wherever it is necessary to deflect pipe from a straight line either in a vertical or horizontal plane, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed the values in the following table:

MAXIMUM DEFLECTION PERMITTED* 18-Foot Length Pipe				
	MECHANICAL JOINT MAXIMUM DEFLECTION**		**PUSH-ON JOINT MAXIMUM DEFLECTION**	
DIAMETER INCHES	**ANGLE DEGREES AND MINUTES**	**DEFLECTION INCHES**	**ANGLE DEGREES**	**DEFLECTION INCHES**
4	8-18	31	5	18
6	7-07	27	5	18
8	5-21	20	5	18
10	5-21	20	5	18
12	5-21	20	5	18

* The maximum deflection shall be whichever is less, the table or that recommended by the pipe manufacturer.

** Safe deflection for 150 pounds pressure. For higher pressure, reduce tabulated deflection proportionally 10 percent for each 150 pounds added pressure.

(12) Alignment. Pipelines intended to be straight shall not deviate from the straight line at any joint in excess of one inch horizontally or vertically.

(13) Unsuitable Conditions for Laying Pipe. Do not lay pipe in water or when, in the opinion of the engineer, trench conditions are unsuitable.

(14) Joining Push-On Joint Pipe and Mechanical Joint Fittings. Lay and join pipe with push-on-type joints in strict accordance with the manufacturer's recommendations. Provide all special tools and devices, such as special jacks, chokers, and similar items required for the installation. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer, and no substitutes will be permitted under any circumstances.

Mechanical joint fittings vary slightly with different manufacturers. Install the particular fittings furnished in accordance with the manufacturer's recommendations. In general, the procedure shall be as hereinafter specified. Clean the ends of the fittings of all dirt, mud, and foreign matter by washing with water and scrubbing with a wire brush, after which, slip the gland and gasket on the plain end of the pipe. If necessary, lubricate the end of the pipe to facilitate sliding the gasket in place. Then guide the fitting onto the spigot of the pipe previously laid.

(15) Anchorage and Thrust Blocking. On all pipelines six inches in diameter or larger, securely anchor by suitable thrust blocking all tees, plugs, caps, and bends exceeding 11 and one-fourth degrees, and at other locations where unbalanced forces exist, as determined by the engineer.

Provide reaction or thrust blocking as directed. The concrete mix shall have a compressive strength of not less than 3,000 pounds per square inch. Place blocking between the undisturbed ground and the fitting to be anchored. The bearing surface shall be as shown on Standard Drawing 430. Place the blocking so that the pipe and fitting joints will be accessible to repairs.

(16) Additional Restraints. Meg-a-lugs are acceptable restraints under certain conditions as approved by the city engineer. Fire hydrants shall be installed with a fully restrained system using a combination of meg-a-lugs and field lock gaskets.

(17) Downtime Protection. When stopping work for the day, the contractor shall plug pipe ends to prevent rodents, other small animals, or debris from entering the pipe. Plugs used shall be tight-woven canvas, securely tied around outside of pipe end. (Ord. 2875 Appx. § 610.2, 2003)

18.28.030 Hydrostatic test of newly installed water line.

The contractor shall make pressure and leakage tests on all newly laid pipe. The contractor shall furnish all necessary equipment and material, make all taps in the pipe as required, and conduct the tests. The engineer will monitor the tests, record the results, and provide a copy of those results to the city. The engineer shall also indicate that the thrusting blocks have obtained the needed strength to resist the pressures obtained during the hydrostatic test.

The contractor shall furnish the following equipment and materials for the tests:

AMOUNT	DESCRIPTION
2	Approved graduated

	containers.
2	Pressure gauges (maximum two psi increments).
1	Hydraulic force pump approved by the engineer. Suitable hose and additional equipment as required.

Conduct the tests after the trench has been backfilled or partially backfilled. Where any section of pipe is provided with concrete reaction blocking, do not make the pressure tests until at least five days have elapsed after the concrete thrust blocking is installed. If high-early cement is used for the concrete thrust blocking, the time may be cut by two days or as permitted by the engineer.

Conduct pressure tests in the following manner, unless otherwise approved by the engineer. After the trench has been backfilled or partially backfilled as specified herein, fill the pipe with water, expelling all air during the filling. The minimum test pressure shall be 150 pounds per square inch (psi).

(1) Duration. The duration of each pressure test shall be 60 minutes, unless otherwise directed by the engineer.

