City of Sherwood

COMMUNITY DEVELOPMENT DIVISION
ENGINEERING DEPARTMENT

City of Sherwood Oregon

Home of the Tualatin River National Wildlife Refuge

ENGINEERING DESIGN AND STANDARD DETAILS MANUAL

Originally Adopted: July 1, 2009
Current Revision Date: August 15, 2022

PREFACE

This document sets forth the technical engineering standards that implement the City's Site Development Ordinance. It is published under the authority of the *City of Sherwood Municipal Code*. Copies of the resolution and ordinances, as enacted, are available through the City Recorder's Office.

Under the authority of the *City of Sherwood Municipal Code*, the City Engineer or the Community Development Director may officially interpret the provisions of this document. These interpretations are intended to promote uniformity in the application of the City's Site Development Ordinance. The City Engineer's or Community Development Director's official interpretations of this document may be used as precedent in the processing of other projects, if the facts and circumstances are substantially the same. A copy of the interpretations is available from the City's Services Counter or on the City's web page.

Unless otherwise specified by the City Engineer or Community Development Director, at the time of an application for a Site Development Permit, the *Engineering Design and Standard Details Manual* is to be used in conjunction with the most recent edition of the following codes and standards, which are hereby adopted by this reference:

- Oregon Revised Statutes
- Oregon Administrative Rules
- The *City of Sherwood Municipal Code*, as amended
- The City of Sherwood Development Code, as amended
- The City of Sherwood Transportation System Plan, as amended
- Clean Water Services (CWS) *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, as amended
- Tualatin Valley Water District (TVWD) *Water System Standards*, as amended
- *Manual on Uniform Traffic Control Devices* (MUTCD) as modified by the Oregon Supplements to the MUTCD
- American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide (recommendations from which, as applied, interpreted, and/or modified by the City Engineer, are mandatory requirements in the City of Sherwood)
- American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications (recommendations from which, as applied, interpreted, and/or modified by the City Engineer, are mandatory requirements in the City of Sherwood)
- American Association of State Highway and Transportation Officials (AASHTO) Design of Highways & Streets (recommendations from which, as applied, interpreted, and/or modified by the City Engineer, are mandatory requirements in the City of Sherwood)
- American Water Works Association (AWWA) Standards, as amended
- *ODOT/APWA Oregon Standard Specifications for Construction* and *Oregon Standard Drawings* (hereinafter "ODOT/APWA Standards" when referenced jointly)
- ODOT *Bridge Design Manual* and accompanying *Standard Drawings*
- American with Disabilities Act of 1990, Public Law 101-336 and its implementing rules and regulations

- ODOT *Pavement Design Guide*
- Appendix Chapter 33 Excavating and Grading of the *International Building Code* as adopted by the State of Oregon with applicable local amendments

If in the course of design or construction, any of the above codes or standards should change, the City Engineer or Community Development Director may determine, based on his or her professional judgment whether the new or former standard shall be applicable.

Additional Notes:

If work is proposed in the right-of-way of another jurisdiction, the applicable standards from that jurisdiction will govern, including applicable permit requirements.

Work in or near wetlands, sensitive lands, floodplains, and floodways may require permits and/or approvals from Army Corps of Engineers (USACE), Clean Water Services (CWS), and/or the Oregon Division of State Lands (DSL).

Other permits and standards may be applicable to specific projects. The applicant bears the responsibility to obtain all necessary permits and to apply with all applicable standards related to any specific project.

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ABBREVIATIONS AND DEFINITIONS

As used herein, unless the context requires otherwise:

AASHTO	means the American Association of State Highway and Transportation Officials
AC	means Asphalt Concrete
ACI	means the American Concrete Institute
ADA	means the Americans with Disabilities Act of 1990
ADT	means Average Daily Traffic
ALTA Survey	means the American Land Title Association Survey
ANSI	means the American National Standards Institute
Applicant	means the owner, developer, or agent of either, who applies for a permit
APWA	means the American Public Works Association
ASCE	means the American Society of Civil Engineers
ASTM	means the American Society for Testing and Materials
AWWA	means the American Water Works Association
Bicycle	means a vehicle as defined in ORS 801.150
Bicycle Facilities	means improvements and provisions which accommodate or encourage bicycling, including: parking facilities, maps, signs, bike lanes, shared-use paths, and shared-use roadways designated for bike use
Bicycle Lane	means a bicycle lane as defined in ORS 801.155
Bikeway	means, in general, any path or roadway facility that is intended and suitable for bicycle use
CBE	means crushed base equivalent (CBE), which 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
CDF	means Controlled Density Fill (CDF). Note the term "CDF", as used in this manual, is not synonymous with the term "Controlled Low Strength Materials (CLSM), an ODOT specification term
City	means the City of Sherwood, as defined in the City of Sherwood Municipal Code
City Code	means the *City of Sherwood Municipal Code*, as amended
City Engineer	means the City employee delegated by the City Manager pursuant to Chapter 16
City Property	means the real property owned or controlled by the City, other than public right-of-way as those are defined herein, and all property held in a proprietary capacity by the City. City property includes, but is not limited to city parks, open spaces, trails, paths, access ways, parking lots, and public buildings and access easements, driveways, or access ways located upon such property. City-owned street lights and street light poles shall be considered to be City property
Clear Vision Zone	means a triangular-shaped area in the vicinity of an intersection that must be kept clear of visual obstructions in order to maintain safe operation of the intersection

Commercially Reasonable and Practical
: means reasonably available to the permitee's industry or trade in this locality as determined by the owner in consultation with the City Engineer

Corner Clearance
: means the distance between a driveway and the nearest crossroad intersection as measured from the face of curb of the intersecting street and the nearest edge of the driveway

CWS
: means Clean Water Services

DBH
: means diameter at breast height

DEQ
: means the State of Oregon, Department of Environmental Quality

Development Code
: means the *City of Sherwood Municipal Code*, Title 16

DHS
: Department of Human Services

Director
: means the Community Development Director

Disturb, or Disturbance of a Right-of-Way or Existing Improvements
: means anything that physically alters a public right-of-way aboveground or underground, hinders or prevents use of a right-of-way or any existing improvement therein by pedestrians or vehicles for its intended purpose. Also means the occupation of a public right-of-way for the purpose of construction within or outside the right-of-way

DSL
: means the State of Oregon, Division of State Lands

Emergency Work
: means construction work that responds to an unforeseen combination of circumstances or the resulting condition(s) that call for immediate action to restore service to utility customers, restore pedestrian and vehicular traffic flow, mitigate a safety hazard, or restore emergency access. Emergency work also includes restoration of non-emergency access to a property after a complaint about disruption of that access has been received by the City and the City has determined that the restoration of that access will not create a hardship for the public. Emergency work excludes expedited work being done solely for the design engineer's, contractor's, developer's, or owner's convenience, increased profitability on what would otherwise be non-emergency work, or for making up lost time on what would otherwise be non-emergency work where the lost time is due to inclement weather or other adverse conditions not resulting from any action or inaction of the City

Engineer
: means the owner's or developer's project engineer, design engineer, stamping engineer, or engineer of record

EPA
: means the Environmental Protection Agency

FEMA
: means the Federal Emergency Management Agency

GPS
: means global positioning system

GIS
: means Geographic Information System

Geotechnical Engineer
: means the owner's or developer's project consulting geotechnical engineer or engineering geologist

HMAC
: means Hot Mix Asphalt Concrete (HMAC), an ODOT material designation for roadway surfaces

I.E.
: means invert elevation

Improved Street or Improved Right-of-Way

	means as existing public street right-of-way or other public right-of-way that has been improved with curbs, curb and gutters, pavement, sidewalks, utility facilities, or other improvements
Inspecting Engineer	means the engineer or qualified individual designated by the owner or developer to inspect the construction of public improvements
IBC	means the International Building Code with Oregon amendments
Keyhole Cut	means a circular street cut
Long-term Bicycle Parking	means bicycle parking that accommodates persons who are expected to leave a bicycle parked longer than two hours
MUTCD	means the Manual on Uniform Traffic Control Devices as modified by the "Sign Policy and Guidelines for the State Highway System"
NEC	means the National Electric Code with Oregon Amendments
OAR	means the Oregon Administrative Rules
ODOT	means the Oregon Department of Transportation
ORS	means the Oregon Revised Statutes
OSHD	means the Oregon State Highway Division
OSHA	means the Occupation Safety and Health Administration
Parking lot	means paved surfaces on private property intended for movement and storage of four (4) or more vehicles
PCC	means Portland Cement Concrete (PCC), an ODOT material designation for roadway and sidewalk surfaces
Permittee	means any person performing or causing to be performed utility-related work within the right-of-way with the City's oral or written permission, including a person doing utility-related work within a public right-of-way for which no permit is required
Pothole	means an exploratory excavation to uncover an existing utility facility for the purpose of determining its precise location and elevation
Private Utility Company	means a privately-owned utility company and its agents
Private Utility Facility	means any physical structure or improvement necessary or desirable to deliver service to a private utility's customer
Public right-of-way	means but is not limited to, streets, roads, highways, bridges, viaducts, and other structures, alleys, sidewalks, public utility easements, and all other public ways or areas, including the subsurface under and air space over these areas under the jurisdiction of the City but excludes City property
Public Utility	means owned and operated by a unit of government or its agents
Public Utility Easement	means an easement conveyed, granted, or dedicated to the City or the public and acquired, established, dedicated, or devoted to utility purposes, whether designated as a public utility easement, utility easement, general utility easement, or similar term
Public Works Director	means the City employee delegated by the City Manager
Review Authority	means City staff and other outside jurisdictional agency staff with whom the City Engineer consults when a decision regarding a design standard

	modification is made. For the purposes of this manual, this staff includes the City Public Works Director, CWS, TVWD, TVFD and the City Traffic Engineer
Sanitary MP	means the City of Sherwood Sanitary System Master Plan, as amended
Shared-Use Path	means an off-street path that can be used and shared by several transportation modes, including bicycles, pedestrians, and other non-motorized modes. Shared-use paths accommodate two-way travel
Shared Roadway	means a street that is recommended for bicycle use but does not have a specific area designated for bicycle use within the right-of-way
Short-term Bicycle Parking	means bicycle parking that accommodates persons who are expected to depart within two hours
Sidewalk	means the area located along street, within the right-of-way or easement, separated by a curb, planter, or both from the street, and designated for use by pedestrians
Storm MP	means the City of Sherwood Storm System Master Plan, as amended
Street	means a public way, road, street, thoroughfare and place, including bridges, viaducts and other structures used or intended for use of the general public for pedestrians, vehicles or vehicular traffic
Street Cut	means any cut of any pavement, including street pavement, curb, curb and gutter, sidewalk, driveway, or other pavement in a street, alley, bikeway, or other improvement, in the public right-of-way, easement or property preparatory to excavating
Traffic Coefficient	means a number used in determining the structural section of a street
Trail	means a shared use path when used in the context of the *City of Sherwood Transportation System Plan*
TSP	means the *City of Sherwood Transportation System Plan*, as amended
Trench	means an excavation that is at least twice as long as it is wide
TVF&R	means Tualatin Valley Fire and Rescue
TVWD	means Tualatin Valley Water District
UFC	means the 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
Utility	means overhead or underground wires, pipelines, conduits, ducts, or other structures owned, operated, or maintained in or across a public right-of-way or easement. Also, it can mean a public or private utility agency
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 wetland boundaries shall be done by a qualified biologist or environmental engineer using applicable State and Federal guidelines
Window Cut	means an excavation that is less than twice as long as it is wide
WMP	means the City of Sherwood Water System Master Plan, as amended

CHAPTER I
GENERAL DESIGN REQUIREMENTS

110 REQUIREMENTS FOR PUBLIC IMPROVEMENTS

110.1 General

A. The purpose of this manual 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 residential, commercial, and/or industrial developments, 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. These improvements include, but are not limited to: street, bikeways, paths and street lighting, and any other infrastructure 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 manual and referenced in the *City Code*.

B. The standards contained in this manual are established by the City as rules governing the quality of workmanship to which designers, developers, contractors, and others shall adhere in preparing plans and specifications for public improvements, in preparing plans for private utility facilities in public rights-of-way, and in constructing said improvements and facilities, and to which City staff shall adhere in reviewing plans and inspecting said construction. Where minimum values are stated, greater values should be used whenever practical and consistent with State law; where maximum values are stated, lesser values, if acceptable to the City, 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 a municipal code standard that is directly related to the *Engineering Design and Standard Details Manual* standard, as allowed by law.

C. The City has adopted the APWA/ODOT "Oregon Standard Specifications for Construction", latest edition, and AASHTO "A Policy on Geometric Design of Highways and Streets", latest edition, for street design and construction standards. The City has also adopted CWS's design and construction standards and details for storm drainage and sanitary sewer systems. The standard specifications and standard details should be used in the design and construction of improvements intended for public use and maintenance in the City. Where the design standards, standard specifications, or standard details do not cover improvements, the City Engineer shall establish appropriate standards.

D. Upon consultation with the City Attorney, the City Engineer may make the following changes or corrections to the provisions of this manual when the changes or corrections do not alter the sense or meaning of its provisions:

1. Misspellings: Misspelled words may be corrected.
2. Histories: Erroneous legislative histories may be corrected.

3. Cross-references: Cross-references may be changed to agree with new, amended, reenacted, renumbered, relettered, reallocated or corrected ordinances or resolutions.
4. Capitalization: Improper capitalization may be corrected.
5. Headings: Descriptive headings of titles, chapters, sections or subsections may be edited or added to briefly and clearly indicate the subject matter of the title, chapter, section or subsection.
6. Renumbering, relettering: The numbering or lettering of sections of ordinances and resolutions, including duplicative numbering or lettering created by conflicting enactments, may be corrected or properly arranged.
7. Changed job titles, agency names: References in design standards to specific job titles or agency names that are changed without substantial affect on job or agency responsibilities may be changed to refer to the new job title or agency name.
8. Punctuation: Punctuation, including hyphenization, may be corrected.
9. Clerical Errors: Typographical or grammatical errors may be corrected.
10. Gender: Gender-specific terms that occur in an ordinance or resolution may be changed to gender-neutral terms and necessary grammatical changes to properly use the gender-neutral terms may be made.
11. Mandated changes: Additions, deletions, or revisions to City design standards may be made when required for City compliance with mandatory regional, state or federal regulations.
12. De Minimus changes: Additions, deletions, or revisions to City design standards may be made wherein the City Engineer estimates the addition, deletion, or revision will have no material effect on the cost of constructing the item affected by the changed design standard. A material effect on the cost of constructing an item affected by a changed design standard is an increase or decrease in the cost of constructing an item that is greater than five percent (5%) of the cost of constructing the item under existing design standards. If a change to a City design standard affects a specific project, the change, in addition to having no material effect on the cost of constructing the item affected by the changed design standard, must also have no material effect on the cost of a project. A material effect on the cost of a project is an increase or decrease in the cost of the project that is greater than one-tenth of one percent (0.1%) of the estimated total cost of the project at the time of issuance of the project's site development permit. If the City Engineer makes two or more de minimus changes to City design standards under the authority of this paragraph that affect a specific project, each de minimus change must meet the above requirements of this paragraph by (a) having no material effect on the cost of constructing the item affected by the changed design standard and (b) having no material effect on the cost of a project. In addition, the combined effect of the multiple changes to design standard relating to that specific project must not increase or decrease the total cost of a project by more than three-tenths of one percent (0.3%) of the estimated total cost of the project at the time of issuance of the project's site development permit. Consider details as a necessary change to standards.

E. Any change or correction made under the authority of this section may not affect the substantive meaning of any enactment of the City. Any erroneous or inadvertent substantive change must be construed as a clerical error and given no effect. If the City Engineer or City Attorney is in doubt whether a specific change or correction is authorized by this section, the City Engineer may not make the change or correction under authority of this section.

110.1.1 Commencement of Work

A. No work regulated by the City's codes shall commence prior to the approval of construction plans and issuance of the appropriate approval(s) by the City, CWS, TVFD, and TVWD, as applicable. A fully-executed compliance agreement and right-of-way (ROW) permit will be issued at the pre-construction conference (with the City Engineer or their representative, Owner, Engineer of Record, and General Contractor) only if the following steps have been completed satisfactorily:

1. Submittal of a Service Provider letter and/or system connection permits from CWS and Public Works, if applicable.
2. Completion of the Planning Department Design Review, and Planning Commission approval or other appropriate land use approval, including appeal periods, if applicable.
3. Performance of all applicable Conditions of Approval that must be met prior to issuance of the permit.
4. Approval of the construction plans by the City (completion of the City Engineering Plan Review and approval process), CWS, and Public Works.
5. Submittal of acceptable calculations and other supporting documents to the City Engineer, when such documents are requested.
6. Approval by the City of the detailed construction cost estimate.
7. Approval of the performance security by the City.
8. Completion and submittal of the signed compliance agreement
9. Approval of all legal documents, easements, and other documents in addition to showing improvements on construction plans as required by a decision-making authority's conditions of approval.
10. Payment of all fees necessary for the permits per the current adopted fee schedules.
11. Submittal of copies of permits from all other affected governmental jurisdictions.
12. Completion of all appeal periods (land use approval).

110.1.2 Required Approvals and Permits

A. Property owners, developers and others proposing to do any work on a site that will alter the site to a significant degree (as defined by the City), including those changes itemized in the Development Code (Title 16 of the *City Code*), will be required to obtain all applicable land use approvals, complete all of the aforementioned steps, and obtain a site development permit, and/or right-of-way permit as appropriate, before commencing work.

110.1.3 Design Requirements

A. Submitted designs shall be stamped by a registered Professional Engineer licensed to practice in the appropriate engineering discipline in the State of Oregon.

110.1.4 Accessibility

A. 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 to City standards at intersections with pedestrian crosswalks to allow a smooth transition between street and sidewalk elevations.

110.2 Precedence of Documents

A. 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: Land use decision-making authority's Conditions of Approval.

Third: City of Sherwood *Engineering Design and Standard Details Manual.*

Fourth: *City of Sherwood Municipal Code*.

Fifth: *Clean Water Services (CWS) Design and Construction Standards* for design and construction requirements for storm sewer, sanitary sewer.

Sixth: *Oregon Standard Specifications for Construction* (current edition) (ODOT, Oregon APWA) and any reference specifications and standard practices adopted by nationally recognized professional societies such as AASHTO, ASCE, AWWA, APWA, ACI and ASTM.

Seventh: *ODOT Pavement Design Guide.*

Eighth: *International Building Code* and City-issued building, mechanical, electrical, and plumbing permits.

Ninth: Americans with Disabilities Act of 1990.

Tenth: Plans and details prepared by the design engineer.

B. Supplemental written agreements, franchise agreements, and approved revisions to plans and specifications by the appropriate jurisdictions and conforming to local, state, and federal law 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.

110.3 Design Life of Improvements

A. The public water systems shall be designed to meet the minimum design life as defined in AWWA. The public sanitary and storm sewers shall be designed to meet the minimum design life as defined by CWS. All other public improvements as defined by the *City Code* Title 16*,* chapters on *Zoning and Community Development Code,* shall have a minimum design life of 20 years. It shall be the design engineer's responsibility to ensure that all improvements when built shall meet or exceed the requirements to achieve the above minimum design life.