(2) Procedure. Fill the pipe with water and apply the specified test pressure by pumping, if necessary. Then valve off the pump and hold the pressure in the line for the test period. At the end of the test period, operate the pump until the test pressure is again attained. The pump suction shall be in a clean barrel or similar device approved prior to filling with clean water, or metered so that the amount of water required to restore the test pressure may be measured accurately.

(3) Leakage. “Leakage” shall be defined as the quantity of water necessary to restore the specified test pressure at the end of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133{,}200}$$

In the above formula:

L = Allowable leakage, in gallons per hour.

S = Length of pipe to be tested, in feet.

D = Nominal diameter of pipe, in inches.

P = Average test pressure during the leakage test, in pounds per square inch.

(4) Correction of Excessive Leakage. Should any test of pipe laid disclose leakage greater than that allowed, locate and repair the defective joints or pipe until the leakage of a subsequent test is within the specified allowance.

(5) Isolation of Existing Systems Prior to Testing. Existing water pipelines shall be protected from contamination during the testing process for new construction. Use of special “blind flanges” will be necessary if the line being tested cannot be adequately separated from existing systems. The engineer shall submit shop drawings and proposed procedures to the city prior to installing any special testing device. (Ord. 2875 Appx. § 610.3, 2003)

18.28.040 Sterilization of newly installed water line.

Pipeline intended to carry potable water shall be sterilized before placing in service. Sterilizing procedures shall conform to AWWA C-651. (Ord. 2875 Appx. § 610.4, 2003)

18.28.050 Tapping.

All tapping of four-inch and larger public water pipe shall be performed using an all stainless steel tapping sleeve.

If a live tap is required in order to extend a line over 10 inches in diameter a gate valve will be allowed. All valves shall be installed with valve boxes and lids per city standards.

Prior to tapping, all items that may come in contact with the public water shall be swabbed with a 300-mg/L chlorine solution. The following items shall be the minimum items swabbed: tapping machine bit and cutter, tapping valve, tapping sleeve, and the exterior section of pipe to be tapped after the pipe has been cleaned with a wire brush (to be extended a minimum of six inches outside the tapping area). (Ord. 2875 Appx. § 610.5, 2003)

18.28.060 Cross-connection control and backflow assemblies.

When required, backflow prevention assemblies for protection of the public water system shall meet the requirements set forth in the current OAR 333-61-070 and the Uniform Plumbing Code.

The assembly shall be installed at the location normally established for water meters, usually at the property line. A water service shall not be turned on until all required backflow prevention assemblies are installed, inspected, tested, approved, and registered with the city of St. Helens. Costs of all installations, including all costs of inspection and testing fees, shall be the responsibility of the customer. The backflow prevention assembly will remain the property of the customer. The customer will be responsible for all maintenance and testing of the assembly and vault.

There are three types of backflow prevention assemblies which the city will allow as protection of the public water system. The Oregon Health Division, Drinking Water Section, provides a list of approved assemblies.

The type of backflow prevention assembly required is determined by the aforementioned rules and codes, based on the type of premises to which water service is being provided. The approved types of assemblies are listed below with some of the types of premises that must be protected by each type of assembly. However, these lists

are not complete, they are only intended to give you some basic guidelines.

(1) Reduced Pressure Backflow Assembly. An approved reduced pressure backflow assembly shall be installed on the service connection above ground to the following:

(a) Any tax lot that has an auxiliary water supply on or available to it. This will include any above or below ground water source. (The most commonly encountered type of auxiliary water supply is a private well.)

(b) Commercial buildings which are located within an industrial zone.

(c) Hospitals, medical centers, and clinics.

(d) Mortuaries and nursing homes.

(e) Gas stations.

(f) Sewage pumps and lift stations.

(g) Dry cleaners and commercial laundries.

(h) Any water system which has a pump to supplement pressure.

(2) Double Check Assembly or Double Detector Check Assembly. An approved double check assembly or an approved double detector check assembly shall be required (provided that all internal plumbing is installed and maintained in accordance with the Uniform Plumbing Code) on the service connection to premises where there is:

(a) Any fire system or water line to a private fire hydrant.

(b) Shopping centers or large retail stores.

(c) Restaurants or fast food establishments.

(d) Any water service which is larger than two inches in diameter.