110.4 Violations

A. Any act or omission as to work within a public right-of-way or on private property accessible to persons on public right-of-way in violation of the standards or requirements of this *Engineering Design and Standard Details Manual* is deemed a civil infraction and a public nuisance and is subject to the provisions and remedies of the following *City Code* chapters on:

- Powers of the City Council
- Right of Way Permits
- Sidewalk Construction and Repairs
- Storm Water
- Zoning and Community Development Code
- Street Construction Specifications
- Utility Facilities in Public Right of Way
- Erosion Prevention and Sediment Control
- Authority of Police and Fire Departments
- Authority of the City Engineer
- Public Improvements
- Water Systems
- Sanitary/Storm Systems

B. It is a defense to such action or proceeding that the responsible person was acting in accordance with specific provisions of a valid permit or franchise issued by a government agency with appropriate jurisdiction.

C. Notwithstanding the provisions of the *City Code* Title(s) *Health and Safety; Peace, Morals and Welfare; Vehicles and Traffic et seq*., the City Council declares that a violation of this *Engineering Design and Standard Details Manual* or all chapters within Title 16 – Zoning and Community Development Code of the *City Code* as to work within a public right-of-way or on private property accessible to persons on public right-of-way constitutes an immediate threat to the public health, safety, and welfare and may be summarily abated as per *City Code* Title(s) on *Public Peace, Morals and Welfare*. When a property is in violation of the standards or requirements of this *Engineering Design and Standard Details Manual* and the violation has not been corrected within the time allowed, the City shall issue no permits to that property until the violation is corrected, all costs incurred by the City in providing for abatement have been paid, and, if required, sufficient additional security for performance has been provided to the City.

110.5 Appeals

A. Unless otherwise governed by specific provision of the *City Code*, a person aggrieved by any action, decision, or interpretation of the City Engineer may appeal to the City Council in accordance with the *City Code* chapter on *Administrative Procedures*.

115 SUBMITTAL REQUIREMENTS

115.1 General

A. All submittals shall also include all materials and completed checklists required of the applicant by the *Municipal Code* and the development review process.

B. Submittal requirements consist of design plans, grading plans, erosion control plans, drainage calculations, and other information as required by each kind of City permit. Letters of transmittals shall accompany all submittals. The City Engineer may apply any of the standards in this Section 115 to any type of permit, to the extent consistent with Subsection 145.1.5 of this Manual.

C. The ODOT/APWA *Oregon Standard Specifications for Construction* and *Oregon Standard Drawings* (current edition) are hereby adopted and incorporated as part of this document by reference except as modified herein. When ODOT/APWA Oregon Standard Drawings are included in a design, they shall be reproduced in full, not merely referenced.

115.2 Design Plan Format

A. The plans shall be submitted on 22 x 34-inch (preferred as half size sets fit 11 x 17-inch sheets) or 24 x 36-inch sheets. All plan sheets shall be the same size unless otherwise approved in writing by the City Engineer.

B. Vicinity Map shall be located on the title sheet of all plans and shall be oriented with the north arrow pointing up.

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. The scale of the drawing shall be placed adjacent to the north arrow. If the drawing is schematic, no scale is required, except that the City Engineer may require that a schematic be redrawn to scale to clarify the drawings. Schematics that are not drawn to scale shall be labeled "Not to Scale" (see 115.2.E).

D. Site Development Plans shall be organized as follows:

1. Title sheet to include project name in large letters across the top of the page, vicinity map (showing the location of the project in respect to the nearest major street intersection), name, phone number, fax number and mailing address of developer/owner and engineering firm (including contacts), general notes, notice to excavators (one call utility locates), sheet legend, index, space for City approval stamp (3"x 5") in the lower right quadrant, and information on site impervious surface area for both pre and post developed condition. Standard General Notes shall be obtained from the City and shall be faithfully reproduced on the title sheet or separate general notes sheet. State the basis for horizontal and vertical control as required by the Washington County Surveyor's Office.

a. A note shall be placed on the title sheet that states: "This design complies with ORS 92.044(7) in that no utility infrastructure is designed to be within one (1) foot of a survey monument location shown on a subdivision or partition plat. No design modification nor final field location change shall be permitted if it would cause any utility infrastructure to be placed within a prohibited area."

2. Composite utility plan including existing public and private utilities, proposed public improvements, and existing and proposed easements.

3. Sanitary sewer and water plan and profile showing existing and finished contours at 1-foot intervals, and including all piping, structures and appurtenances as required by the City, CWS and TVWD.

4. Street and storm sewer plan and profile showing existing and finished contours at 1-foot intervals. Street lighting, signing and striping plans shall be on an additional sheet to provide clarity.

5. Grading and erosion control plan with maximum contour intervals of 1-foot. See Subsection 115.3 for additional requirements.

6. Approved preliminary subdivision or partition plat (if applicable).

7. Tree removal plan including all plan elements required by the Community Development Code.

8. Landscape plan including PUE's, other easements, sight vision zones, sidewalks, bikeways, entry monuments or signage, mail boxes, sound walls, retaining walls, irrigation, all underground utilities and street lighting in the project and along all existing and proposed street frontages (see Subsection 210.18).

9. All City standard details shall be full size, 75 percent or 66 percent of original size. All modifications to a City standard drawing must be clearly marked and initialed by the Engineer, along with the date of City Engineer approval for modifications. Pre-approval is required for modifications to the City standard details per Section 145 of this manual.

E. The vertical scale shall be 1 inch = 2 feet, 5 feet, or 10 feet and horizontal scale shall be 1 inch = 20 feet, 40 feet, or 50 feet horizontally for all drawings except as otherwise required or pre-approved by the City Engineer. Metric scales shall not be used without pre-approval by the City Engineer.

F. Full size drawing alpha-numeric characters and text symbols shall not be smaller than 0.10-inch high.

G. Permanent and temporary survey control points (benchmarks) and related data shall be shown on the plans in accordance with Subsection 135.5.

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 name of the project, the name and contact information for engineering firm and the owner, the sheet title, and the sheet number.

I. The seal of the registered Oregon Professional Engineer and/or Landscape Architect (landscape plans) responsible for preparation of the plans shall appear on each sheet.

J. The description and date of all revisions to the plans shall be shown on each affected sheet, and shall be approved and dated by the registered Professional Engineer(s) of record as evidenced by original signature(s) or initials(s).

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

L. The design engineer shall not rely solely on aerial photography, USGS Quadrangle Maps or other public topographic maps, or any combination thereof, for the topographic information used to prepare the design plans, but shall make an on-site evaluation and survey and shall use the survey data as the primary source of topographic information.

115.2.1 Plan View

A. Plan views shall show the following within the site and for a minimum distance of 200 feet outside the site unless specified otherwise:

1. Right-of-way, property, tract, and easement lines (existing and proposed) and their respective identifiers, and existing and proposed utility lines within them, all on the same drawing.

2. Subdivision name, lot numbers, street names, and other identifying labels. Subdivision and street names are subject to the approval of the City Planning Department, Fire Marshal's Office, and the County Surveyor.

3. Location and stationing of existing and proposed street center lines and curb faces.

4. Horizontal alignment and curve data of proposed street center lines and curb returns.

5. Existing aboveground and underground utility facilities and vegetation within the construction limits. For additional information required on site grading plan, see Section 115.3.

6. Location of existing buildings, wells, septic tanks, drain fields, fuel tanks, and any other buried structures. An ALTA survey shall be required for at least 100 feet surrounding any of the above items to remain. Historical buildings shall be identified as such on the drawings.

7. All other affected, adjacent and existing off-site areas and features that are within a distance of 200 feet outside the site boundary, including but limited to:

   a) Off-site features that, in the design engineer's best judgment at the time of the topographic survey, will be within the zone within which grading, excavations, fills trenching, stockpiling, pile driving, blasting, ground shaking from construction vehicles or equipment, structural loading, or invasive construction activities will potentially compromise the structural stability or condition of off-site features, including but not limited to cultivated vegetation, landscaping and trees, buildings, fences, decks, walls, slabs, and pavements.

   b) Trees of any type defined by the following:

      i. Trees that are 6-inches DBH or more and whose root zones extend into the site (using the trees' canopies as the delineators of their root zones) or are off-site within 10 feet or less of the site boundary.

      ii. Other areas and features designated by the City Engineer for evaluation.

   c) Tax lot information including: tax lot number, lot area (acres and square feet), and township, range and section numbers.

8. Location, stationing, and size of all proposed 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.

9. Match lines with stationing and sheet number references.

10. Provisions for cross-connection control must be clearly shown on the plans, including any retro-fitting of existing water service connections and existing auxiliary water supplies, conversions to the Public Works Department 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.

11. Street stationing to be noted at a minimum of 100 foot intervals and "tic" marks at 50 foot intervals.

12. Top of curb elevations along curb returns at quarter-deltas, and at 100 foot stations.

13. Location of the low points of street grades and curb returns and locations of catch basins and street inlets on sidewalk ramp detail drawings.

14. Sidewalk dimensions and locations and sidewalk ramp dimensions and elevations. This shall include spot elevation at breaks in grade on ramps, locations by street stationing of transitions in locations or width, and dimensions and street stationing for driveways.

15. Detailed information for each curb return and curb ramp including: spot elevations at all break points, and lengths and grades between each spot elevation.

16. Crown lines along portions of streets transitional from one typical section to another.

17. Center line stationing of all intersecting streets.

18. Location and description of existing survey monuments, including but not limited to section corners, quarter corners, donation land claim corners, and Washington County bench marks.

19. Location of proposed street intersection monument boxes and other required surveying monuments shown on the plat.

20. FEMA designated 100-year flood plains and flood ways, or areas of flooding during a 100-year storm event, wetland buffers and natural resource areas.

21. Existing and proposed wetland areas, wetland mitigation areas, and storm water quality undisturbed corridors (buffer strips), drainage ways and swales.

22. Legend.

23. Developer's/Applicant's name, address, phone number, fax number, and e-mail address.

24. Any additional information that the City, CWS, TVWD, or TVFD deem necessary.

115.2.2 Profile View

Profile Views shall show the following:

1. Stationing, elevations, vertical curve data (including curve k factors), and slopes for center of streets or top of curbs. For off-set 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.

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

3. 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.

4. Vertical alignment of streets, including existing center line monumentation.

5. The top of curb for all cul-de-sacs, eyebrows and curb returns, reflecting quarter deltas, low and high points, vertical curve data, and extending 50 feet beyond the PC and PT.

6. All proposed drainage facilities, all invert and top elevations, slopes, materials, bedding, and backfill.

7. 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). Base flood elevations shall be shown on the profile, if applicable.

8. Profiles for ditch and creek flowlines 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.

9. Profiles shall designate structures using alpha or numeric labels on profiles to correspond to plan view notation. Sanitary and storm sewer manhole designations shall conform to Washington County CWS system identification requirements.

10. Profiles for existing and proposed storm, sanitary, and water mains.

11. All existing and proposed sanitary, water, storm lines and other utilities crossing the profile.

115.3 Site Grading Plan

A. The City Code Title on Zoning and Community Development Code requires a site grading plan as part of the application for any development that involves the excavation or fill of greater than 1000 cubic yards of material. Grading contours, existing and proposed, shall be at no more than 1-foot intervals, and shall extend off-site a minimum of 200 feet. The grading plan shall be prepared from recent ground surveys and include all existing and proposed surface drainage conveyances, storm drainage collection structures, and all storm drainage outfalls. The extent and limits of all proposed grading must be shown as a clearly delineated boundary including but not limited to all catch points, grading limits for all excavations and fills, along with the limits of the proposed vegetation stripping. All slopes steeper than 20 percent shall be shown as a ratio of horizontal run to vertical rise. The grading plan shall also note source of information, date of field work, and location of original document.

B. All soil disturbing construction activity must adhere to the requirements of the OAR 340-41-455 and CWS's *"Erosion Prevention and Sediment Control Planning and Design Manual"*. A detailed erosion control plan shall be shown in conjunction with the site grading plan.

C. The beginning of an excavation or the toe of a filled slope shall be located one half its vertical height but not less than 2 feet, nor more than 20 feet from an adjoining property line. A request for waiver of this requirement may be made to the City Engineer by presentation of detailed plans along with appropriate substantiating documents in the form of written opinion of a soils engineer or engineering geologist to support justification for the waiver.

D. On grading and erosion sediment control plans, the contours shall extend off-site a minimum of 200 feet. Grading and erosion control plans shall note the source of the topographical information, date of fieldwork, and location of original document. Grading and erosion control plans shall show the limits of construction, the on-site topography, and any required tree preservation fencing, and the adjacent off-site topography within 200 feet of the site boundary along its entire length. The design engineer shall not rely solely on aerial photography, USGS Quadrangle Maps, or other public topographic maps, or any combination thereof, as the sole source of the off-site topographic information, but shall make an off-site evaluation and survey, and shall use the survey data as the primary source of the off-site topographic information. The grading and erosion control plans shall include all affected adjacent existing off-site areas and topographic features specified in the *City Code* that are within a distance of 200 feet outside the site boundary.

E. All grading plans for those areas where the grading will be within 10 feet or less of the property line, shall include cross sections every 50 feet (minimum of three required) showing any proposed changes in grade exceeding 2 feet vertical, new structures, and new utility facilities. These cross sections shall extend a minimum of 50 feet each side of the property line and shall show not only the proposed grades, structures and utility facilities, but also the existing grades, structures, and utility facilities.

F. The erosion control plan shall show both the construction erosion control plan and also the post-construction erosion control plan. Where possible, the construction and post-construction grading and erosion control plans shall each be entirely on separate sheets. The erosion and sediment control plans shall include all construction drawings information required by DEQ NPDES 1200-C permits.

G. Unless inconsistent with the other provisions of this manual, the *City Code*, or the *International Building Code Appendix* (latest edition) relating to excavation and grading, are hereby incorporated in their entirety herein by this reference, except that the term "City Engineer" shall be substituted for the term "Building Official or designee" as found therein. The provisions so incorporated shall apply to excavation and grading, whether authorized by a Site Development Permit or a building permit.

H. Grading plans shall be designed in conformance with the Zoning and Community Development Code Title requirements of the *City Code*.

115.4 Storm Drainage Calculations and Design Requirements

A. Drainage calculations shall be presented in a clear, concise, and complete manner, and shall comply with the requirements of CWS (storm design manual).

B. Storm drainage system design shall conform to the requirements of CWS.

C. For detailed information on storm drainage calculations, contact CWS (503-681-3600).

D. Additional requirements shall be as follows:

1. Collector streets shall have curb inlets located such that no inlet grate is located within a bicycle lane.

2. Roof and foundations drain laterals shall not be installed to discharge through curblines. All roof and foundation drain lines shall be connected to storm drain laterals tied to storm drain mainlines.

115.5 Other Requirements

A. Other information to be shown on the construction drawings or the other submittals includes:

1. The design assumptions for each street (e.g., traffic coefficient, R-value).
2. The design elements such as:

   a. Street classification.
   b. Design speed.
   c. Superelevation.
   d. Average Daily Traffic (ADT) or Design Hourly Volume (DHV).

B. Structural construction plans and the necessary calculations for proposed structures (e.g., walls, box culverts, bridges shall be submitted. All drawings, specifications, and calculations shall conform to the requirements and conventions of the AASHTO, ODOT, IBC, and ACI codes, specifications, and guidelines incorporated into this manual by reference.

C. Any additional information that the City Engineer deems necessary to review the plans and assure compliance with design standards.

115.6 Details Sheet(s)

A. One or more detail sheets shall be provided as part of the site development permit plans. The detail sheet(s) shall show all City standard details and special details necessary for the project.

B. All City standard details shall be full size, 75 percent, or 66 percent of original size. Any modifications to a City standard detail or special detail must be clearly marked and initialed by the Design Engineer along with the date of approval for the modification. Pre-approval for modifications to City standard details and special details is required; see Sections 145 of this manual.

115.7 Review Procedure

A. Six full size sets and one half-size set of the completed plans or as directed by the City Engineer, shall be submitted for initial review. Supporting information and documentation, such as drainage and water system calculations, traffic analysis report, fire flow tests and worksheets, and a geotech report shall also be submitted.

B. Upon completion of the detailed review by the City, the City will return one set of plans with "red line" comments. More than one review may be required. All successive sets of "red line" plans shall be returned to the City with the corresponding revised plan set. After the Design Engineer has completed all revisions, six full size sets of final revised drawings shall be submitted to the City for signoff. Additionally, three half-size sets of final revised drawings, and a CD containing scanned electronic files of the final approved and signed drawings (in PDF format), shall be submitted to the City prior to commencing construction.

C. Plan review priority will be given to plans submitted for final review over plans submitted for initial or intermediate review. The final plan review and approval is valid for 1 year from the date of plan review fee payment. If a site development permit is not issued within the one-year time frame from the date of application, the permit application is void and a new application, fees, and plan review will be required regardless of previous plan approval(s). If a site development permit is obtained, approval is valid for 2 years from the date of the issuance of the site development permit. Extensions to the permit can be made by requesting a 1 year extension using a City provided form. Contact the City Engineer for a copy of the form. Approval of a permit extension may require a new plan review if conditions have changed since the plans were approved.

115.8 As-Built Drawings

A. Following completion of construction and prior to final inspection of a completed project, the Design Engineer shall submit one complete set of as-built (record) drawings for City review.

B. As-built drawings shall contain and reflect any and all design modifications incorporated into the completed project, and any and all revisions to the previously approved construction plans. Design Engineer shall make/verify additional comments/changes and provide a clean as-built.

C. As-built drawings shall be accompanied by a completion certification letter from the Design Engineer. The completion certification letter shall accompany the as-built drawings and shall include a statement that the site and adjacent properties (as affected by work performed under the City permit) are stable with respect to settlement and subsidence, shallow and deep sloughing of cut and fills slopes, and the as-built improvements (public improvements, site grading and paving) meet or exceed the minimum design life as defined in Subsection 110.3.

Advisory Note: A building permit release letter will not be issued until the as-built drawings have been submitted to the City and approved with or without condition.

D. If specialists were required in the design of the project (soils engineer, surveyor, arborist, wetland scientist, engineering hydrologist, etc.) then a completion certification from those individuals shall be required related 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 installed, based on CWS's *"Erosion Prevention and Sediment Control Planning and Design Manual"*.

E. All erosion control measures are to be installed and in good working order.

F. Each sheet of the as-constructed drawings shall be stamped "As-Built" and dated.

G. Each as-built drawing shall be signed by the Design Engineer. This signature constitutes a certification that the public improvements, grading, and other elements of the engineering drawings have been completed in accordance with the City and CWS approved plans and to the standards of the City and CWS.

H. As-builts shall be black India ink on originals or reverse reading, fixed-line, photographically reproduced 4-mil mylar, 22"x 34" or 24"x 36" in size and to engineering scale. Each sheet included in the construction plan set shall be as-built. Sepia mylars or vellums will not be accepted. A CD shall also be submitted containing electronic files in PDF format of the scanned signed as-built drawings. A CD shall also be submitted containing the AutoCAD and PDF drawing(s) survey and as-built design base files. In addition, the following requirements apply:

1. All public utility easements (PUE) must be shown on the as-built drawings.
2. Distance between utility mainlines in shared trenches must be shown.
3. Type of mainline, size, and material must be shown.
4. All laterals must be shown with descriptions of their lengths, plan stationing, sizes, materials, and invert elevation at the right of way line.
5. If one or more sidewalks are constructed, the appropriate City standard drawing for each type of public sidewalk must be included.
6. Clear vision zones shall be shown for each intersection on the as-built drawings.
7. Permanent and temporary survey control points and related data must be shown in accordance with Subsection 135.5.

120 STREET DESIGN

120.1 Functional Classification

A. The functional classification of existing and proposed roads is established by the current edition of the City's TSP. Streets shall be designed to the minimum standards of this manual.

120.2 Access

A. Access to public streets shall conform to the requirements of the TSP and the *City 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 Washington County or State of Oregon jurisdiction must be formally approved by those entities at the applicant's initiative and expense.

120.3 Width

A. The City's TSP and street standard detail drawings (shown in Chapter VIII of this manual) provide the minimum road width standards by functional classification of the road. It should be noted that public utility easements beyond the right-of-way are typically required.

B. In locations where traffic signals exist or are anticipated for installation within 5 years, provide additional right-of-way to accommodate signal poles, underground conduits and cabinets clear of the sidewalk.

120.4 Number of Lanes

A. The City's TSP identifies the number of lanes for each class of street. Additional lanes may be required at intersections in excess of the minimum street standards shown in the City's TSP and standard detail drawings. Additional right-of-way may be needed in addition to that shown in the minimum street standard detail drawings to accommodate the increased number of lanes at intersections.

120.5 Design Speed

A. Design speed shall be as follows:

Arterials	35 miles per hour
Collectors	35 miles per hour
Residentials	25 miles per hour
Locals	25 miles per hour

1. Design speed is the maximum safe speed that can be maintained over a specified section of roadway when traffic, weather, and other conditions are so favorable that the design features of the roadway govern. The City Engineer may approve a lower alternative design speed where it can be shown that the 85th percentile speed of traffic will be lower than the design speed standard during all hours. The design speed is the minimum speed that shall be used in design of safe road geometry. The design speed shall not prohibit the use of traffic calming features or signing, where appropriate, to encourage lower traffic speeds.

125 EASEMENTS

A. The minimum public utility easements for residential subdivisions shall be an 8 foot wide PUE along all front lot lines, as shown on the local street section standards in the TSP.

B. Public water on private property shall be centered within a permanent utility easement granted to the City, with a minimum width of 15 feet along its entire length. Public storm and sanitary sewer located on private property shall be centered within a permanent utility easement granted to the City, with a minimum width of 15 feet along its entire length. The actual required width of an easement may be greater than the minimum required as the required easement width shall be measured from the outside edge of the pipe zone to the catch point where a theoretical line at a 1:1 slope would daylight. No encroachment within a public utility easement of any private utility facility or structure shall be allowed without prior itemized approval by the City or CWS. Under no circumstances shall a private utility facility or structure be placed within the pipe zone, regardless of whether the City or CWS approval of their location has been given. Private utilities that cross public utility easements shall do so as close as practical to right angles with the public utility. The City cannot approve any encroachment location, which would adversely affect the ability of the City or CWS to maintain utilities. Such easements, when directed by the City or

CWS, shall be accompanied by temporary construction easements granted to the City or CWS of adequate width to allow construction and maintenance of water, sanitary, and storm drainage facilities. The developers engineer or surveyor shall provide the City or CWS with documents necessary to record the easements. The width of combination easements is evaluated at the site development review stage on a case-by-case basis. It is within the authority of CWS and 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.

C. 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/or City Attorney.

D. All recording costs for easements created by private development shall be borne by the developer unless specifically agreed to by the City.

E. All easements shall be shown and noted on the construction plans wherever applicable.

130 ACCURACY OF CITY MAPS AND PLANS NOT GUARANTEED

A. 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.

135 SURVEYING

135.1 General

A. This document, Section 105 of the APWA specifications, and ORS 209.140-150 define the requirements for protection of existing survey monuments during any construction and the setting of new survey monuments following construction of new streets, sanitary or storm systems, waterlines and related works.

B. The City's Community Development Director may not approve or sign any partition, subdivision or planned unit development (PUD) plat until the necessary public infrastructure to serve the proposed and affected existing lots has been installed and has been guaranteed by a security acceptable to the City Attorney. It is within the authority of the City's Community Development Director to refuse to approve or sign any partition, subdivision or PUD 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, width and legal description of proposed rights of way and easements are adequate for the completed infrastructure.

135.2 Existing Survey Monuments

A. 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.

B. As per ORS 209.150, no person shall willfully or negligently remove, destroy, 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.

135.3 New Survey Monuments

A. New 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. Center line monuments, as shown on the Standard Details shall be installed in new streets as required by Oregon Revised Statues. Public street intersections or private street/public street intersections shall be monumented in a City Standard monument box.

B. 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 County or City.

C. If a monument box is used, whether required by the City or not, it shall not be less than 8-inches inside diameter and shall be approved by the City Engineer before its installation.

D. Other center line 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.

E. To prevent new underground utilities from interfering with the installation of centerline monuments, underground public utility lines shall not run down the centerline of any new street except with the express approval of the City Engineer. If a new street centerline monument conflicts with a utility lid, valve box, or manhole casting, four equal offset monuments are required to monument the true centerline point or intersection location. In the case of an intersection monument, four monument boxes are required. The project surveyor shall officially document the offset monuments by filing the appropriate application (new survey, revised plat, or post-monumentation survey) with the Washington County Surveyor.

135.4 Global Positioning System (GPS) Specifications

A. The following are the minimum requirements for work done utilizing Global Positioning System (GPS) surveying techniques:

1. All work shall conform to all pertinent statutes, including but not limited to ORS 93.320, ORS 93.330 (1) (c) and ORS 93.350.

2. All work shall be performed under the direct supervision of a surveyor registered to practice in the State of Oregon.

3. Horizontal control shall be Oregon State Plane Coordinates, Oregon North Zone, NAD 83 (98), expressed in International (SI) Feet. Vertical control shall be NGVD 29 (1988), expressed in U.S. Survey Feet.

4. If the use of GPS techniques is to provide control for photogrammetry or projects like those referenced in Section 135.5 of this manual, then durable and permanent monuments shall be found (such as existing Public Lands Monuments, monuments set in Subdivision Plats or surveys of record, etc.) or monuments shall be set for this purpose. Durable and permanent monuments would be considered to be brass caps in concrete or monuments similar to those depicted in standard detail drawing numbers RD-31A through RD-31C. Masonry nails (such as "PK" or MAG" nails, with or without washers or shiners) shall not be considered durable and permanent.

5. If the project will involve the recording of a survey or plat, the document of record shall include descriptions of those monuments found or set and the positional values (see Section 135.5) established on them. Information shall be provided as to methodology, control held, equipment, statistical assessments of the quality of the work, relative positional accuracies, etc. This information shall be included in the recorded documents in a manner acceptable to the Washington County Surveyor.

6. If the project does not involve recording a survey, then the same information shall be delivered to the City Engineer in both digital and paper formats.

135.5 Coordinate System and Control for Plats, Base Mapping, Monumentation, and As-Built Drawings

A. The purpose of the following requirements is to promote a method by which CWS and the City's utility as-builts and other facilities maps can be combined efficiently and accurately into a cohesive whole and to provide for a simple and straightforward (mapping accuracy or better) insertion into the City's, CWS's and various GIS and facilities map systems, thereby increasing their utility to the end user. When all the mapping components relate to each other in a common system at a known accuracy, the usefulness and value of the information will be significantly increased for both the public and private engineering and surveying communities.

B. All plats, engineering designs, as-builts and other mapping shall be based on the following control to the extent commercially reasonable, practicable and consistent with applicable law:

1. Horizontal control shall be Oregon State Plane Coordinates, Oregon North Zone, NAD 83, expressed in International (S1) Feet. Vertical control shall be per ODOT and Washington County Land Surveyor's Office, currently NGVD 29, expressed in U.S.

Survey Feet. Project control may be established using traditional surveying methods and/or Global Positioning System (GPS) techniques. The State of Oregon Department of Transportation (ODOT), Washington County DOT, or the City of Sherwood control monuments shall be used as the basis of all work. When establishing horizontal control, preference shall be given to using the monuments and values determined in Washington County Geodetic Survey of record or other geodetic surveys recorded by the County. Preferred control shall include all Washington County GPS base stations. All digital maps and data files shall be on the same coordinate system.

C. Engineers and surveyors providing services for land division projects with public improvements and preferring not to work in state plane coordinates may be exempted by the City Engineer upon written request submitted to the City Engineer by the engineer or surveyor. Requests for exemptions require approval by the City Engineer. The procedures for processing such requests shall be the same as specified in Section 145, except in order for the City Engineer to grant an exemption, one of the following criteria must be met:

1. Topography, right-of-way, other geographical conditions or other impediments impose an undue economic hardship on the applicant and thereby make compliance with this standard commercially unreasonable, or

2. Use of an equivalent alternative coordinate system that can accomplish the same design purpose and will not materially compromise any of the following; public safety or accessibility, design accuracy, the City's permitting processes or plan review processes, City inspections, the cost-effective use of a public right-of-way, the safe use of a public right-of-way and public infrastructure, the cost-effective construction, operation, maintenance and repair of the City's infrastructure, or public use of as-built drawings, or

3. The project site area, including adjacent right-of-way that will be disturbed, is less than 0.25 acres, or the project's total cost is estimated by the City Engineer to be less than $10,000.

D. The City Engineer shall notify the applicant of the decision within 14 calendar days of receiving the applicant's request. The applicant may appeal the City Engineer's decision to the City Community Development Director.

E. Exempted projects and other development proposals may be based on coordinates representing ground distances. However, the initial positional ("starting coordinates") and azimuth control shall be based on State Plane Coordinates, while using a local reduction or scale factor to produce project coordinates that represent a local datum plane (LDP).

F. All plans, as-builts, surveys, plats or maps based on a coordinate system shall contain a statement that clearly describes the coordinate system used, whether the distances are ground or grid, and the control held. When a local datum plane is used for the project, a statement similar to the following shall be included in the notes: "Coordinates shown are referenced to a local datum plane (LDP) and represent measured ground distances. To convert to the Oregon Coordinate System of 1983, North Zone, multiply the LDP coordinate by an average combined grid factor of 0.nnnnnnnn". Additionally, when a geodetic azimuth is not used as the basis of

bearings, and/or the starting coordinates are not State Plane Coordinates, the notes shall contain all information required to transform, rotate and scale the project to NAD 83 coordinates.

140 STRUCTURES

140.1 General

A. Structures in public rights-of-way and easements shall be designed and constructed in accordance with the requirements of the *Oregon Standards for Construction,* the Structural Design Section of ODOT and ACI, and in cases of conflict or disagreement, the most stringent requirements among them, as determined by the City Engineer, shall take precedence. These requirements among them, as determined by the City Engineer, shall take precedence. These requirements are contained in ODOT's *Manual of Field Test Procedures, Bridge Design Manual and Accompanying Standard Drawings*, *Oregon Standard Specifications for Construction and Oregon Standard Drawings*, AASHTO's *Roadside Design Guide*, and AASHTO's *Load and Resistance Factor Design* (LRFD) *Bridge Specifications*, which are incorporated herein by reference. The *International Building Code* (IBC) or the ACI codes, specifications, and guidelines, at the discretion of the City Engineer, shall govern those structures and characteristics of structures not addressed by the aforementioned standards.

140.2 Design Criteria

A. The project construction drawings and Special Provisions shall state the ODOT requirements and design criteria for bridges and other structures that apply to the project. Concrete for roadway structures and roadside structures shall be Class 5000-3/4" concrete.

140.3 Retaining Walls

A. The Engineer shall obtain and submit to the City letters from affected private utility companies approving the location of the retaining walls within the PUE.

B. Roadside retaining walls shall be designed to avoid conflicts with the maintenance of utilities and their appurtenances. Utility lines shall not be located under retaining wall tie-backs. Water lines within 10 feet or less of the tie-backs shall be encased in approved steel pipe casings.

C. Retaining walls located within public easements shall be designed for maintenance traffic loads in the easement at the top of the wall. The entity responsible for maintenance of each retaining wall and its subsurface drain piping shall be noted on subdivision plats and on the construction plans for the walls.

D. A building permit may be required by the IBC depending upon the height of the wall.

E. Retaining walls requiring a building permit under the IBC shall be designed by a professional civil or structural engineer in accordance with the IBC design criteria.

F. Retaining walls within the right-of-way or PUE with an exposed face of greater than 18-inches shall be provided with an approved handrail or fence on top conforming to the applicable APWA/ODOT standards as determined by the City Engineer.

G. Retaining walls located at street intersections shall conform to the Clear Vision Area requirements of this manual.

140.4 Testing of PCC Concrete for Structures

A. PCC concrete for structures shall be tested and evaluated as specified in Subsections 210.2.4. of this manual.

145 DESIGN MODIFICATIONS

145.1 Modification Process for Specific Projects

A. The City Engineer may make project-specific revisions to City standard details and other City-promulgated technical engineering standards for use in any project, whether privately or publicly funded, pursuant to the following procedures:

145.1.1 Requested Modification

A. A design engineer may request that the City Engineer modify a City standard relating to, and only for, a specific project by submitting a written request for such modification to the City Engineer. The written request shall state desired modification, the reason for the requested modification, the conditions in Subsection 145.1.5 that apply to the desired modification, and a comparison between the City's existing standard and the proposed modification.

145.1.2 Review of Requested Modification

A. A design engineer may request that the City Engineer modify a City standard relating to, and only for, a specific project. The City Engineer shall:

1. Approve the request as proposed,
2. Approve the request with condition, or
3. Deny the request

B. The City Engineer's decision shall be documented in writing. A denial of a request shall be accompanied with brief explanation of the reason for the denial.

C. The City Engineer may consult with others to assist in determination of whether to approve, approve with conditions, or deny a request to modify a City standard for a specific project.

D. Whether a request for modification is approved as proposed or with conditions, the approval is for project-specific use and shall not constitute a precedent or general modification of the City standard.

145.1.3 Appeal of Requested Modification

A. Pursuant to the *City Code*, a design engineer may appeal the City Engineer's decision regarding a request to modify a City standard to the City Council.

145.1.4 City-Initiated Modifications

A. During design or construction of a project, the City Engineer may:

1. Modify and add features and requirements details applicable to a specific City-approved Capital Improvement Project (CIP). Such addition or modification is for project-specific use and shall not constitute a precedent or general modification of the city standard.

2. Modify and add design features and requirements applicable to a specific project other than a City-approved CIP. Such addition or modification is for project-specific use and shall not constitute a precedent or general modification of the City standard.

3. Modify and add design features and requirements for pedestrian safety-related standards imposed in connection with work in a public right-of-way or easement. Such addition or modification is for project-specific use and shall not constitute a precedent or general modification of the City standard.

B. Pursuant to the *City Code*, a design engineer may appeal to the City Council the City Engineer's decision to modify a City standard under authority of this subsection.

145.1.5 Modification Criteria

A. The City Engineer may make project-specific modifications and amendments to an existing City standard when any one of the following conditions is met:

1. The standard is inapplicable to a particular situation.

2. Topography, right-of-way, or other geographical conditions or impediments impose an undue economic hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety, increase short/long term maintenance or cause future increased costs or accessibility.

3. A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

4. The modification or amendment will be De Minimus, per Subsection 110.1.D.12. of this manual.

5. For utility facilities, exemption criteria are listed in Section 210.18.Q of this manual.

150 CONSTRUCTION

150.1 Work Hours

A. The work hours for all items covered by the site development permit shall be from 7:00 am to 6:00 pm Monday through Saturday, and 8:00 pm to 5:00 pm Sundays. However, site clearing, earth moving, installation or construction of underground utilities, paving, framing or pouring of streets, sidewalks, or foundation or structural framing are entirely prohibited on Sundays. The City Manager, Public Works Director or the Community Development Director may allow longer or require shorter work hours depending on site-specific condition. The City shall observe the following holidays: New Years Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veteran's, Day, Thanksgiving Day, day after Thanksgiving, and Christmas Day. These holidays shall be considered as Sundays or other legal holidays. Should City Hall be closed by order of the City Manager due to inclement weather, natural disaster, or national security, those days shall also be considered as Sundays, or other legal holidays.

B. In order to perform work covered by the site development permit outside the above days and hours, or on holidays, the owner, developer, or Engineer of Record (or contractor if accompanied by a written authorization by Developer) shall request in writing (on forms supplied by the City Engineer) at least two full business days prior to the requested day. This request shall indicate what special circumstance requires the work to be performed outside the standard work week as described above. To be valid, the City Manager or the Community Development Director's approval must be in writing and this approval shall be posted at the site on the approved work day, and a copy of it shall be submitted with the Engineer of Record's daily report to the City Engineer. Requests made with less than two days notice may not be approved if the City Manager or Community Development Director is not available.

150.2 Inspections

A. 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. 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 pre-construction conference. All inspection costs, including required testing, shall be paid by the owner or developer.

B. 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. Non-compliance with the requirements of this paragraph shall be cause for removal of the offender from the project.

C. The City's policies on inspection services for privately funded site improvements (such as clearing, stripping, grading, non-structural drainage improvements, and private utility work) and privately funded public infrastructure improvements are as follows:

    1. City Inspection Services: It is the policy of the City of Sherwood to provide only "spot check" (secondary) inspection services, which are listed in Subsection 150.2.1 below.

2. Privately-funded Inspection Services: Privately funded inspection services required by the City are the primary inspection services on a project, are more comprehensive and intensive than City inspection services, and are the responsibility of the owner, developer, and designated inspecting engineer. The privately funded inspection services required by the City are listed in section 150.2.2 below.

3. Limitations of City Inspection Services: The City's inspection services are only secondary inspection services and do not relieve the owner, developer, design engineer, or contractor of responsibility for proper construction and compliance with the requirements of this manual, nor do City inspection services constitute approval of any modification to the approved construction plans.

4. All public water system improvements shall be inspected by the Public Works Department.

150.2.1 City Inspector's Activities

A. Inspecting services provided by the City shall include:

1. Acting as a liaison between the designated inspecting Engineer, that Engineer's inspector, 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 designated inspecting Engineer or that Engineer's inspector to stop the work. 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. Maintain a project 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 of Record. It shall be at the discretion of the City Engineer's inspector as to whether the revision is significant enough to warrant review by the City Engineer. If so, the Engineer of Record shall submit two full-size copies of the proposed plan revision(s); no work affected by the revision shall be done until approval by the City Engineer.

150.2.2 Inspecting Engineer's Activities

A. 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) Site development permit number.

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

   d) Weather conditions, including temperature.

   e) A description of construction activities.

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

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

   h) Perceived problems and action taken.

   i) Final and staged inspections.

   j) Record all material and soil types and conditions.

   k) Test results.

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

   m) General remarks including citizen contact or complaints.

   n) Maintain ESC daily log book and ESC inspection reports.

B. 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.

1. Obtain and use a copy of City-approved construction plans, specifications, and a copy of this manual.

2. Review and approve all pipe, aggregate, portland cement concrete, asphaltic concrete, and other materials to ensure their compliance with City standard.

3. Approve all plan or specification changes in writing and obtain City approval (see City Inspectors Activities above). All changes to the approved plans or specifications must be

with the approval of the City prior to the commencement of work affected by the revision.

4. Monitor construction activities to ensure end products meet City specifications.

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

6. For street construction, perform the following inspections and record date of each:
   a) Curbs, curb-and-gutter, catch basins and street inlets, and sidewalk ramps are built to line and grade and meet all ADA requirements.
   b) Subgrade meets grade and compaction specifications.
   c) Base rock meets depth/thickness, gradation, grade, and compaction specifications.
   d) Leveling course meets depth/thickness, gradation, grade, surface condition, and compaction specifications.
   e) Wearing course meets material, depth/thickness, gradation, grade, surface condition, and compaction specifications.
   f) Provide the City with 24-hour notice of impending inspections.