(3) Installation and Testing. Backflow prevention assemblies shall be installed at the water service connection on the customer side of the meter. Backflow assemblies three-inch diameter and larger shall be installed in a vault in accordance with Article II of this chapter. Backflow prevention assemblies smaller than three inches shall be installed in a typical meter box, all-concrete construction, with a one-piece full traffic lid.

After installation, all backflow prevention assemblies that are installed must be tested by a state of Oregon certified tester. The results of the testing shall be received by the city prior to issuance of “final occupancy.” (Ord. 2875 Appx. § 610.6, 2003)

Article II. Requirements for Water System Vault Installations – Vaults for Water Meters, PRVs, Fire Service and Domestic Backflow Devices

18.28.070 General requirements.

To ensure proper operation and accessibility of all assemblies, the following requirements shall apply to installation of these assemblies, unless otherwise approved by the city of St. Helens:

(1) Provide approved ladder if the vault or chamber depth is five feet, zero inches or greater and entry is through the vault or chamber roof.

(2) Adequate drainage for the vault or chamber shall be provided. (Drainage to piped storm systems allowed with check valve.)

(3) Vault must be equipped with a moisture-proof light fixture if adequate lighting is not available.

(4) Vault is to have no other use, except for use described by these standards.

(5) Vault shall be installed on undisturbed base or compacted three-fourths to zero gravel base.

(6) No piping shall be installed in excess of three feet above the vault floor.

(7) Assembly is to be adequately supported from the floor, and suitably restrained from movement. Supports shall consist of steel supports or approved equal; no wood supports shall be used.

(8) All electrical wiring shall be inspected by the Columbia County electrical inspector (permit is required).

(9) The assembly shall be readily accessible with adequate room for maintenance.

(10) All new services are to be pressure-tested and disinfected by the contractor and proven to be bacteriologically safe from the existing main to the vault.

(11) The assembly shall be protected from freezing and other severe weather conditions. (Ord. 2875 Appx. § 620.1, 2003)

18.28.080 Water meter vaults.

The vault is to be provided and installed by the contractor, per Standard Drawing 405. (Ord. 2875 Appx. § 620.2, 2003)

Chapter 18.32
BICYCLE/PEDESTRIAN FACILITIES

Sections:

18.32.010 General requirements.

Safe, convenient, and properly designed facilities are essential to accommodate and encourage bicycle riding and pedestrian movements. The purpose of these standards is to establish design criteria for the development of public bikeway and pedestrian facility construction. The following are selected city policy statements concerning bikeway and pedestrian facilities:

(1) All bikeway and pedestrian facility development and construction provided and intended for public use shall conform to these standard specifications.

(2) Bicycle facilities shall be constructed along routes identified in the adopted comprehensive plan and all addendums thereof.

(3) For all biking and pedestrian facilities that fall within wetlands or stream corridors, the contractor and the city shall meet with the appropriate state and federal resource agencies to review and assess site-specific development compatibility issues prior to selecting any alternative for development.

(a) This review shall assess all potential and reasonable alternatives for these subject pathways in light of impacts to these affected areas.

(b) The review of the alternatives shall specifically consider the level to which impacts can (or cannot) be satisfactorily mitigated.

(4) Bikeways shall conform to the design guidelines set forth in the “Guide for Development of New Bicycle Facilities” as published by the American Association of State Highway and Transportation Officials (AASHTO) and adopted by the Oregon Transportation Commission.

(5) Bikeway signs shall be in conformance to the “Manual of Uniform Traffic Control Devices” (MUTCD), as supplemented and adopted by the Oregon Transportation Commission.

The minimum width of a one-directional bicycle path is five feet. The minimum width for two-way bikeways separated from the road is eight feet.

A two-foot-wide clear area is desirable to provide clearance from trees, poles, walls, fences, guardrails, or other lateral obstructions. A wider clear area on either side of the bicycle path can serve as a separate jogging path.

The vertical clearance to obstructions should be a minimum of 8.2 feet. (Ord. 3203 § 2 (Att. A), 2016; Ord. 2875 Appx. § 710, 2003)

18.32.020 On-street facilities.

(1) Drainage Grates. Drainage grate inlets and utility covers are potential problems to bicyclists. All grate covers shall be bicycle-friendly with a herringbone rib pattern as shown in the standard drawings. It is important that grates and utility covers be adjusted flush with the surface, including after a roadway is resurfaced.