8. Prior to requesting any building occupancy on commercial, multi-family, and/or other projects with concurrent site development and building permits, the engineer shall certify that all necessary public improvements have been installed and accepted in compliance with the City approved site development permit construction plans. 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 but not limited to payment of all fees, recording of all public utility easements, and obtaining maintenance bonds).

150.3 Substitution of Products; "Approved Equal" Designation

A. It is not the intent of this manual to exclude other equipment or materials of equal value, quality, or merit. Whenever a product, manufacturer's name or brand, or a specific item is designated, it shall be understood that the words "or approved equal" follow such designation, 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 or Public Works Director. A contractor shall not use an alternative product without prior written approval of the City Engineer. A request to designate an alternative product as an "approved equal" shall be processed as if the alternative product were a modification under Section 145 of this manual.

150.4 Safety Requirements

A. 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.

B. The City Project Inspector's role is not one of supervision, safety management or enforcement of OSHA's rules, but is one of observation only. The City Project Inspector may point out possible OSHA violations to the contractor, but must rely on OSHA for determining and enforcing violations. Nothing contained in this section or elsewhere in this manual 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 these rules.

C. City may stop work if a serious safety issue is not addressed or corrected.

150.5 Scheduling

A. Sequence of operations:

1. The Contractor shall plan construction work and execute his operation with a minimum of interference with the operation of the existing public facilities. It may be necessary to perform 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.

2. 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.

B. Progress of Construction:

1. Construction shall proceed in a systematic manner that will result in a minimum of inconvenience to the public.

2. In the case of a pipe laying job for sanitary sewer, storm drainage, water, and broadband utility improvements the trenching equipment at one time shall not 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. Steel traffic plates shall be on-site before work begins for street cuts on all arterial and collector streets. Steel plates may be required on some local streets, to allow the street to be reopened in the event that unforeseen circumstances prevent the work from being completed in a reasonable time. Under no circumstances shall any street be left in an "open" situation when the contractor leaves the site.

150.6 Preservation, Restoration, and Cleanup

A. Preservation and Restoration During Construction and During the Maintenance Period.

1. Unless the permit or construction documents expressly indicate any of the following site features and amenities are to be disturbed during construction, the owner, developer, and contractor shall preserve, protect, and maintain them during construction and during the maintenance period:

   a) Existing drainage patterns and features;

   b) Existing vegetation, shrubs, trees, and landscaping;

   c) Public property, improvements, operations, and services;

   d) Private property and improvements;

   e) Access to public and private property and the enjoyment of same;

   f) Private utility facilities and services; and,

   g) Other site features and amenities that the construction documents expressly indicate are to be preserved, protected, or maintained.

2. An unauthorized disturbance of existing drainage features or drainage features access shall be restored as soon as possible but in no case shall such a disturbance be left unrestored for more than 1 hour, unless an extension is granted by the City and/or CWS.

3. Disruptions of utility services shall be restored as soon as possible but in no case shall a disruption last for more than 1 hour, except that private utility service(s) shall be restored by the utility(ies) at its/their convenience. The Contractor shall provide temporary utility services during the period of disruption of utility services that is beyond 2 hours after the disruption first occurs, until the service is fully restored, unless an extension is granted by the utility providers.

4. An unauthorized disturbance of any other feature or amenity listed in Subsection 150.6.A.1 shall be restored as soon as possible, but in no case shall such a disturbance be left unrestored for more than 8 hours unless more immediate restoration is required by the City or an extension is granted by the City.

5. A request for an extension of a deadline specified in Subsection 150.5 shall be submitted in writing to the City Engineer, who shall make one of the following decisions:

   - Approve the request as submitted.
   - Approve the request with changes.
   - Deny the request.

   a) Denial of a request shall be accompanied by an explanation of the decision to deny.

   b) The City Engineer may only deny a request for extension on one or more of the following grounds:

      1. The disturbed feature, property, improvement, disrupted service, operation, or amenity cannot reasonably be restored within the time period due to:

i. The extent of the disturbance or disruption; or,

ii. The length of time required to obtain labor, materials, or equipment needed for the restoration, or,

iii. Inclement weather, wet ground conditions, or other substantial geotechnical or environmental impediments.

2. Temporary restoration by alternate means can be performed to the satisfaction of the City within a reasonable time period as determined by the City.

3. The extension would cause an undue hardship on the public or affected utility customers.

4. That it is not in the public interest or convenience to approve the extension.

6. Ongoing site maintenance and cleanup during construction. 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.

7. Stockpiling of construction materials shall not be allowed on existing sidewalks or the driving surface of existing streets. Stockpiling of excavated material or the storage of construction material or equipment, shall not be permitted within the dripline of existing trees to be preserved. Existing trees to be preserved shall be protected by tree protection fencing installed per the Zoning and Community Development Code of the *City Code*.

8. 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 water, sanitary sewer, and storm drainage facilities, irrigation and house drainage pipe, drain tiles, sewer lateral, and culverts shall be repaired and restored per Subsection 150.6.A.

9. All areas of existing public rights-of-way and easements disturbed by the Contractor's operations shall be restored to their original condition or better. Areas of the ground on private property that are disturbed by the contractors operations shall be graded and restored to original condition or better and in a manner satisfactory to the property owner. The Contractor shall obtain a written release from such property owners for any claims of injury or property damage, and shall submit a copy of the written release to the City prior to final acceptance of the work by the City.

10. Street Cleanup. The contractor shall clean up all spilled dirt, mud, rock, gravel, and other foreign material by the contractor's construction operations in public rights-of-way and

easements from all streets and roads at the conclusion of each day's operation, or as directed by the City. Cleaning shall be by grader and front-end loader, supplemented by power brushing and hand labor, unless otherwise approved by the City. Sawcut slurry shall be removed from the street and disposed of in an approved manner. The contractor shall follow the City's and CWS's erosion control procedures.

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

12. Dust Prevention. During all phases of 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. Water used for dust control is subject to water use restriction.

13. Stream and Creek Crossings. The Contractor shall comply with all provisions of the permits required by the Oregon Department of Environmental Quality (DEQ), Oregon Division of State Lands (DSL) and/or the U.S. Army Corps of Engineers (USACE). 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. The Engineer shall notify the City in writing forty-eight (48) hours prior to commencing any in-stream work.

150.7 Interferences and Obstructions

A. 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 forty-eight (48) hours notice shall be given to all utility operators that may be affected by the construction operation. Should a utility service be interrupted due to the construction operation, the proper authority shall be notified immediately and the utility service should be restored per Subsection 150.6.A.

B. 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, mail boxes, driveways, shrubs, and lawns. If any of the above have been disturbed, they shall be restored to as near their original condition as possible in a manner satisfactory to the property owner.

150.8 Railroad Crossings

A. Crossings of railroad rights-of-way shall be done in a manner that 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.

B. 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.

150.9 Materials

A. To ensure the proper, safe operation and required service life of all public improvements, all construction material and components used in the construction of public improvements shall be new manufacture, unless specified by the City Engineer. No re-built, reconditioned, refurbished or used materials or components will be allowed.

B. Products Altered During Installation, After Installation or During Disassembly. When a product, including but not limited to, a pre-cast manholes section or other manhole component, street inlet grate or frame, pipe, or other construction material or product is disturbed or disassembled after installation and is found to have been altered physically in any way since its manufacture, it shall be discarded and replaced with all new construction material or component.

C. City Engineer and CWS's Approval of Re-Use. With the City Engineer's and CWS's prior approval, used manhole components, street inlet components, or other structurally sound components of utility structures that have not been altered physically in any way may be reused.

155 ENVIRONMENTAL PROTECTION DURING CONSTRUCTION

155.1 General Policy and Requirements

A. It is the policy of the City of Sherwood to require temporary and permanent measures for all construction projects to lessen the adverse effects of construction on the environment:

1. The Contractor shall comply with all necessary DEQ, DSL, and USACE requirements and permits, including but not limited to obtaining an NPDES 1200-C permit.

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

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

4. 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.

B. For any project having slopes equal or greater than ten 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, and when reviewed and approved by the City, shall constitute a part of the site development permit.

C. The environmental protection 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, and other actions affecting environmental quality, and shall address the criteria of Subsection 155.3 through Subsection 155.9.

D. 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.

155.2 Air Pollution Control

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

1. Sprinkling haul and access roads and other exposed dust-producing areas with water. Obtaining water from a hydrant will require specific authorization from the applicable water jurisdiction.

2. Applying DEQ approved dust palliatives on access and haul roads.

3. Establishing temporary vegetative cover.

4. Placing wood chips or other effective mulches on vehicle and pedestrian use areas.

5. Maintaining the proper moisture condition on all fill surfaces.

6. Pre-wetting cut and borrow area surfaces.

7. Use of covered haul equipment.

B. Fumes, smoke, and odors.

1. 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.

2. Open burning shall not be permitted unless approved by DEQ and TVF&R and the City's Community Development Director.

3. A permit for outdoor burning may be obtained at TVF&R. Open burning shall conform to the requirements of this permit.

4. 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.

5. 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.

6. 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.

7. 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.

155.3 Erosion Control

A. Erosion and sediment control design and construction methodologies must meet or exceed the applicable standards of the City, CWS and DEQ.

B. The Engineer shall obtain and submit to the City, DEQ NPDES 1200-C permit approvals for the project, if applicable.

C. The City of Sherwood has adopted CWS's *Erosion Prevention and Sediment Control Planning and Design Manual* (latest version) as the standard for erosion and sediment control design and construction requirements.

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

E. 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.

F. The concentration of runoff on or across slopes shall be prevented.

G. 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.

H. 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.

I. Areas for borrow pits and waste disposal shall be selected with full consideration of erosion control needs during and after borrow operations.

155.4 Maintaining Surface Water quality

A. Construction between stream banks shall be performed strictly under the requirements of DSL, DEQ, and/or USACE approved permits.

B. Pollutants such as sawcut slurries, concrete slurries, excavated and quarried materials, fuels, lubricants, bitumens, raw sewage, and other harmful materials shall not 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 activities shall not be directly discharged into the public storm drainage system. Activities and construction practices must comply with all Oregon Department of Environmental Quality (DEQ) rules and regulations regarding discharge of chlorinated water onto the ground, to any public or private storm drainage system, and/or that may reach a stream or creek. Contact DEQ for the current State statute and administrative rules.

C. The use of water from a stream or impoundments will not be allowed.

155.5 Fish and Wildlife Habitat Preservation

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

B. The requirements of local, state, and federal agencies charged with wildlife and fish protection shall be adhered to by the entire construction work force.

C. Construction projects shall be designed and construction activities shall occur so as to avoid harm to fish habitat or wildlife species listed as endangered or threatened by a federal agency.

155.6 Control of Construction Noise Levels

A. Construction noise shall be minimized by the use of proper engine mufflers, protective sound reducing enclosures, other sound barriers, or other approved measures.

B. Noise control shall comply with ORS 467, OAR 340-035, City of Sherwood Ordinance 2001-1116 all other applicable laws and the following construction noise abatement measures:

1. Perform no construction within 1,000 feet of an occupied dwelling unit or other noise-sensitive properties on Saturdays, Sundays, legal holidays, or between the hours of 6:00 p.m. and 7:00 a.m. on other days, without the approval of the City Manager, Public Works Director or Community Development Director.

2. Use equipment with sound control devices no less effective than those provided on the original equipment. Equipment with unmuffled or inadequately muffled exhaust is prohibited.

3. Use equipment complying with pertinent equipment noise standards of the Environmental Protection Agency (EPA).

4. Perform no pile driving or blasting operations within 3,000 feet of an occupied dwelling unit on Saturdays, Sundays, legal holidays, or between the hours of 6:00 p.m. and 7:00 a.m. on other days, without the approval of the City Manager, Public Works Director or Community Development Director.

5. Mitigate the noise from rock crushing or screening operations performed within 3,000 feet of any occupied dwelling or other noise sensitive properties by placing material stockpiles between the operation and the affect dwelling, or by other means approved by the City Engineer.

C. Should a specific noise impact complaint occur during the construction of the project, one or more of the following noise mitigation measures may be required at the contractor's expense, as directed by the City Engineer:

1. Locate stationary construction equipment as far from nearby noise sensitive properties as is feasible.

2. Shut off idling equipment.

3. Reschedule construction operations to avoid period of noise annoyance identified in the complaint.

4. Notify nearby residents, in writing, whenever extremely noisy work will be occurring.

5. Install temporary or portable acoustic barriers around stationary construction noise sources.

6. Operate electric-powered equipment using line voltage power or solar power.

7. Provide temporary living accommodations away from construction to residents with special needs, including but not limited to people with hearing disorders, nervous or sleep disorders, people recovering from trauma or surgery, people who work at home nights or sleep days, occupants of medical facilities, people under extreme stress, or people with other extraordinary physical, mental, emotional, or employment needs.

8. Direct workmen to refrain from shouting, using offensive language, and making unnecessary noise. (Source: *Oregon Standard Specifications for Construction 2002*, Oregon Department of Transportation and Oregon Chapter of the APWA).

D. Exceptions

Noise caused by emergency work, by the ordinary and accepted use of emergency equipment, vehicles, and apparatus, regardless of whether such work is performed by public or private agency or upon public or private property is exempted from the requirements of this subsection.

E. Variances

Extended hours, weekend, and holiday work requests shall be processed per Subsection 155.1 requirements. Approval may be withdrawn if the extended working hours generate noise complaints from neighboring residents or merchants.

155.7 Natural Vegetation

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

B. 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.

C. Planting of natural vegetation and maintenance of planting shall be in the prescribed manner set out in the CWS design manual, and Chapter 16 titles of the *City Code* on *Landscaping* and *Street Construction Specifications*.

155.8 Historical and Archaeological Areas

A. Whenever Native American 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 liaison officer for the State Historic Preservation office, Archeological Sites Unit. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work.

B. Under the natural Historical Preservation Act, state liaison officers shall be notified when historical or archaeological items are unearthed.

C. The *Oregon Criminal Code* prohibits disinterment of a corpse without permission of the appropriate authorities.

155.9 Use of Pesticides

A. The use of pesticides including insecticides, larvicides, herbicides, defoliants, and soil sterilants 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.

B. 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 groundwater, surface water, or the air does not occur. In no case shall toxic materials be dumped into drainage ways.

C. 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.

160 REVISIONS

A. Any revisions to the City approved plans must be submitted by the engineer of record to the City Engineer for approval prior to construction. The submittal shall include two copies of the 22”x 34” or 24”x 36” revised pages, three copies of the 11”x 17” 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 reviews will be conducted in the order that the revisions are received, on a first come, first served basis.

CHAPTER II
STREETS

210 STREET DESIGN

210.1 Subgrade Elevation

A. Soil testing to obtain the strength of the soil is required for all roads and streets in order to analyze and design the structural section. Soil tests are needed on undisturbed samples of the subgrade materials that are expected to be within 3 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.

B. 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.

210.2 Structural Section

A. The following materials may be used for street structural section construction. The structural section type shall not change between major intersections; only one type of section shall be used. At transitions between asphaltic and Portland Cement Concrete structural sections, appropriate Portland Cement Concrete impact slabs shall be designed and installed. The following special pavements types and/or conditions are to be approved by the City Engineer:

1. Full depth asphaltic concrete.

2. Asphaltic concrete with crushed rock base or treated bases.

3. Portland cement concrete with cushion course of crushed rock or on a base of crushed rock or treated base.

210.2.1 Aggregate Base

A. All aggregate shall meet Oregon State Highway Division (OSHD) specifications for base rock.

B. The minimum aggregate section, unless otherwise approved by the City Engineer, shall be as follows:

Functional Classification	Leveling Course Thickness	Base Rock Course Thickness (in)	Total Rock Section Thickness (in)
Local	2”	8”	10”
Neighborhood	2”	8”	10”
Commercial	3”	9"	12”
Collector	3”	9”	12”
Arterial	4”	10”	14”

C. During compaction, materials shall be maintained within 2 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.

210.2.2 Hot Mix Asphalt Concrete Pavement Design and Construction

A. Hot mix asphalt concrete (HMAC) pavement shall be designed and constructed per the ODOT/APWA standards, except as modified herein.

B. The base course of asphalt concrete streets shall be ¾-inch Dense Graded HMAC, and the wearing course shall be ½-inch Dense Graded HMAC placed in 2 lifts. HMAC thickness shall meet the following thickness requirements for each street functional classification, unless approved otherwise by the City Engineer.

Functional Classification	Second Lift HMAC Thickness (in)	First Lift HMAC Thickness (in)	Total HMAC Section Thickness (in)
Local	2”	2”	4”
Neighborhood	2”	2”	4”
Commercial	2”	2”	4”
Collector	2”	3”	5”
Arterial	2”	3”	5”

C. For asphalt thickness greater than 4-inches, no single lift shall be applied in excess of 2½-inches.

D. The mix design level of the HMAC shall be based on the traffic loads as follows:

1. Level 1 – For use on residential driveways, shared-use paths, hiking trails, and other recreational uses.

2. Level 2 – For use on local streets, neighborhood routes, collector and arterial streets where the 20-year equivalent single axle loads (ESALs) are less than 1 million.

3. Level 3 – For use on arterial streets where the 20-year ESALs range from 1 to 10 million.

E. The specific grade of asphalt cement shall be PG-70-22 performance Graded Asphalt (AASHTO MP-1) as approved by the City Engineer.

F. Asphalt pavement shall be designed using the AASHTO Design procedure as defined in the *ODOT Pavement Design Guide* (replaces ODOT's former OSHD Design Procedure).

G. The compaction shall be at least 92 percent based on a Rice theoretical maximum density, as determined in conformance with AASHTO T209, as modified by OSHD. In addition, for Level 1 and 2 mixes, a 50 blow Marshall (AASHTO T245) and for Level 3 mix a 75 blow Marshall (AASHTO T245) or Superpave Performance Testing as outlined in the ODOT *Contractor Mix Design Guidelines for Asphalt Concrete* shall be performed and all related test data shall be provided to the City Engineer. The minimum "Tensile Strength Ration," "voids filled with asphalt," "voids in mineral aggregate," and "air voids" shall be according to the *ODOT/APWA Oregon Standard Specifications for Construction.* The Marshall requirement may be waived by the City Engineer on a case-by-case evaluation.

H. If the average in-place relative density of any asphalt concrete pavement lift is less than 92 percent, then the asphalt shall be deemed unacceptable, and will be rejected. The Engineer of Record shall then submit to the City Engineer for approval a plan to remove and replace the asphalt that was rejected.

I. Asphalt concrete pavement shall be placed per the ODOT/APWA *Oregon Standards Specifications for Construction* (latest edition). Placement of asphalt concrete pavement at temperatures below those specified, to a minimum of 40° F ambient air temperature, may be permitted with the following conditions:

1. The City Engineer shall be notified 24-hours in advance of intent to place asphalt concrete pavement under the minimum conditions noted above.
2. Approval to place asphalt concrete pavement under the minimum conditions noted above shall be at the discretion of the City Engineer on a case by case basis.
3. Placement of asphalt concrete pavement under the minimum conditions noted above shall not occur without written approval of the City Engineer.
4. The project Geotechnical Engineer shall be present while asphalt concrete pavement is being placed.
5. The project Geotechnical Engineer shall perform compaction testing of each lift of asphalt concrete pavement at a minimum interval of 50 feet along the length of roadway.
6. There shall be a minimum of 3 compaction tests across the road section per each 50 foot length of roadway. One compaction test shall occur within the wheel path of each travel lane and one compaction test at the road crown or centerline.
7. The compaction testing results shall meet the requirements of Section 00745.79 – Compaction QC, of the ODOT/APWA *Oregon Standard Specification for Construction* (latest edition).
8. Compliance for each roadway section compaction test shall be:
   a) Two of the three compaction tests meeting compaction requirement standards.
   b) The third compaction test shall be within 95% of the compaction requirement standards.
9. The compaction tests shall be submitted to the City Engineer for review and acceptance approval.

10. Non-compliance with or failure to meet the compaction testing requirements noted above may result in the removal of the pavement section upon direction of the City Engineer or their designated representative.

J. Design considerations:

1. Design parameters used in the pavement design procedure shall be appropriate for the particular design. The design engineer is responsible for selecting design input values and for obtaining assistance when necessary from the ODOT pavement Services Unit.

2. For all asphalt concrete pavement designs, 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.

210.2.3 Asphalt Overlay Design and Construction

A. Pavement overlays and inlays shall be designed and constructed in accordance with the City's current overlay specifications, available from the City Engineer by request.

210.2.4 Portland Cement Concrete Pavement Design

A. 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 following publications: *Concrete Streets: Typical pavement Sections and Jointing Details (1S211.01P); Thickness Designs for Concrete Highway and Street pavements (EB109.01P);* and, *Joint Design for Concrete Highway and Street Pavements (1S059.03P),* the applicable ACI standards, and the *Oregon Standard Specifications for Construction*, whichever are deemed most stringent by the City Engineer.

B. The subgrade shall be tested to determine the Modulus of Subgrade Reaction, k, in order to design the street structure. A correlation of CBR to k may be made using Figure 2, *Thickness Designs for Concrete Highway and Street Pavements*. In addition, the City will require that the following be incorporated into the design and construction:

1. Use a minimum 20-year design period.

2. Minimum thickness of Portland Cement Concrete shall be 5-inches.

3. Concrete shall meet the specifications for "Structural Concrete" and the classes of Structural Concrete described in the "Materials" section of the Oregon Standard Specifications for Construction, except that the City requires Structural Concrete (not Structural Concrete Option A) regardless of the total quantity of concrete for the Project. The minimum design compressive strength for concrete pavement shall be 5000 psi (Class 5000 – 1 ½ concrete) in 28 days, and the minimum flexural strength for pavement shall be 650 psi in 28 days. The minimum cement content will be 660 pounds per yard, with a maximum water/cement ratio of 0.40. The slump shall range from 3-inch to 4½ - inch. The entrained air shall be from 4 to 6 percent. Concrete for bridges shall be as specified for "Concrete Bridges" in the *Oregon Standard Specifications for Construction.*

4. A design joint plan shall be prepared and incorporated into the street construction plans. Longitudinal and transverse joint locations shall be clearly delineated. Transverse joints shall be skewed forward 2 feet per land with right and left curb street stationing noted for each end. Joint spacing (in feet) should not exceed 1.5 to 1.75 times the slab thickness (in inches). For example, an 8-inch thick slab would have a maximum joint spacing of 12 to 14 feet. The maximum length to width ratio shall b 1.25: 1.0 for any panel unless there are other constraints that the City will examine on a case-by-case basis.

5. Longitudinal joints shall be sawed at the same time or immediately following the transverse joints. Joints shall be sawed 0.25-inches in width and to a depth of at least one-third the slab thickness. Sawing shall occur as early as pollible, especially when large changes in temperatures are expected. At no time shall construction equipment or traffic be allowed on the new pavement until laboratory tests indicate at least 95 percent design strength has been attained, a minimum of seven days have passed since placement, or both the City Engineer and the Design Engineer agree that the street is ready for traffic and construction loads.

6. At no time shall construction equipment or traffic be allowed on the new pavement until laboratory tests indicate at least 95 percent design strength has been attained, a minimum of 7 days have passed since placement, or both the City Engineer and the design engineer agree that the street is ready for traffic and construction loads.

7. All joints shall be sealed. The concrete surfaces to which joint sealant will be applied must be clean and dry. To some degree, the technique or combination of techniques selected to accomplish this will depend on the conditions encountered in the field. Saw cutting (old joints), high pressure water jetting, sand blasting, wire brushing, and blowing out the joint with compressed air are methods that can be used. Air compressors used for this purpose must be equipped with traps capable of removing moisture and oil from the air. All residues must be removed from the joint that might prevent bonding of the joint sealant material. A 3/8-inch diameter, closed-cell, expanded polyethylene foam backer rod shall be placed in the joints according to the joint sealant manufacturer's recommendations. The joints shall be sealed with a hot rubber asphalt sealant (ASTM D3405 spec.) or Dow Corning 888 silicone sealant (or equivalent as determined by ATM D1475, ASTM D3583, ASTM C719, and ASTM D793 spec.) and placed as per the manufacturer's specifications. The sealant type to be used shall receive approval from the City Engineer and be noted on the design joint plan. The surface of the sealant should be 1/4 –inch beneath the surface of the pavement. All excess materials shall be removed from the surface.

8. The field testing of Portland Cement Concrete pavement shall follow the procedures for field testing concrete pavement listed in the *ODOT Manual of Field Test Procedures, 2002 Revision.* Those procedures are as follows:

ODOT TM 770	Determining the Graphic Profile Index with a Profilograph
ODOT TM 775	Non-destructive Depth Measurement of Concrete Pavement
AASHTO T22	Compressive Strength of Cylindrical Concrete Specimens
AASHTO T 23	Making and Curing Concrete Test Specimens in the Field
AASHTO T119	Slump of Hydraulic Cement Concrete

AASHTO T 121 Mass per Cubic Meter, Yield, and Air Content of Concrete
AASHTO T 152 Air Content of Freshly Mixed Concrete by the Pressure Method
AASHTO T 231 Capping Cylindrical Concrete Specimens
AASHTO T 309 Temperature of Freshly Mixed Concrete
WAQTC TM2 Sampling Freshly Mixed Concrete

9. All other testing shall follow ACI and ODOT procedures, except as otherwise specified herein. In cases of conflict or disagreement between procedures, the City Engineer shall determine which govern.

10. The statistical analysis and interpretation of the results from the above tests, and the application of said test results to acceptance or rejection of Portland cement concrete pavement, shall be as specified in the applicable ACI standards and the *Oregon Standard Specifications for Construction*, whichever are deemed the most stringent by the City Engineer.

210.3 Horizontal Alignment

A. Alignments shall meet the following requirements:

1. Center line alignment of improvements should be parallel to the center line of the right-of-way.
2. Center line of a proposed street extension shall be aligned with the existing street center line.
3. Horizontal curves in alignments shall meet the minimum radius requirements as shown in Table II-a.

B. Reversing horizontal curves shall be separated by no less than 50 feet of tangent. On arterials the separation shall be no less than 100 feet.

TABLE II a – DESIGN SPEED/CENTERLINE RADIUS (MINIMUMS)

Design Speed (mph)	Friction Factor (F)	Minimum Curve Radius (ft) for \Various Cross Slopes				
		(e) - 2.5%	(e) 0%	(e) 2.5%	(e) 4%	(e) 6%
15	0.330	50	45	45	40	40
20	0.300	100	90	85	80	75
25	0.252	185	165	150	145	135
30	0.221	305	275	245	230	215
35	0.197	475	415	370	345	320
40	0.178	700	600	525	490	450
45	0.163	980	830	720	665	605

Note: For Table II a – right-of-way runoff shall be controlled to prevent concentrated cross flow in superelevated sections. The above tables are to be used unless otherwise directed by the City Engineer.

C. Superelevations will be required as directed by the City Engineer. Where superelevation is used, street curves should be designed for a maximum superelevation rate of 4 percent. If terrain dictates sharp curvature, a maximum superelevation of 6 percent is justified if the curve is long enough to provide an adequate super elevation transition.

D. On local streets, requests for design speeds less than 25 miles per hour shall be based on topography, right-of-way, or geographic conditions, which impose an economic hardship on the applicant. Requests will be reviewed at the discretion of the City Engineer on a case-by-case basis. Requests must show that a reduction in centerline radius will not compromise safety. There will be posting requirements associated with designs below 25 miles per hour.

Source: American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets 2004*, Fifth Edition (Standards for Low-Speed Urban Streets).

210.4 Vertical Alignment

A. Alignments shall meet the following requirements:

1. Minimum tangent street gradients shall be 0.5 percent along the crown and curb.

2. The standard grade for all streets is 10 percent for unrestricted length, and 12 percent for a maximum length of 200 feet. A request for a variation for street designs with grades exceeding 12 percent shall be submitted to the City Engineer for review. Approval of street grades in excess of 12 percent shall be at the discretion of the City Engineer on a case by case basis. Under no conditions shall grades exceeding 15 percent be approved for public streets.

3. Local streets intersecting with a local route or greater functional classification street, or streets intended to be posted with a stop sign, shall provide a landing averaging 8 percent or less for 50 feet. Landings are that portion of the traveled street extending 50 feet beyond the projected curb line of the intersecting street at full improvement.

4. Grade changes of more than 1 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 super elevation transitions shall be designed to not allow concentrations of storm water to flow across the travel lanes.

7. Off-set crowns shall be allowed only with prior written approval of the City Engineer and must conform to the Standard Detail for off-set crowns.

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

9. 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 manual shall be met for both present and future conditions.

B. When new streets are built adjacent to or crossing drainage ways, the following standards shall govern the vertical alignment:

Functional Classification	**Vertical Standard**
Freeways and Arterials	Travel lanes shall be at or above the 100 year flood elevation.
Collectors	Travel lanes shall be at or above the 50 year flood elevation but not lower than 6-inches below the 100 year flood elevation.
Neighborhood Routes and Local streets (residential)	Travel lanes shall be at or above the 25 year flood elevation but not lower than 6-inches below the 100 year flood elevation.
Local streets (non-residential)	Travel lanes shall be at or above the 25 year flood elevation but not lower than 6-inches below the 50 year flood elevation.

C. 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 5-inches below the 25-year flood event.

D. Vertical curves shall conform to the values found in Table II b:

TABLE II b – DESIGN CONTROLS FOR CREST AND SAG VERTICAL CURVES

DESIGN SPEED (MPH)	MINIMUM RATE OF VERTICAL CURVATURE, K	
	CREST	SAG
15	3	10
20	7	17
25	12	26
30	19	37
35	29	49
40	44	64
45	61	79

Source: American Association of State Highway and Transportation Officials, *A Policy of Geometric Design of Highways and Streets 2004*, Fifth Edition.

Table II b assumes that street lighting does not exist. The City Engineer may accept a lower K value for sag vertical curves if the roadway design includes lighting. The design engineer shall provide calculations for sag curve K values based on lighting.

210.5 Intersection Sight Distance Policy

A. It is the policy of the City of Sherwood to have the applicant's Project Engineer evaluate safe intersection sight distance using the principles and methods recommended by AASHTO. This policy shall apply to the design of new streets and driveways, and to the placement of any object in the public right-of-way, including landscaping features. The following minimum standards shall apply:

TABLE II c – INTERSECTION AND DRIVEWAY SIGHT DISTANCE

DESIGN SPEED (MPH)	MINIMUM INTERSECTION SIGHT DISTANCE (FEET)
15	145
20	195
25	240
30	290
35	335
40	385
45	430

Source: American Associate of State Highway and Transportation Officials, *A Policy of Geometric Design of Highways and Streets 2004*, Fifth Edition, (based on AASHTO Case B2 and B3).

B. Sight distance shall be determined for each street approach to an intersection. A driver on the approach street should be able to see each vehicle on the intersecting street from the time that the vehicle is the sight distance from the intersection until the time that the vehicle reaches the intersection. Poles, trees, and similar obstruction will be allowed within the sight distance area only if it can be shown that such obstructions do not prevent the continuous view of the vehicle approaching on the intersecting street.

C. 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 range of 3.5 feet to 7.6 feet above the approach street pavement. The sight distance criteria should be met throughout the range of driver's eye heights. The top of the vehicle on the intersecting street is assumed to be 3.5 feet above the cross-street pavement.

D. The traffic speed used in the calculation shall be the highest of the following: (1) the design speed of the intersecting street; (2) the posted speed of the intersecting street; or (3) the measured 85^{th} percentile speed of the intersecting street. Where the intersecting street is controlled by a stop sign or yield sign, a design speed of zero may be assumed. Where traffic signal control exists at an intersection or where a traffic signal is likely to be installed in the future, adequate sight distance shall be provided for potential right turns on red. 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 assure that the required sight distance can be maintained in the future.

E . Site distance requirement areas shall be shown on the plat and construction plans as open space tracts, not easements encumbering lots.

F. No modifications or exceptions to these standards shall be allowed unless approved in writing by the City Engineer.

210.5.1 Visibility at Intersections

A. All work within the public right-of-way and adjacent to public streets and access ways shall comply with the standards of this section.

B. Except as otherwise provided in this section, no fence, berm, wall, vehicle, hedge or other planting or structure shall be erected, planted, placed, or maintained within a sight clearance area (see the standard details drawings).

C. The horizontal limits of the sight clearance area shall be a triangular area measuring 20 feet along the right-of-way or private access, as shown in standard detail (RD-53). The edge of the hard surfaced area of the private access, be it roadway, curb, or sidewalk, shall be treated as the right-of-way line in determining the site clearance areas.

D. The vertical limits of the sight clearance area shall be two planes. The lower plane shall intersect the right-of-way line at points 30 inches above the elevation curbline of the adjoining street. The upper plane shall intersect the right-of-way line at points 10 feet above the elevation of the curbline of the adjoining street.

E. Poles, tree trunks, and similar objects less than 12-inches in width may be allowed in the sight clearance area if such objects meet the intersection sight distance requirements.

F. No modifications or exceptions to these standards shall be allowed unless approved by the City Engineer.

210.6 Intersections

A. 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 75 degrees. A straight horizontal alignment (no curves, no angle points) shall be used through the intersection and for a minimum of 25 feet each side of intersecting right-of-way lines.

B. Curb radii at intersections shall be as shown in Table IId for the various functional classifications. 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.

Table II d – Minimum Curb Radii At Intersections (in feet)

Street Classification	Arterial	Collector	Neighborhood Route	Local
Arterial	See Note 3	See Note 3	See Note 2	See Note 2
Collector	See Note 3	See Note 3	See Note 2	See Note 2
Neighborhood Route	See Note 2	See Note 2	See Note 1	See Note 1
Local	See Note 2	See Note 2	See Note 1	See Note 1

Note 1: Except in areas zoned for industrial areas, the intersections of local streets and neighborhood routes shall have a minimum curb radius of 20 feet. In areas zoned for industrial uses, the minimum curb radius shall be 30 feet.

Note 2: The intersection of a neighborhood route or local street with an arterial or collector street shall have a minimum curb radius of 25 feet. In areas zoned for industrial uses, the intersection of a neighborhood route or a local street with an arterial or collector street shall be design to accommodate a WB-50 Semitrailer Design Vehicle and the curb alignment shall be designed so that the vehicle can complete a right turn using only the vehicle lanes nearest to the curbs of the two streets. See Note 4.

Note 3: At an intersection where each street is an arterial or a collector, the intersection shall be designed to accommodate a WB-50 Semitrailer Design Vehicle. If either street is designated as a Truck Route in the City's TSP, the intersection shall be designed so that the vehicle can complete a right turn using the vehicle lane nearest to the curb on the approach street and using all available lanes in the direction of travel on the departure street. See Note 4.

Note 4: Curbs should be designed to minimize the length of pedestrian crossings. Designers are encouraged to consider curb alignments with compound curves and other methods to minimize the intersection width needed to satisfy Notes 2 and 3. Parking lanes and bicycle lanes may be included in considering the effective width available to accommodate the turning design vehicle.

C. The radii standards in Subsection 210.6.B may also be applied by the City Engineer to driveways.

D. Sidewalk access ramps shall be provided at all corners of all intersections, regardless of curb type, and shall conform to the standard details.

E. Intersection Spacing Along Streets. The minimum and maximum distance between streets shall be as follows:

Street Classification	Roadways & Driveways Spacing (max)	Full Access Intersections Spacing (min)	Limited Access* Intersections Spacing (min)	Driveway Spacing (min)
Major Arterial	n/a	1,000 feet	500 feet	500 feet
Minor Arterial	n/a	600 feet	300 feet	300 feet
Collector	530 feet	400 feet	400 feet	200 feet
Neighborhood	530 feet	200 feet	n/a	n/a
Local	530 feet	200 feet	n/a	n/a

Note: Street Classifications are identified in the City TSP.

* Limited Access – Vehicles are restricted to right-in/right-out turn movements. In some cases, left-in turn movements may be permitted.

1. Distance between streets is measured from the centerline of the subject street to the centerline of the adjacent street.
2. Local street connections are based on the Metro RTP requirements for new residential or mixed used developments.
3. Provide full street connections with spacing of no more than 530 feet between connections except where prohibited by barriers.
4. Provide bike and pedestrian access ways in-lieu-of streets with spacing of no more than 330 feet except where prevented by barriers.

210.7 Cul-de-sacs, Eyebrows, Turnarounds

A. The following specifies the minimum requirements for cul-de-sacs, eyebrows, and turnaround areas. Other turnaround geometrics may be used when conditions warrant and the City Engineer and TVF&R Fire Marshal approve the design and application of its use.

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

C. Cul-de-sacs shall not be more than 200 feet in length, except for the modified infill design cul-de-sac, which shall not be more than 150 feet in length. The length of a cul-de-sac shall be measured along the center line of the cul-de-sac 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. See the standard details for cul-de-sac right-of-way and pavement requirements.

D. The minimum curb radius for transitions into cul-de-sac bulbs shall be 28 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.

E. 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. Eyebrow geometry shall be evaluated on the basis of turning requirements for Fire Department vehicles.

210.8 Driveways

A. Corner Clearance for Driveways. Corner clearance shall be based on an intersection analysis and to the following minimum distances:

FOR LOTS FRONTING ON:	DESIGN SPEED (MILES PER HOUR)	MINIMUM DISTANCE BETWEEN FACE OF CURB OF INTERSECTING STREET AND NEARSIDE EDGE OF DRIVEWAY (FEET)
Arterials and Collectors	25	150
	30	180
	35	180
	40	200
	45	230
	50	350
Neighborhood Routes		50
Local Streets		25

Note: Street Functional Classifications are identified in the City's TSP Figure 8-3.

B. If the minimum standards in this subsection would prohibit access to the site, a driveway with restricted turn movements acceptable to the City Engineer may be approved.

C. Minimum driveway spacing between driveways on arterials and collectors shall also conform to the corner clearance standards of this section.

D. Driveway Approaches. The City Traffic Engineer and City Engineer have the authority to limit access and access locations. Access to streets and highways under Washington 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 non-access reserve strips.

2. Concentrated surface runoff shall not be allowed to flow over commercial driveways or sidewalks into the street.

3. Driveways shall meet the minimum intersection sight distance requirements.

4. The maximum standard grade for all driveways is 14 percent. Driveway grades exceeding 14 percent shall be submitted to the City Engineer and TVF&R for review. Approval of driveway grades in excess of 14 percent shall be at the discretion of the City Engineer and TVF&R on a case-by-case basis.

5. The maximum width of residential driveways shall not exceed 24 feet for lot frontage up to 60 feet and 30 feet for lot frontage greater than 60 feet. This width does not include the width of the transition wings on both sides of the driveway.