(2) Traffic Control. The MUTCD and the Oregon Supplement should be consulted for guidance on signs and pavement markings. Where bicyclists are expected to use different patterns than motorists, direction signing should be used to advise bicyclists of this special routing.

(3) Bicycle Lanes. Bicycle lanes should always be one-way facilities and carry traffic in the same direction as adjacent motor vehicle traffic. Wrong-way riding is a major cause of bicycle accidents and violates the Rules of the Road stated in the Uniform Vehicle Code. Bicycle lanes on one-way streets should be on the right side of the street, except in areas where a bicycle lane on the left would decrease the number of conflicts.

Under ideal conditions, minimum bicycle lane width is five feet. However, certain edge conditions dictate additional desirable bicycle lane width. In the case where bike lanes are adjacent to monolithic curb and gutters, a minimum lane width of four feet should be maintained from the edge of the longitudinal joint between the pavement and the gutter.

Where parking is permitted adjacent to a bicycle lane it is preferable to designate separate parking and bicycle lanes. Where parking volume is substantial and/or turnover is high, an additional one or two feet of width is desirable for safe bicycle operation.

Bicyclists do not generally ride near a curb because of the possibility of debris, of hitting a pedal on the curb, of an uneven longitudinal joint, or of a steeper cross-slope. Bicycle lanes in this location should have a minimum width of five feet from the curb face. If the longitudinal joint between the gutter pan and the roadway surface is uneven and falls within five feet of the curb face, a minimum of four feet should be provided between the joint and the motor vehicle lanes.

Bicycle lanes on a highway without curb or gutter: Bicycle lanes should be located between the motor vehicle lanes and the roadway shoulders. Bicycle lanes may have a minimum width of four feet where the shoulder can provide additional maneuvering width. A width of five feet or greater is preferable; additional widths are desirable where substantial truck traffic is present, on grades, or where motor vehicle speeds exceed 35 miles per hour.

At intersections, bicyclists proceeding straight through and motorist turning right must cross paths. Striping and signing configurations which encourage these crossings in advance of the intersection, in a merging fashion, are generally preferable to those that force the crossing in the immediate vicinity of the intersection. To a lesser extent, the same is true for left-turning bicyclists; however, in this maneuver, Oregon's vehicle codes allow the bicyclist the option of making either a "vehicular style" left turn (where the bicyclist merges leftward to the same lane used for motor vehicle left turns) or a "pedestrian style" left turn (where the bicyclist proceeds straight through the intersection, turns left at the far side, then proceeds across the intersection again on the cross street). Where there are numerous left-turning bicyclists, a separate turning lane, as indicated in Part IX of the MUTCD, should be considered. General guidance for pavement marking of bicycle lanes is contained in the MUTCD.

Adequate pavement surface, bicycle-safe grate inlets, safe railroad crossings, and traffic signals responsive to bicycles should always be provided on roadways where bicycle lanes are being designated. Raised pavement markings and raised barriers can be dangerous obstacles for bicyclists and should not be used to delineate bicycle lanes.

(4) Widened Sidewalk. Widened sidewalks for bicycle use should only be considered where more preferred facilities, such as separated pathways, bike lanes, or shared roadway facilities are not possible due to street right-of-way constraints or within developed areas where independent rights-of-way cannot be provided. Widened sidewalks should be considered where pathways terminate at poor street crossing locations to lead bicyclists to safe crossing locations. Where widened sidewalks are used as a designated bikeway, they should be identifiable by striping, signing, or lighting – or a combination of these features. Ideally, widened sidewalks are used only where planter strips are also present. Widened sidewalks should not be encumbered by utility poles, hydrants, driveway aprons, street trees, signposts, and other obstacles which act to reduce the usable width of the facility. Alignment alternatives shall consider minimizing street and driveway crossings. Widened sidewalks should maintain a constant grade and minimize dips and rises associated with driveway crossings.

(5) Bikeway/Wheelchair Ramps. Intersection curb cuts or ramps, commonly referred to as wheelchair ramps, serve a multitude of user groups – these include, in addition to wheelchairs, bicyclists, the elderly (ranging from using walkers, canes, or adult tricycles), the visually impaired, or other handicapped persons. Due to this range of users and the variety of their needs when utilizing sidewalks, it is imperative that all intersections be equipped with an adequate system of ramps.