210.9 Curbs, Shoulders, and Grading

A. The following specifies the requirements for curbs and cross-slope grading for streets:

1. For local, neighborhood and commercial street classifications standard curb and gutter shall be used.

2. For collector and arterial street classifications standard curb and gutter shall be used, except that vertical curb may be used with approval of the City Engineer.

3. All streets shall include curbs on both sides. Approval of interim street designs which have shoulders and ditches on one or both side of the street shall be at the discretion of the City Engineer on a case-by-case basis.

4. Interim width streets shall have 6 foot wide shoulders adjacent to the street at a 2-1/2 percent cross-slope and roadside ditches each side of the shoulders with a maximum side-slope of 2 horizontal to 1 vertical. The 6 foot shoulder area may consist of a section of pavement and/or a section of crushed rock. The pavement section shall be a minimum of 2 feet wide and a maximum of 6 feet wide.

5. Cross-slope of the street section shall be no less than 2.5 percent and no greater than 5 percent. Whenever possible, the crown of the street shall be the same elevation as the top of the curbs.

B. Grading outside the improved areas shall be as follows:

1. Collectors or higher functional classifications shall have a maximum 2 percent upward grading to the right-of-way line, and no steeper than 1½:1 up, or 2:1 down, outside the right-of-way.

2. Local Street and Commercial/Industrial functional classifications shall have a maximum 2 percent upward grading to the right-of-way line, a 5 to 1 upward or downward grading within the public utility easement, and no steeper than 1½:1 up, or 2 to 1 down outside the public utility easement.

C. Retaining walls shall be used if slopes are greater then the 1½:1 requirement in the subsections above or where slope stability is a problem. If slopes are to be maintained (mowed) by the City, a maximum of 3:1 slope will be required. Retaining walls shall be constructed to a height where the slope is no more than 1½:1.

D. When new curbing is being placed, a stamp shall be placed to mark where each water, irrigation sleeve, sanitary sewer, and storm service crosses the curb line. A note shall be placed on the approved construction plans indicating this requirement. The imprinting stamp impression left for a water service shall be the letter “W”; for a sanitary service, it shall be the letter “S”; for the storm service, it shall be the letter “D”; and for irrigation sleeves, it shall be the letter “I”. These impressions shall be 2-inches high, and shall be placed on the top of the curb.

210.10 Sidewalks

A. The following specifies the requirements for sidewalks:

a) Sidewalks shall be separated from the curb as indicated in the street standards in the TSP and standard details, except where physical or topographic conditions make it impracticable to separate the sidewalk from the curb, the City Engineer may approve a design modification to allow the sidewalk to be adjacent to the curb. Modification of the sidewalk standard shall be at the discretion of the City Engineer on a case-by-case basis.

b) 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.

c) In no case shall the sidewalk clear space be smaller than the clear space shown on the applicable standard detail drawing.

d) In instances where it is required to install sidewalks and a permanent sidewalk cannot be constructed, a temporary sidewalk may be constructed. The temporary sidewalk may consist of an asphaltic concrete or portland cement concrete to a width, location, and structure approved at the discretion of the City Engineer on a case-by-case basis.

B. The following are the minimum requirements for location and construction of sidewalk ramps:

1. Sidewalk ramps shall be located and constructed in accordance with the rules and regulations of Title III of the Americans with Disabilities Act of 1990 (ADA). Design plans are required to have a detailed plan and profile of each curb ramp and curb return gutterline.

2. The City's interpretation of the ADA is that all existing sidewalk ramps abutting a street overlay or pavement reconstruction shall be brought into compliance with the ADA's requirements for sidewalk ramps.

3. Crosswalks shall be marked (striped) only at crossings that are protected by a traffic signal, or stop sign, or at other locations recommended by the City Engineer and approved by the City Council.

4. Ramps located within marked (striped) crossings shall be wholly within the crossing, excluding the flared wings.

5. At unmarked crossings, ramps may be single (one ramp per street corner) diagonal ramps.

6. At new Tee intersections, the "cross-bar" of the tee must have at least one crossing equipped with ramps, regardless of whether the crossings are marked or not. All new Tee intersections shall have at least four ramps, with two ramps on one corner of the intersection. On retrofitted existing Tee intersections, at least two single ramps and a third ramp that may be double or single, depending on whether the crossings are marked (stripe) shall be provided unless existing conditions prohibit the double ramp.

7. Location of ramps and the minimum number of ramps per intersection shall be shown on the construction plans in accordance with these specifications and as shown in the Standard Details.
8. Sidewalk Trip Hazards: A sidewalk trip hazard exists if there is a vertical height difference between adjacent sidewalk panel sections. If the sidewalk is raised not more than 1-inch and the concrete edges are solid, the concrete may be ground to remove the trip hazard. Grind the concrete so that the concrete has gradual transition between existing sidewalk panels. For a ½-inch of rise, grind back a minimum of 6-inches. For 1-inch of rise, grind back a minimum of 12-inches. For sidewalks with more than 1-inch of vertical height difference, one complete panel (at a minimum) shall be removed and replaced to eliminate the trip hazard.

Note: See standard details for ramp details including current ADA requirements.

210.11 Raised Medians

A. Where raised medians are allowed, the following criteria must be met:

1. The raised median shall be set back at least 2 feet from the median lane on both sides.
2. Street lighting shall be sufficient to provide illumination of the raised median.
3. Objects, such as trees, shrubs, signs, and light poles, shall not physically or visually interfere with vehicles or pedestrian traffic in the travel way.
4. The style and design of the raised median shall be site specific. The raised median shall be safe for the design speed, and shall be subject to City approval.

210.12 Subsurface Drainage

A. Subsurface street drainage must be considered in the design of each street. Subsurface drains shall be designed and constructed per the recommendations of the geotechnical engineer. In the event that no subsurface drainage is required by the geotechnical engineer, a transverse perforated drain pipe shall be installed below the subbase rock at the low point of each sag vertical curve. The subsurface drains are for the purpose for collecting and conveying subsurface water only, not surface runoff. They are not to be considered part of the storm drainage system for storm drain pipe sizing purposes.

B. Subsurface drains shall connect and drain into the storm drainage system at catch basins, curb inlets, gutter inlets, manholes, or roadside ditches. Alternative subsurface drainage measures may be used if approved by the City Engineer.

210.13 Major Roadway Structures

A. Major roadway structures including but not limited to embankments, bridges, retaining walls, headwalls, crash rated traffic barriers, guardrails, handrails, and fencing on bridges and other major structures shall be designed and constructed in conformance with AASHTO and ODOT

standards, except that all permanent crash rated roadside traffic barriers shall be designed to meet AASHTO's Test Level 4 (TL-4) criteria, regardless of the street's design speed.

B. Steeply sloped roadway embankments, steep slopes adjacent to driveways, and retaining walls at those locations shall be provided with crash rated traffic barriers where recommended by the AASHTO and ODOT roadway design standards and shall be designed in accordance with Subsection 210.13.A.

210.14 Transitions

A. Street width transitions from a narrower width to a wider width shall be designed with a 3:1 taper. Delineators, as approved by the City, shall be installed to define the configuration.

B. For street width transitions from a wider width to a narrower width, the length of transition taper shall be determined as follows:

$L = S \times W$ (for S = 45 mph or more)

$L = \frac{W \times (S)^2}{60}$ (for S = less than 45 mph)

Where L = minimum length of taper (feet)
S = design speed (mph)
W = EP to EP offset width

C. 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).

D. 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 details. If the wider section does not provide an additional travel lane, only a barricade is required without the transition.

210.15 Super Elevation Cross-Sections

A. Off-set crown cross-sections are not acceptable as super elevation sections.

B. Super elevation sections shall be designed using AASHTO guidelines.

C. Super elevation transitions shall be designed to not allow concentrations of storm water to flow over the travel lanes.

210.16 Stub Streets

A. Stub streets that are to allow for future extensions shall be barricaded and signed as per the standard details.

210.17 Private Streets, Parking Lots, and Common Driveways

A. Streets, parking lots, and common driveways on private property shall meet the requirements of the *City Code* and this manual. The Engineer shall provide a pavement section designed to support an 80,000-pound truck in all local weather conditions and ground conditions. This design must meet or exceed the following minimum standards:

1. Areas used for city-required parking or for maneuvering of vehicles shall have a durable hard surface as follows:

   a) In all residential areas, the minimum pavement section shall be 4-inches of asphalt over 2-inches of ¾"– 0" compacted crushed rock aggregate leveling course over 8-inches of compacted 1½"– 0" crushed rock aggregate base course or shall be 5-inches of Portland cement concrete over 6-inches of 1½"– 0" compacted crushed rock aggregate base course over subgrade compacted to 95 percent AASHTO T-99.

   b) In commercial and industrial areas, the minimum pavement section shall be 5-inches of asphalt over 4-inches of ¾"– 0" compacted crushed rock aggregate leveling course over 10-inches of compacted 1½"– 0" crushed rock aggregate base course or shall be 7-inches of portland cement concrete over 6-inches of compacted 1½"– 0" crushed rock aggregate base course over subgrade compacted to 95 percent AASHTO T-99.

2. The parking surface shall be placed on a well-compacted subgrade.

3. All required parking spaces shall be striped.

4. Private streets serving residential areas shall be designed with travel lanes at or above the 25- year flood elevation but not lower than 6-inches below the 100-year flood elevation.

5. For a driveway or private street serving more than three single-family homes, the required hard surface shall have a minimum unobstructed width of 20 feet. An easement or similar dedication shall be provided to assure maintenance of the required unobstructed width.

6. Parking access drives shall not be more than 50 feet in width.

7. On access drives that connect to a public street, there shall be no parking stalls within 20 feet of the right-of-way of the public street.

8. Access drives shall be located not closer than 5 feet to a side lot line, except that a common access drive to two adjacent properties (width not exceeding 50 feet) may be provided at the common lot line.

9. Parking spaces along the outer boundaries of a parking area, except where specifically prohibited, shall be designed to include a continuous curb a minimum of 6-inches high located not less than 6 feet from the property line. The purpose of the curb is to prevent a

motor vehicle from extending over an adjacent property line or a street right-of-way. The curb shall be a barrier-type curb per the standard details.

10. The maximum longitudinal grade for private streets and driveways serving two or more single family homes shall be 12 percent, with intersection areas no steeper than 8 percent.

11. Where existing site grades are such that private street and driveway grades must exceed 12 percent in order to provide "reasonable" access to the site, the developer shall submit a variance request to the City and TVF&R for review and approval. Approval of grades exceeding 12 percent for private streets and driveways is at the discretion of the City Engineer and will be reviewed on a case by case basis. Grades exceeding 15 percent will not be approved in any case.

210.18 Utilities and Other Work in a Public Right-of-Way

A. The installation, maintenance, upgrade, repair, replacement, modification, removal and abandonment of utility facilities (including public and private utility facilities) in public rights-of-way shall be governed by applicable local, regional, state and federal laws, the other chapters of this manual, section 210.18.B (hereafter "this section") and Section 210.19 of this manual, and any conditions of approval issued with the City permit(s) for the work, unless a City franchise or applicable state or federal law expressly supersedes or contains an express exemption there from.

B. Permits Types. In addition to the requirements of the *City's Development Code*, if applicable, no person shall engage in certain utility construction, maintenance or repair, including certain private utility work and certain public utility work performed by another unit of government, as more specifically defined hereinafter, that disturbs a public right-of-way, easement, or existing improvements therein without obtaining a site development permit, or a right-of-way permit, as prescribed below:

1. Application and Expiration. A right-of-way permit shall be obtained in the manner prescribed herein for any utility work requiring such a permit and shall expire at the time designated by the City, or 1 year from issuance, whichever is sooner. A right-of-way permit must be obtained before any work requiring such a permit is begun. In emergency situations as defined herein, the work may begin without a permit; however, the applicant must inform the City Engineer of the nature, location, and expected duration of the emergency work before 12:00 p.m. the next business day. Failure to provide the required information may result in suspension of the work until the City receives the required information.

2. Site Development Permit. In addition to the requirements of the *City Code* that apply to excavations, fills, grading, and floodplain/floodway encroachments, if applicable, no person shall engage in certain major utility construction work in a public street right-of-way that disturbs the right-of-way, alters or tampers with pavement, sidewalks, curbs, gutter, landscaping, utilities or other public improvements, or is not part of the construction of utility facilities in a new subdivision or other development for which a separate Site Development Permit has already been issued, without first obtaining a

permit from the City Engineer. A site development permit is required for any of the following:

a) Utility construction work, excluding utility service lines, that is within one or more collector or arterial streets, an intersection thereof, or a combination thereof, and has a total length of 10 feet or more that is within the existing pavement.

b) Utility construction work, excluding utility service lines, that is within one or more public streets and has a total length of 300 feet or more that is in existing pavement, driveways, sidewalks, or other hard surfaced areas, or any combination thereof.

c) Installation of an aboveground utility facility that is in a public right-of-way, is governed by Subsection 210.18.D. and is 2 feet or more in height (above the ground surface).

3. Right-of-Way Permits. In addition to the requirements of the *City Code* and this design manual if applicable, no person shall engage in certain utility maintenance, repair and minor construction work in a public street right-of-way that disturbs the right-of-way, alters or tampers with pavement, sidewalks, curbs, gutter, landscaping, utilities or other public improvements, and is not part of the construction of utility facilities in a new subdivision or other development for which a separate site development permit has already been issued and currently valid, without obtaining a right-of-way permit from the City Engineer as provided for herein, unless expressly exempted by Subsection 210.18.B.

a) A right-of-way permit is required for utility construction that is not included in the scope of work of an approved site development permit and consists of one or more of the following types of work:

(1) Utility construction work, including but not limited to utility line installation, that is within one or more public streets and the cumulative length of which, within travel lanes, is less 10 feet.

(2) Utility construction work, including but not limited to utility service line installation, that is within one or more public streets and the cumulative length of which, within existing pavement, driveways, sidewalks and other hard-surfaced areas, or any combination thereof, is less than 300 feet.

(3) Utility construction works, including but not limited to utility service line installation that is within one or more public streets, is entirely outside pavement, driveways, sidewalks, and other hard-surfaced areas.

(4) Installation of an underground utility transmission pipe or conduit, or a utility service pipe or conduit that is 20 feet or more in length, by boring, horizontal directional drilling, funneling, or similar means.

(5) Installation of an aboveground utility facility that is less than 2 feet in height (above the ground surface) in a public right-of-way.

(6) Utility construction work that is within one or more public streets, is entirely outside existing pavement, driveways, sidewalks, and other hard surfaced areas, and has a total length of more than 100 feet and less than 500 feet, or a total area of more than 100 square feet and less than 1,000 square feet.

(7) All pot-holing and those "keyhole" or other circular street cuts that are 2-inches in diameter and greater and:

a) Are in the improved portion of a public street, or

b) Are in a public easement that is occupied by an existing public utility facility, or

c) Are in a drainage way, jurisdictional wetland, or a water quality sensitive area.

(8) Sidewalk and driveway repairs and replacements.

(9) Sidewalk ramp installation.

(10) Planting/Removal of street trees.

b) A right-of-way permit shall expire at the time designated by the City Engineer or one (1) year from issuance, whichever occurs first.

c) No Permit Required. The following types of utility work do not require a City site development permit, or a right-of-way permit but for emergency work require notification of the City by no later than 12:00 p.m. of the next business day after beginning the work that would otherwise require a permit:

(1) Emergency repairs of existing utility facilities.

(2) Routine maintenance, repair, replacement and other utility work that if within public rights-of way, does not disturb the right-of-way or existing public improvements, and does not close a pedestrian way, bikeway, or vehicular traffic lane during peak hours (7 a.m. to 9 a.m. and 4 p.m. to 6 p.m.). Notify school district if construction activity is within immediate school vicinity and lane restrictions would affect school bus access and/or arrival times.

(3) Installation of an underground utility service pipe or conduit to a structure, of which 5 feet or less of its length is in a public right-of-way, is entirely outside pavement surface of any public street, is performed with minimal disturbance of the public right-of-way and existing improvements, and does not close a pedestrian way, bikeway, or vehicular traffic lane during the aforementioned peak hours.

C. Application of Design and Construction Standards.

1. The construction standards in Subsection 210.18 and Subsection 210.19 apply to public and private utility work throughout the City unless specifically exempted by Subsections 210.18.C through 210.19.C immediately below:

   a) All new utility facilities that are to be located in a new public right-of-way that is within the boundaries of a new development or redevelopment or within a new public utility easement that is within the boundaries of a new development or redevelopment are exempt from Subsection 210.18.D.10 and Subsection 210.18.D.11, which only apply to new utility facilities to be located in improved existing public rights-of-way and utility easements.

   b) Modifications of existing underground utility facilities that disturb the right-of-way or existing improvements but neither require additional space nor add an at-grade or aboveground component, are exempt from Subsections 210.18.D.1.a, 210.18.D.1.g, 210.18.D.1.h, 210.18.D.10.a, 210.18.D.10.b, 210.18.D.10.e through 210.18.D.10.j, 210.18.E, 210.18.F, 210.18.L, and 210.18.Q.

   c) Maintenance and repair (both routine and emergency repair) of existing utility facilities in existing rights-of-way that disturb the right-of-way or existing improvements are exempt from Subsections 210.18.D.1.a, 210.18.D.1.g, 210.18.D.1.h, 210.18.D.10.a, 210.18.D.10.b, 210.18.E, 210.18.F, 210.18.H, 210.18.L, 210.18.J, and 210.18.Q.

D. Location and Design of New Utility Facilities.

1. General:

   a) All new underground utility facilities to be installed in street rights-of-way and public easements shall be installed in conformance with applicable local, regional, state and federal law and in the standard locations within the right-of-way or easement required by this manual.

   b) Except as otherwise required by this manual or by the City Engineer, new private utility facilities shall be located outside of the paved area of the street to the extent commercially reasonable and practicable so as to avoid future street cuts, except that public utility service lines may be extended across the paved area of the street.

   c) On all phased or interim street improvements, public utility facilities shall be stubbed across the interim improvement to ensure that cuts are not necessary when the road is expanded to its full width.

   d) All private utility lines (linear facilities) shall be placed underground, except as expressly allowed otherwise by the City's *Municipal Code*, as amended from time to time, or by applicable state or federal law. (See section on *Specific Construction Details for Utility Facilities* for current exceptions.)

e) The City does not allow, without an appropriate City right-of-way permit or prior written approval of the City Engineer or Public Works Director, potholing (exploratory excavations), "keyhole" cuts or other circular street cuts that are 2-inches in diameter or greater, or installation of an underground utility facility requiring a street cut.

f) New private underground utility facilities 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 (or interim) street, underground utility facilities can be located in the future paved section of the street, if approved by the City Engineer.

g) All new underground utility facilities shall be installed with the following minimum depths (i.e., depths of cover, from the proposed finished grade down to the top of the new facility), horizontal separations and vertical separations except when greater minimum depths are required by the NEC:

Type of Utility Facility	**Minimum Depth Required**	**Minimum Horizontal Separations Required**	**Minimum Vertical Separations Required**
Public	30-inches	(a) Minimum horizontal separation from other public utility facilities: As specified in Chapters 5,6 and 7 of this Design Manual (b) Minimum horizontal separation from parallel private utility facilities: 3 feet	(a) Minimum vertical separation from other public utility facilities: As specified in Chapters 5,6 and 7 of this Design Manual (b) Minimum vertical separation from private utility facilities: 1 foot

h) Methods of installation that do not cut the pavement or undermine the aggregate base of the street (i.e., "trenchless" methods), such as boring or driving, shall be used required and as approved by the City Engineer.

2. The private utilities standard depths (of cover) in this area are as follows:

a) Natural gas lines: Mains at 24-inches to 48-inches; services at 18-inches to 30-inches.
b) Power lines: 30-inches (primary and secondary lines), except in joint use trenches with other electric utility lines, primary power lines will be below the other electric utility lines and will have a minimum of 12-inch vertical separation from the other lines.
c) Cable TV lines: Main lines at 30-inches; services at 12-inches.
d) Copper telephone lines: Main lines at 30-inches; services at 18-inches
e) Other copper telecommunications lines: 30-inches; services at 18-inches.

f) Fiber optic telecommunications lines; 48-inches to 60-inches.

Type of Utility Facility	Minimum Depth Required	Minimum Horizontal Separations Required	Minimum Vertical Separations Required
Private	At least equal to the standard depths adopted by the respective	(a) Minimum horizontal separation from public utility facilities: 5 feet (b) Minimum horizontal separation from other parallel private utility	(a) Minimum vertical separation from public utility facilities: 1.5 foot (b) Minimum vertical separation from other private utility facilities: At least equal to the minimum standard separations
	Utilities consistent with current local, state and federal law	Facilities: At least equal to the minimum standard separations adopted by the respective industries consistent with current local, state and federal law	Adopted by the respective industries consistent with current local, state and federal law

3. For lines 6-inches in diameter and larger, and for all lines that will cross existing lines, the City Engineer may require that an in-situ subsoil investigation be performed by a qualified professional civil or geotechnical engineer retained by the permitee to properly determine the subsoil conditions and to recommend the most desirable method that will not disrupt the surface grade or integrity of existing utilities in the right-of-way. As alternatives, the City Engineer may accept copies of previous in-situ subsoil investigations in lieu of a new subsoil investigation, or may waive the requirement for an in-situ subsoil investigation if documentation is available that other underground construction in the immediate vicinity encountered acceptable subsurface conditions and the documentation is acceptable to the City Engineer. The permitee shall submit a written report on the findings of the subsoil investigation to the City. The City may require other information on the method proposed or on the contractor's qualifications in order to make final approval. Any and all surface heave or settlement, or related problems caused by the trenchless method shall be corrected by the permitee at its expense, to the satisfaction of the City. The trenchless methods of concern include but not limited to pushing conduit or reaming and backpulling conduit through pilot bore holes of any size. Any annular region or other cavity remaining after the installation of the conduit, pipe or cable shall be pressure grouted to the satisfaction of the City, prior to backfilling the bore pits. All drilling fluids shall be removed and disposed of properly. All entrance and bore pits and other affected areas shall be cleaned of all objectionable material and properly backfilled and restored. All such areas shall be restored to original contour, shape, appearance and condition.

4. In difficult underground conditions such as an area of a public right-of-way containing numerous existing utility facilities, the City Engineer may require increased depths and separations for safety, maintenance, or repair purposes

5. Underground vaults and other structures, and their access doors, manholes or other access facilities to be constructed within 10 feet of a vehicular travel way shall be designed for vehicular traffic loading on paved surfaces. All access doors, manholes, and other access facilities shall be designed and reinforced to a manufacturer's standard suitable at a minimum for AASHTO HS 20 traffic loadings on off-street locations that are not subjected to high-speed or high-density traffic. The utility will be responsible for repairing such utility structures and their access facilities that are damaged by any commercially available public vehicles, including but not limited to emergency vehicles, with a weight of 80,000 pounds or less.

6. Utility access facilities that encroach into the sidewalk shall conform to ADA requirements.

7. At-grade and above ground utility facilities, including but not limited to transformers, enclosures, cabinets, housings, pedestals, and other utility facilities, shall bear the owner's name and identification or reference number for that facility, but shall not bear any signs or advertising devices (other than certification, warning, or other required seals or signage). If the City notifies the utility in writing that this information is missing or illegible, the utility shall replace it within 30 calendar days. Emergency repairs and replacements for existing utility facilities are exempt from the requirements of this paragraph for a period of 90 calendar days after they are installed.

8. A development or project with 200 feet or more of frontage on an arterial or collector street within or abutting the development shall provide for future signal interconnects in the public rights-of-way. That is, in each collector and arterial street within or abutting the development or project, the development or project shall furnish and install along its entire frontage on rigid metal conduit conforming to the requirements of this manual for street illumination along its entire frontage.

9. When new curbing is being placed, a stamp or tag shall be placed to mark where each water, sanitary sewer, and storm sewer service crossed the curb line. The method of marking the curb shall be approved by the City Engineer and noted on the approved construction plans. If an imprinting stamp is used, the impression left for a water service shall be the letter "W"; for a sanitary sewer service, it shall be the letter "S"; and for a storm sewer service, it shall be the letter "D". These impressions shall be 2-inches high, placed on the top of the curb.

10. Underground Utility Facilities to be Installed in Existing Improved Public Right-of-way. In addition to the requirements of Subsection 210.18.D.1, all proposed underground utility facilities to be installed in existing improved rights-of-way shall be installed as follows:

    a) They shall be installed in the standard locations within the right-of-way or easement specified herein and elsewhere in the Engineering Design Manual and standard details, unless the City Engineer finds that existing conditions prohibit installation in the standard locations and approves alternate locations.

b) They shall be installed as near to adjacent existing underground private utility facilities as is commercially reasonable, practicable, and consistent with other requirements herein, but shall be located so as not to interfere with the safety, operation, inspection, maintenance, repair, replacement, or extension of public utility facilities.

c) They shall not be located under existing pavement unless permitted by the exceptions below or expressly permitted by the City Engineer:

(1) Private underground utility facilities may be constructed in the pavement of an existing street if they are installed by a method that does not cut the pavement or undermine the aggregate base of the street, such as boring, driving, or another acceptable method.

(2) Existing private underground utility facilities that are already in the pavement of an existing street may be replaced, upgraded, or expanded in the same location, or extended along a projection of their existing alignment unless the facilities would create a safety hazard, would damage another utility facility, or would impair the operation, inspection, maintenance, repair, or extension of public utility facilities in that location. However, if an existing underground utility facility is extended along a projection of its existing alignment in the street pavement, it shall be returned to the City's standard location and alignment outside the pavement at the earliest opportunity to do so that is commercially reasonable and practicable.

d) They shall be installed in a manner that avoids conflicts with existing public utility facilities. The new utility facilities shall be installed at the depths, horizontal separations and vertical separations specified for utilities in unimproved rights-of-way and easements above, except as may be required otherwise by the City Engineer to prevent conflicts with the operation, inspection, maintenance, repair, and replacement of any existing public utility facilities and any future extensions of said public utility facilities or services that can reasonably be expected by the City to be installed in the future.

e) If an underground utility facility must cross an existing paved street that is not a residential street serving predominantly single family residences, the underground facility shall be installed by a method that does not cut the pavement or undermine the aggregate base of the street unless expressly approved by the City Engineer.

f) A replacement for an existing underground utility facility proposed to be in approximately the same location and at the same depth as the existing facility it is to replace is exempt from these depth requirements and may be installed at the same depth as the existing facility it is replacing, providing the existing depth complies with applicable electrical codes, state and federal laws, and installing the replacement facility at the same depth will not create a safety hazard or impair the operation, inspection, maintenance, repair, or of said public utility facilities or services that can reasonably be expected by the City to be installed in the future.

g) With the exception of emergency repairs, no construction of underground utility facilities in an existing right-of-way may begin until all existing utility facilities (including but not limited to all public and private utility main lines and service lines) have been located in the field and marked. Under OAR 952-001-0090, a permitee may not excavate for any work other than emergency repairs until the existing utility facilities have been affirmatively located and marked in the field. Prior to constructing a utility facility in an improved existing right-of-way based on the best information available, show the existing utilities on the construction plans in the plan and profile views as clearly and accurately as possible (based on available records), and have the existing facilities marked in the field by the appropriate agency. Planning of the proposed utility facilities shall be done jointly with the City Engineer in order to determine the most feasible route and depth. The City Engineer may require additional vertical and horizontal clearance to protect existing utility facilities from damage or for safety or maintenance reason.

h) A proposed private manhole cluster (i.e. a group of two or more proposed manholes serving the same type of utility that are generally spaced less than 50 feet apart) shall not be located within 300 feet of a signalized intersection, including future intersections planned by the City.

i) If a new utility facility must be located within the paved area of the street, to the extent commercially reasonable and practicable, the facility shall be located so that the edge of the pavement cut is not within an existing pavement patch or a wheel path. If, due to site conditions, the edge of a street cut must be in a wheel path, the City Engineer may require removal of additional pavement.

j) To the extent commercially reasonable and practicable, new underground utility vaults, manholes, and other structures with at-grade access doors, manhole covers, or other access facilities that encroach into the sidewalk shall be located on the projection of a common property line between two parcels or as far apart as possible.

k) After pot-holing (exploratory excavation) or other window cut excavating has been performed in an arterial or collector street that has been paved or resurfaced within the previous five (5) years, or other street that has been paved or resurfaced within the previous three (3) years, pavement restoration shall be performed in accordance with section 210.19.

11. At-grade and Aboveground Facilities to be Installed in Existing Improved Public Rights-of-way.

a) At the option of the applicant and subject to rules promulgated by the Oregon Public Utility Commission (PUC), the requirements of this Subsection 210.18.D.11 apply to surface mounted transformers, surface mounted connection boxes, telephone pedestals, power supplies, surge suppressors, tap/splitters and other similar facilities to be installed by an electric power, telephone, cable television or telecommunications utility company in an existing public right-of-way.

b) The requirements of this Subsection 210.18.D.11. do not apply to the following existing or proposed aboveground utility facilities: utility poles, overhead utility lines, guy wires, street light poles and luminaries, traffic signal poles, signal cabinets, temporary utility service facilities during construction, or high capacity electric lines operating at 50,000 volts or above.

c) All proposed at-grade and above ground utility facilities to be constructed, relocated, or upgraded within a public right-of-way including but not limited to those required for electric power, telephone, cable television, and telecommunications, shall be located and constructed as follows:

(1) They shall conform to the provisions of this manual except as expressly provided otherwise herein, as amended from time to time, or by applicable local, state, or federal law.

(2) To the extent commercially reasonable and practicable, they shall be installed in such a manner as to minimize the disturbance of their surroundings, natural and man-made, to the extent consistent with City franchises and applicable local, state, and federal law. In determining the extent of said disturbance for purposes of permitting, the City shall consider public health, safety and welfare, private property rights, and impacts on property amenities and values to be paramount.

(3) To the extent commercially reasonable and practicable, they shall be located within 10 feet of a lot corner.

(4) To the extent commercially reasonable and practicable, proposed aboveground utility facilities governed by this design manual that are commercially available in equivalent underground models acceptable to the utility shall be installed underground unless placing said equipment underground would create a safety hazard or impair the maintenance or repair of public utility facilities. Electric and gas meter sets, gas regulator stations, cathodic protection test stations, power transformers are exempt from this requirement.

(5) When underground installation of a proposed new utility facility in an existing public right-of-way is not allowed or is not commercially reasonable or practicable, the applicant shall consider alternative aboveground facilities and their locations in the order of preference prescribed by Subsection 210.18.D.11 to the extent commercially reasonable, practicable, and consistent with applicable local, regional, state, and federal law. Facility replacements installed in the same location as the facilities they are replacing are exempt from this requirement unless said replacement would perpetuate or create a safety hazard or impair the maintenance or repair of an existing public utility facility. Enclosures to be installed underground shall be manufactured specifically for underground service.

(6) If an applicant believes that it is not commercially reasonable and practicable to install such equipment underground and desires an exemption on that basis, the applicant shall submit to the City Engineer in a form conforming to Section 145

Design Modifications and acceptable to the City Engineer, a written explanation regarding the hardship associated with, or unfeasibility of, underground installation. The City Engineer shall review the explanation, shall consult with qualified utility industry representatives and decide whether the underground installation is commercially reasonable and practicable, and shall inform the applicant of their decision within 14 calendar days. An applicant seeking an exemption from this requirement for all future installations of its equipment shall submit to the City Engineer; (1) a letter requesting exemption, and (2) a comprehensive manual for its facilities, including descriptive literature and engineering data for all proposed equipment, cabinets, node housings, pedestals, and other enclosures. The letter and manual combined shall contain sufficient information for the City Engineer to determine whether underground installation is commercially reasonable and practicable. Any class of utility facilities for which the City Engineer determines underground installation to be not commercially reasonable and practicable shall be granted an exemption, subject to the City Engineer's revocation of their determination for reasonable cause at any time.

(7) The location of proposed above ground utility facilities shall be in accordance with the following order of preference to the extent commercially reasonable, practicable, and consistent with applicable state or federal law, and the standards and operating requirements of those power, gas, telephone, cable TV, and telecommunications companies operating within the City of Sherwood on the Current Revision Date of the *Engineering Design and Standard Details Manual*:

(a) Adjacent to non-residential properties in an area where no modification to the existing right-of-way would be required and existing landscaping is present to screen the facilities from view.

(b) Adjacent to side or rear yards of residential properties, preferably on major streets where no modification to the existing right-of-way would be required and existing landscaping is present to screen the facilities from view.

(c) As close as possible to the common property line between the front yards of residential properties where no sight distance from driveways would be obstructed.

(d) At corner residential lots, aboveground facilities shall not be located at the lot corner nearest the intersection, except with the City's prior approval, and then only if the aboveground unit(s) will not obstruct the sight triangle at the intersection.

(8) To the extent commercially reasonable and practicable, proposed new relocated, and upgraded at-grade and aboveground private utility facilities of any kind shall be located so as to minimize impairments to the relocation, extension, upgrading, operation, and maintenance of existing public street and utility improvements, adjacent private property and improvements thereto, including driveways,

landscaping, trees, shrubs, plants, groundcover, lawn, surfacing and other improvements.

(9) Proposed new, relocated, and upgraded at-grade and aboveground utility facilities shall not:

(a) Obstruct the line of sight requirements at intersections or driveways.

(b) Obstruct or hinder the opening of a door or a vehicle parked at curbside, in a designated parking space, or adjacent to a residential driveway.

(c) Obstruct disabled access along public sidewalks to the extent that a minimum clear passage width of 4 feet would not be maintained.

(d) Interfere with any existing or proposed infrastructure improvement projects.

(10) To the extent commercially reasonable and practicable, an applicant proposing the installation, relocation, or upgrade of an aboveground utility facility that is 2 feet or more in height as measured above the surface of the nearest curb, sidewalk, or driveway, shall locate said facility at a common lot corner between adjacent lots and should locate said facility as far as possible from other existing aboveground utility facilities that are 2 feet or more in height. In addition, aboveground utility facilities located in the planter strip should be located at the same distance from the curb as other utility facilities along the planter strip to create a uniform setback distance and appearance.

(11) A new at-grade or aboveground utility facility shall not be located in an existing public right-of-way in such a way as to require the removal of an existing tree. Any removal or pruning of a tree is subject to the provisions of the City Code Title on Zoning and Community Development Code.

(12)To the extent commercially reasonable and practicable, a utility proposing to install a new, relocated, or replacement facility shall consider minimizing the number of above ground utility facilities that would be clustered together and shall consider minimizing over-concentration of at-grade and above ground utility facilities (including existing and proposed facilities), For purposes of this section, over-concentration is defined as 3 or more aboveground utility facilities, each of which has an aboveground volume of 1½ cubic feet or more that are less than 10 feet apart.

(13) The height of a proposed new aboveground cabinet, housing, pedestal, or other aboveground facility, including any facility replacing an existing facility, that is taller than the applicant's existing units in the immediate area and is to be located in a public right-of-way adjacent to the front, side, or rear property line of a residentially zoned property, may not exceed the permitted height of fencing as determined at the property line.

(14) New at-grade and aboveground utility facilities, including but not limited to transformers, enclosures, cabinets, housings, pedestals, power supplies, surge suppressors, tap/splitters and other utility facilities, shall be constructed of durable, new, or like-new materials, shall be green, tan, or brown colored.

(15) To the extent commercially reasonable and practicable, all at-grade and aboveground utility facilities are subject to current City ordinance(s) relating to removal of graffiti.

(16) A proposed aboveground utility facility shall not be located immediately in front of a building, structure, of public stairway such that it causes a violation of ADA guidelines for pedestrian passage and shall not obstruct pedestrian passage from private property to the public right-of-way.

(17) Private utility services stubbed to the right-of-way line or to a public utility easement and terminated there may be terminated with a riser extended up to the ground surface, provided the top of the riser s is cut off and capped flush with the ground surface.

(18) Prior to constructing an at-grade or aboveground utility facility, a public or private utility shall meet or confer with all persons entitled to notice under Subsection 210.18.H. of this manual and shall make reasonable accommodation of those persons' needs relating to their work schedule, noise, and other emissions access to those person's property, and the appearance of that property during and after the utility's construction.

(19) All new aboveground utility facilities in existing improved public rights-of-way shall be screened from view. To the maximum extent commercially reasonable, practicable, and consistent with the utilities standards and operational requirements, new at-grade and aboveground utility facilities including new facilities replacing existing facilities, that are 3 feet or more in height, shall be screened from view through the use of fencing, walls, landscaping, or other means that match the type and color of surrounding features including but not limited to existing fencing, buildings, other structures, and landscaping, and shall comply with the *City Code*.

E. Coordination of Trench, Conduit and Enclosure Construction and Joint Occupancy in an Existing Public Right-of-way.

1. When the City or another entity notifies a permitee that two or more utilities are planning to work in the same existing right-of-way, the permitee and the other utilities shall coordinate their work to the extent commercially reasonable and practicable to reduce space requirements, conflicts and the impacts of utility construction activities on the right-of-way and adjacent private property. Underground utility cables and conductors serving the same or different types of utilities shall occupy the same trench where commercially reasonable and practicable. When the City requests utilities to coordinate their proposed work, their failure to do so in accordance with this subsection will be

grounds for the City to suspend their permit(s) for the work until they perform such coordination satisfactorily.

2. In furtherance of the public purpose of reduction of rights-of-way excavation, it is the goal of the City to encourage shared occupancy of underground electrical and telecommunications trenches, bored conduits, and casings.

   a) City Use. In the course of the City's review of plans of a private utility for work that disturbs an existing public right-of-way or public improvements, the City may request installation of facilities at the City's cost for the City's use.

   b) Use of City Utility Facilities. If the City has constructed underground utility facilities and those facilities have excess capacity, the City may require private utility companies proposing to construct new facilities along approximately the same route to consider use of the City's excess capacity on mutually agreed upon terms.

3. Joint Trenching. To the extent commercially reasonable and practicable, multiple private utility facilities to be constructed in the same existing public right-of-way shall be located in a joint trench as illustrated in the *Standards Manual* of the Oregon utilities Coordinating Council.

F. Utility Facilities Operation and Maintenance. Utility Facilities shall be operated and maintained as follows:

1. Except for lawful releases from natural gas facilities, utility facilities shall not emanate noise that exceeds the City's noise standards nor discharge hazardous or toxic liquids or gases to the surrounding environment.

2. The utility shall maintain all facility screens to be in conformance with ADA requirements and other applicable law.

3. To the extent commercially reasonable and practicable, all at-grade and aboveground utility facilities are subject to current City ordinance(s) relating to removal of graffiti.