Design components for ramps must consider slope, width of the ramp, angle of approach, surface roughness, pavement appurtenances (i.e., catch basins, valve covers, etc.), and gutter smoothness. Curb ramps must meet the design criteria established by the Americans with Disabilities Act (ADA). (Ord. 2875 Appx. § 720, 2003)

Chapter 18.36
ENVIRONMENTAL PROTECTION, EROSION PREVENTION, AND SEDIMENT CONTROL RULES

Sections:

18.36.010 Introduction.

This chapter identifies requirements for erosion prevention and sediment control (EPSC). The provisions of this chapter are intended to prevent and reduce adverse impacts to the drainage system and water resources. In combination with other state, federal, and local laws and ordinances, these requirements are intended to protect the beneficial uses of waters within the greater St. Helens service district.

The city will follow the best management practices (BMPs) for EPSC as detailed in the “Erosion Prevention and Sediment Control Planning and Design Manual” issued through CleanWater Services of Washington County. (Ord. 2875 Appx. § 810, 2003)

18.36.020 General policy.

(1) Erosion Prevention and Sediment Control Policy. This chapter specifies the use of erosion prevention techniques and sediment control measures. The use of erosion prevention techniques shall be emphasized, rather than sediment control measures. This shall be especially important on larger construction sites immediately before and during the rainy season. Erosion prevention techniques are designed to protect soil particles from the force of rain and wind so that they will not erode. These techniques include, but are not limited to, such things as construction scheduling, ground cover, and matting. Sediment control measures are designed to capture soil particles after they have been dislodged and attempt to retain the soil particles on site. These measures include, but are not limited to, silt fences, sediment barriers, and settling basins. Both erosion prevention techniques and sediment control measures have appropriate uses; however, numerous case studies have shown that sediment control measures are less effective in preventing soil movement than erosion prevention techniques.

(2) Existing Vegetation. As far as practicable, the existing vegetation shall be protected and left in place, in accordance with the clearing limits on the approved erosion prevention and sediment control plans. Work areas shall be carefully located and marked to reduce potential damage. Trees shall not be used as anchors for stabilizing working equipment.

Where existing vegetation has been removed, or the original land contours disturbed, the site shall be revegetated, and the vegetation established, as soon as practicable. (Ord. 2875 Appx. § 820, 2003)

18.36.030 Enforcement.

Failure to comply with any provision of this chapter or with any term of an erosion prevention and sedimentation control plan shall be deemed a violation and subject to enforcement action pursuant to applicable city ordinances, resolutions and orders, including all implementing rules and regulations. (Ord. 2875 Appx. § 830, 2003)

18.36.040 Erosion prevention and sediment control.

(1) Application and Purpose.

(a) It is a city requirement to reduce the amount of sediment and other pollutants reaching the public storm and surface water system resulting from development, construction, grading, excavating, clearing, and any other activity which accelerates erosion, to the limits prescribed in this chapter.

(b) It is the policy of the city to require temporary and permanent measures for all construction projects to lessen the adverse effects of construction on the environment. All projects shall include properly installed, operated, and maintained temporary and permanent erosion control measures as provided in this section and/or in an approved plan, designed to protect the environment during the term of the project. Additionally, compliance with the measures prescribed in this chapter and/or in an approved plan do not alleviate or diminish the necessity to provide effective and comprehensive erosion prevention and sediment control. These erosion control rules apply to all properties within the city limits, regardless of whether that property is involved in a construction or development activity.

(c) Nothing in this section shall relieve any person of the obligation to comply with the regulations or permits of any federal, state, or local authority.

(2) Erosion Prohibited.

(a) Visible or measurable erosion which enters, or is likely to enter, the public or private storm system or other properties, is hereby prohibited, and is a violation of these rules. The owner of the property, permittee under a construction permit, together with any person or persons, including but not limited to the contractor or the engineer causing such erosion, shall be held responsible for violation of these rules.

(b) No person shall create physical erosion by dragging, dropping, tracking, or otherwise placing or depositing, or permitting to be deposited, mud, dirt, rock or other such debris upon a public street or into any part of the public storm system, or any part of a private storm system which drains or connects to the public storm system. Any such deposit of material shall be immediately removed using hand labor or mechanical means. No material shall be washed or flushed into any part of the storm system until all mechanical means to remove the debris have been exhausted and preventative sediment filtration is in place. The owner of the property, permittee, together with any person or persons, including but not limited to the contractor or the engineer who causes such erosion, shall be held responsible for violation of these rules.

(c) Excess materials and/or stockpiles shall be removed or tarped during wet weather conditions throughout the entire construction process, including home or building construction.

(3) Maintenance. The permittee shall maintain the facilities and techniques contained in the approved erosion prevention and sediment control plan so as to continue to be effective during the construction phase, post-construction phase, establishment of permanent vegetation, or any other permitted activity. If the facilities and techniques approved in an erosion prevention and sediment control plan are not effective or sufficient as determined by the city site inspection, the permittee shall submit a revised plan within three working days of written notification by the city. Upon approval of the revised plan by the city, the permittee shall immediately implement the additional facilities and techniques included in the revised plan. In cases where erosion is likely to occur, the city may require the applicant to install interim control measures prior to submittal of the revised erosion prevention and sediment control plan.

(4) Inspection.

(a) City Initial Inspection. On a site development or any other type of project, the erosion prevention and sediment control measures shall be installed prior to the start of any permitted activity.

(b) Owner Inspections and Inspection Logs. The owner shall be required to inspect erosion prevention and sediment control measures and provide information to the city. Inspections shall be completed on a daily basis or as required by the erosion prevention and sediment control plans. Logs are to be maintained on site and available to the city inspector(s) upon request.

(c) Final Inspection. A final erosion control inspection shall be required prior to the sale or conveyance to new property owner(s) or prior to the removal of erosion prevention and sediment control measures.

(5) Erosion Prevention Techniques and Methods. The engineer of record shall be held ultimately responsible for the design and functionality of the erosion prevention and sediment control plan. The following are minimum requirements of any plan submitted for city approval:

(a) A gravel construction entrance is required. If there is more than one vehicle access point, a gravel construction entrance shall be required at each entrance. The responsibility for the design and performance of the driveway remains with the permittee. Vehicles or equipment shall not enter a property adjacent to a stream, watercourse, storm facility, or wetlands unless adequate measures are installed to prevent physical erosion into the water or wetland.

(b) The use of straw bales as a sediment filter or barrier is not allowed.

(c) Plastic sheeting shall generally not be used as an erosion control measure for single-family house construction. Plastic sheeting may be used to protect small, highly erodible areas, or temporary stockpiles of material. If plastic sheeting is used, the path of concentrated flow from the plastic must be protected.

(d) The erosion prevention and sediment control measures shall remain in place and be maintained in good condition until all disturbed soil areas are permanently stabilized by installation and establishment of landscaping, grass, mulching, or otherwise covered and protected from erosion.

(e) On sites where vegetation and ground cover have been removed from more than one acre of land,

vegetative ground cover shall be planted on or before September 1st with the ground cover established by October 15th. As an alternative, if ground cover is not established by October 15th, the open areas shall be protected through the winter with straw mulch, erosion blankets, or other approved method(s).

(f) Sediment barriers are not required on a site:

(i) Where there are no concentrated flows and the slope being protected has a grade of less than two percent.

(ii) Where flows are collected through the use of temporary or permanent grading or other means such that the flows are routed to an approved settling pond, filtering system, or sediment barrier.

(iii) Where there are no concentrated flows, slopes are less than 10 percent, and where the runoff passes through a grassed area which is either owned by the applicant, or such use is allowed, by written agreement, by the owner of the grassed area. The grass area shall be at least equal in dimensions to the project area.

(iv) Where the surface is protected by approved ground cover or matting.

(6) Dust. Dust shall be minimized to the extent practicable, utilizing all measures necessary, including, but not limited to:

(a) Sprinkling haul and access roads and other exposed dust-producing areas with water.

(b) Applying city-approved dust palliatives on access and haul roads.

(c) Establishing temporary vegetative cover.

(d) Placing wood chips or other effective mulches on vehicle and pedestrian use areas.

(e) Maintaining the proper moisture condition on all fill surfaces.

(f) Prewetting cut and borrow area surfaces.

(g) Use of covered haul equipment. (Ord. 2875 Appx. § 840, 2003)

18.36.050 Contaminated soils.

In the event the construction process reveals soils contaminated with hazardous materials or chemicals, the contractor shall stop work immediately, ensure no contaminated material is hauled from the site, remove his work force from the immediate area of the contaminated area, leaving all machinery and equipment, and secure the area from access by the public until such time as a response team has relieved them of that responsibility. The contractor shall immediately notify an emergency response team, the city, and DEQ of the situation. (Ord. 2875 Appx. § 850, 2003)

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