4. The owners of at-grade enclosures and aboveground cabinets, housings, pedestals, and other aboveground facilities shall keep their facilities in good condition structurally, mechanically, electrically, and aesthetically free of dents, scratches, gouges, rust, peeling paint, loose parts, and in a level upright (plumb) position.

G. Notification of Adjacent Property Owners and Tenants.

1. Prior to beginning construction under a site development permit or a right-of-way permit the utility shall give the City Engineer and the occupants of building(s) within 100 feet of project construction activity adequate written notice by mail or by a "door hanger" notice. Said notification may be addressed to "occupant" and shall be given no less than 5 days before the work is to begin. Said notification shall clearly identify the location and type of work to be performed, the anticipated date and time that the work is to be performed,

and the name and telephone number(s) of the utility company's representative(s) that a property owner should call to contact the utility. In addition, if the proposed construction will extend 500 feet or more in length or the expected duration of the construction is one (1) month or longer, the utility shall also notify the Neighborhood Association Committee (NAC), contact the City Community Services Director for the NAC contact's address currently on file at the City.

H. Consultation with Adjacent Property Owners.

1. A private utility shall meet or confer with any person entitled to notice under Subsection "F" above and shall make reasonable accommodation, as determined by the City Engineer, of that person's needs relating to the work schedule, access to that person's property, and the appearance of that property during and after the utility's construction.

I. Project Sign.

1. Except as otherwise noted herein, private utility work done under a site development permit or a right-of-way permit that is not associated with a city, county, or state project and disturbs the right-of-way or public facilities for a distance of 500 feet or more, or over a project duration of 30 calendar days or more, shall, at least 24 hours before beginning work, be posed for the benefit of pedestrian and vehicular traffic with a post-mounted sign.

   a) The sign shall be posed on the job site at all entrances, using a 2¾-inch high (series D black on orange) letters. The sign shall read as follows:

   "CONSTRUCTION WITHIN THE DEVELOPMENT SHALL BE LIMITED TO 7:00 AM TO 6:00 PM MONDAY THROUGH SATURDAY, AND 8:00 AM TO 5:00 PM SUNDAYS. HOWEVER, SITE CLEARING, EARTH MOVING, INSTALLATION OR CONSTRUCTION OF UNDERGROUND UTILITIES, PAVING OF STREETS AND SIDEWALKS, FOUNDATION FRAMING AND POURING, AND STRUCTURE FRAMING SHALL BE ENTIRELY PROHIBITED ON SUNDAYS".

   b) The sign shall be conspicuously posted by and at the expense of the developer at each and every entry to the development stating these work hours and shall be maintained through buildout. The City Manager shall have the authority to wave these requirements in the event of emergency or in the City Manager's opinion, justifiable cause.

J. Construction Operations.

1. Construction facilities, equipment, tools and materials shall be stored at the construction site as inconspicuously as possible and for the shortest period of time possible. If construction operations are suspended due to inclement weather conditions or for other reasons, the permitee shall monitor its construction facilities, equipment, tools and materials at the work site frequently and ensure that they remain stored in a safe, orderly and inconspicuous manner. The permitee shall monitor temporary traffic control at the

construction site daily and shall maintain a safe flow of traffic with minimum interruptions and inconvenience to motorists, bicyclists and pedestrians.

2. To minimize the impacts of private utility construction, the total area of public right-of-way disturbed during construction of private utility facilities that are governed by these standards shall be kept to a minimum. In addition to the requirements of Section 150.5 and 150.6, the following requirements apply:

    a) In the excavation of pot-holes, low impact, non-invasive excavation methods such as "VacX", "SafeX", "Air-spade" or other similar methods shall be used to the maximum extent commercially reasonable and practicable.

    b) In the exaction of open trenches, bore pits and other excavations, the length of open trench shall be kept to a minimum, and the number of unrestored bore holes and other excavations during construction shall be kept to a minimum. The City Engineer shall be the sole judge of the extent of construction disturbance allowed, the amount of open trench allowed, and the number of unrestored bore hole and excavation sites allowed based on vehicular traffic, pedestrian traffic and other work conditions of the area. In normal cases, the maximum allowed total length of open trench shall not exceed 200 feet; the maximum allowed total length of pavement cut that has not been restored temporarily (i.e., steel plated or temporarily patched with cold-mix asphalt concrete) shall not exceed 400 feet; and the maximum allowed number of bore holes and excavation sited that have not been restored permanently shall not exceed 4 concurrently. In addition, the maximum allowed total length of trench pavement cut that has not been restored permanently (i.e., patched with hot-mix asphalt concrete (HMAC) or Portland cement concrete (PPC) pavement, as required by the permit) shall not exceed 1000 feet.

K. Cleanup and Restoration.

1. This section applies to all private utility work in a public right-of-way and to a public utility easement that is already occupied by a public utility facility, whether or not a City permit is required, and supplements the requirements of Section 150.6 of this manual "Preservation, Restoration and Cleanup", as used herein, includes all labor, equipment and materials needed to maintain the work area in an acceptable condition during construction and to restore the work area to its condition prior to start of construction, or better condition, as required to meet current construction standards, properly upon completion of the work. Any utility replacing an existing line or facility or installing a new or upgraded line or facility in an improved public right-of-way or easement shall perform the cleanup of their work area as an ongoing process that is performed on at least a daily bases. Materials and equipment shall be confined to as small an area as possible and maintained in an orderly fashion. Excavated material, backfill and other materials and equipment stockpiled at the work site shall be confined so as not to spill outside of the immediate area of work. Temporary traffic control devices shall be monitored daily and maintained in their proper location and position. Materials and equipment removed from the immediate work site by vandals or others without permission and left nearby shall be returned promptly to the work site by the utility. Garbage and debris from

lunches or breaks shall be removed from the work area immediately. Packing cases and wrapping material for materials delivered to the work area shall be removed as soon as they are emptied or unwrapped. Unused or unneeded construction materials, including conduit ends, cable ends and other remnants that are not be used shall be removed from the work area promptly. Sod, shrub and tree trimmings, whole shrubs, trees and other vegetation that are irreparably damaged by the work shall be removed from the work area promptly. The City Engineer may require a work site to be temporarily fenced with construction fencing if, in his/her judgement, the site has been unsightly, unmaintained or unconfined for an excessive period of time, is a nuisance or is hazardous.

2. The utility is responsible for erosion control in accordance with OAR 340-41-455 and must remove all debris such as excess excavated soil, tree limbs and chunks of concrete except any debris that the adjacent property owner and the utility agree is to be left on his/her property. The utility shall obtain written permission from a property owner who allows the utility to leave debris on the property owner's property and shall provide a copy of same to the City on request.

3. Damaged sidewalk shall be repaired promptly to its pre-existing condition or better, in conformance with current ADA standards to the extent commercially reasonable, and in a workmanlike manner, but this section does not require the utility to construct additional new sidewalk. All sidewalk panels, sidewalk wheelchair ramps, and driveway aprons damaged by utility construction shall be removed completely and the damaged panels replaced, unless otherwise approved by the City Engineer. In the replacement of individual sidewalk panels, the City Engineer may allow the replacement panels to match the width of the original panels where they join the remaining existing sidewalk, even though the original panels did not comply with ADA standards, except that individual panels in wheelchair ramps shall be replaced with new panels that comply in all respects with ADA standards, except the utility will not be required to remove signs, utility poles or other obstructions that were in the existing sidewalk or wheelchair ramp. To the extent commercially reasonable and practicable, the utility shall make accommodations for the City to remove existing obstructions and upgrade adjacent existing sidewalks that are not ADA-compliant, all of which shall be done at the City's cost.

4. The concrete mixture used in sidewalk repairs shall be a 3,300 psi mixture at 28 days. At least 24 hours prior to pouring concrete, the permitee shall request that the City Engineering Inspector inspect the forms, subgrade, thickness and other construction details. Prior to removing any sidewalk, the permitee shall place signs announcing that the sidewalk is closed. Such signs shall be placed at all intersections leading to the sidewalk where work is being performed. All sidewalks removed for construction along collector and arterial streets shall be plated (or patched with a hard durable material such as compacted ¾"- 0" crushed rock, asphaltic concrete or equivalent material approved by the City Engineer) at the end of each workday. All sidewalks removed for construction along residential streets shall have lighted barricades installed at each end of the removed section at the end of each work day or patched with a hard durable material such as compacted ¾ "- 0" crushed rock, asphaltic concrete or equivalent material. No sidewalk may be left in an impassable condition for a period exceeding 5 workdays without the prior approval of the City Engineer. All sidewalk wheelchair ramps that are disturbed

("disturbed" being defined here as any physical damage or alteration which causes the existing ramp to become either nonfunctional or in need of repair if over 10 percent of the ramp) shall be reconstructed to current City standards. Existing sidewalks shall be kept free of obstructions except in those cases where, in the City Engineer's judgment, the sidewalk must be obstructed or removed for construction purposes. If a sidewalk must be obstructed or removed, the sidewalk shall be restored as described above or an alternate walkway shall be provided within 4 hours.

5. If a permitee cuts, damages or otherwise disturbs a paved or hard-surfaced existing street or sidewalk, said permitee shall do so only if specifically permitted by the City Engineer and shall repair the damage and restore the surface to its original condition, or better condition as required to meet current construction standards, satisfactory to the City and as specified in this section and Section 210.19 of this manual.

6. If a permitee disturbs a landscaped area, planted area, established grassed or lawn area or surfaced area (with gravel, bark dust, wood chips or other material), the permitee shall repair the damage and restore the area to its original condition in conformance with Section 150.6, or better condition as required to meet current construction standards, and shall maintain the restored area until any new plants are established. The permitee shall replace all damaged established grassed and lawn areas with healthy sod and shall replace other grassed areas with hydro-seeded grass.

7. A person who disturbs a public right-of-way shall schedule the work to ensure that the period of time the work site is disturbed (during mobilization, construction, restoration and cleanup) is kept to a minimum. Disturbed areas of the right-of-way and, where applicable, public utility easements shall be restored as quickly as possible. Permit applicants are cautioned that the expiration time specified in the site development permit is not necessarily the minimum time in which the portion of the work that is within existing public right(s)-of-way and, where applicable, public utility easement(s), is to be completed, and that the City expects the permitee to complete that work earlier than other work, if possible. Notwithstanding the repair of sidewalks as specified above, in no case may any disturbed area of the right-of-way or applicable public utility easements go un-restored for more than 30 calendar days, nor may any area of a public utility easement, where applicable, go unrestored for more than 7 calendar days, unless the permitee obtains written permission from the City for a longer period of time when justified by inclement weather, unusual delays in the delivery of materials, or other conditions not under the permitee's control. If a permitee is delinquent in cleaning up or restoring a disturbed area, allowing for such extensions of time as may be granted by the City, and the City notifies said permitee of the delinquency, said permitee shall complete the restoration within 14 calendar days of receiving notice from the City. If the permitee fails to restore the right-of-way or public utility easement, the City shall cause such restoration to be made at the permitee’s expense. The City Engineer may grant the permitee an extension of time for completion of permanent restoration if there are extenuating circumstances that justify the extension, if the permitee requests an extension of time in writing and the permitee agrees to implement such temporary restoration measures as may be required by the City Engineer, including temporary walkway surfacing, paving or other improvements.

L. Damaged and Disassembled Utility Facilities.

1. Utilities shall take reasonable care to ensure that damaged, disassembled or partially disassembled cabinets, node housings, pedestals and other aboveground utility facilities that pose a safety hazard, have been substantially damaged or disassembled or are unsightly are restored satisfactorily by the utility reasonably promptly. If the City or another entity notifies the owner of a facility that said facility has been damaged materially, and repair or replacement of the facility is commercially reasonable and practicable, the owner shall restore, repair or replace the damaged facility to satisfactory condition within 30 calendar days from the date the owner was notified, providing the repair is commercially reasonable. This requirement applies to all such facilities, whether disassembled for a utility construction project or damaged by accident or vandalism. The owner and the City shall determine jointly whether the damage is material and repair is practicable.

M. Relocation of Utility Facilities.

1. Upon the City's determination that an existing utility facility in a public right-of-way must be relocated (to the extent consistent with current franchise agreements) to allow construction or maintenance of public improvements or that it must be modified when the public interest requires, the City shall give said facility's owner 90 calendar days notice before the facility must be relocated. Upon discovery that a utility facility in a public right-of-way appears to be abandoned and the City determines that said facility shall be abandoned formally or relocated, the City shall give the facility's owner (at the owner's address on file at the City) 90 calendar days notice that the facility be relocated or formally abandoned in accordance with all City requirements.

2. If a utility does not respond within 90 calendar days to a city notice as per Subsection M.1 above, the city may declare the facility to be nuisance obstructing public right-of-way pursuant to *City Code* and may abate the nuisance.

N. Security for Performance and Maintenance.

1. Bonds or similar security for performance and maintenance are required for all utility work performed under a city site development permit or right-of-way permit. The security for performance shall be 125 percent of the full amount of the work to be performed within the right-of-way, as estimated by the utility and approved by the City Engineer for general accuracy. The security for maintenance against defects in the permitted work shall be for 25 percent of the value of the work as built and shall be in effect for at least 2 years following the City's written approval of the work. The City Engineer may require that the maintenance security remain in effect for a longer period, if the completed work is not in conformance with all City requirements.

2. If allowed by the permitee's franchise agreement with the City, the City Engineer may accept a combination performance and maintenance "blanket bond" or other type of

"blanket" security for all utility work to be done by a single permitee at one or more locations or times in a calendar year (e.g., utility work that the permitee anticipates may be done under more than one permit). Said blanket security shall be in conformance with the requirements of the Site Development Ordinance, shall be for a period of up to 1 year, and shall be in a form approved by the City Attorney. The blanket security shall be for the full amount of the work to be performed within the right-of-way, as estimated by the utility and approved by the City Engineer for general accuracy. If at any time during the effective period of a blanket security the total estimated cost of the permitee's uncompleted work is expected to exceed the original amount of the security, the City Engineer may require the permitee to increase the amount of the security accordingly. In addition, the City Engineer may review each blanket security upon its expiration, may determine whether a new security is required, whether the amount of the security is sufficient, and may require that the amount of the security be increased accordingly (e.g., if the scope or cost of the project has increased materially).

O. Additional Submittal Requirements.

1. Organization and Content of Submittals for Utility Facilities:

   a) For private utility work that is to be a part of a new subdivision or other development, the permit submittals shall be in conformance with Section 115 and Subsection 210.18.0.2 of this manual.

   b) For utility work that requires a right-of-way permit, the permit submittals shall be in conformance with Section 115 and Subsection 210.18.0.2 of this manual. The construction plans shall be separate plan sheet(s) conforming to Subsection 115.2 of this manual and Subsection 210.18.0.2 below or as otherwise required by the City Engineer.

2. In addition to the minimum requirements set forth in Section 115 of this manual for plan submittals, the following items shall be additional minimum requirements for approval of engineering plans for utility construction work requiring a site development permit or a right-of-way permit. Plans shall contain at least the following information (the City Engineer may request additional information):

   a) The business name of the utility that is constructing the proposed facilities and the name, address and telephone number of the utility's contact person, including an after-hours telephone number, fax number and e-mail address;

   b) The name, address and telephone number of the utility contractor and the name and telephone numbers (office and mobile) of the contractor's contact person, including and after-hours telephone number, fax number and e-mail address;

   c) The name, address and telephone number of the design firm that prepared the plans and the name and telephone numbers (office and mobile) of the design firm's contact person, including and after-hours telephone number, fax number and e-mail address;

d) The business name(s) of the utility or utilities that will use the proposed facilities and the names, addresses and telephone numbers of the utility's or utilities' contact person(s), fax number and e-mail address, unless ORS 757.270 et seq. applies;

e) In the Plan view, the locations and descriptions of proposed underground and aboveground conduits, conductors, and cables (for direct-bury cable);

f) In the Plan view, the locations and descriptions of proposed underground structures, including vaults and other enclosures, including any drainage piping and power supply cabinets and conductors;

g) In the Plan view, the locations and descriptions of proposed aboveground utility improvements, including cabinets, housings, pedestals and other enclosures, with their locations shown to scale;

h) In the Plan view, the locations and descriptions of proposed utility poles;

i) For those proposed underground utility facilities that will be installed in existing streets and will cross existing or planned future public utility facilities and private sewer service lines, a profile view showing the location, depth size, type and number of proposed underground utility facilities, and to the extent the information is available or given to the utility by the City, the existing and planned future utility facilities (public and private) that are parallel with and within a 3 foot radius of the proposed facilities, and showing in cross-section all existing and planned future utility facilities to be crossed by the proposed underground facilities based on the best as-built information available, regardless of the method of construction to be used for installing the proposed underground facilities, (i.e., trench or trenchless construction);

j) If multiple underground conduits are being proposed, typical cross-sectional views showing the location, depth, size, type and number of proposed underground and aboveground private utility facilities, regardless of the method of construction to be used for installing the proposed underground facilities (i.e. trench or trenchless construction);

k) The method(s) of construction to be used for installing each run of underground utility lines (i.e, trench or trenchless (directional drilling) construction); and,

l) Application fee as set forth in the City Code or subsequent resolution, unless otherwise prescribed in the applicant's franchise agreement with the City.

3. For facilities permit, plan sheet(s), if required by the City Engineer, shall be in conformance with Subsection 115.2, with the following exceptions:

a) The requirement of 115.2.A that plans be submitted on 22 x 34-inch or 24 x 36-inch plan sheets is optional. The plans may also be submitted on 11 x 17-inch or 8½ x 11-inch sheets.

b) Subsections 115.2.D.1 and 115.2.D.2 are waived. (No Title sheet or composite utility plan sheet is required.)

c) Subsections 115.2.D.3 through 115.2.D.8, 115.2.E (preferred but not required), 115.2.G, and 115.2.I are waived.

d) Subsections 115.2.1.A.2 through 115.2.1.A.4, 115.2.1.A.7 through 115.2.1.A.13, and 115.2.1.A.15 through 115.2.1.A.19 are waived.

e) Subsection 115.2.2 is waived. (Profile views are not required.)

f) Subsection 115.3 is waived. (A site grading plan is not required.)

g) Subsection 115.4 is waived. (Drainage calculations are not required.)

h) Subsection 115.5 and 115.6 are waived.

i) Subsections 210.18.O.2.i, 210.18.O.2.j and 210.18.O.2.l are waived. (profile information, cross sections and an application fee are not required.)

4. If the method of construction identified in Subsection 210.18.0.2.k above must be changed or any other aspect of a proposed utility facility governed by these standards must be changed materially during construction, the permitee shall inform the City of the change(s). The permitee shall make a reasonable effort to inform the City of the change(s) in writing before proceeding with that aspect of the construction, but a revisions of site development permit shall not be required unless the proposed facility is to be located in a newly pave or resurfaced street (an arterial or collector street that has been paved within the previous 5 years or other street that has been paved within the previous 3 years and the proposed change will require a street cut, in which case Section 210.19 will apply.

5. The proposed locations of the utility lines and other utility facilities shown in site development permit or right-of-way permit submittals shall be dimensioned in sufficient detail to allow the city to determine their proposed locations accurately in the field. Where the proposed utility facility is planned to be located 5 feet or less from an existing or planned future public utility facility, and upon completion of the proposed utility facility its actual location deviates from its planned locations more than 2 feet in the horizontal or more than ½ foot in the vertical, and the deviation will cause a safety hazard, substantial maintenance difficulties, or substantial additional future construction costs for the City, the City may require the utility company to re-install the facility in its correct location or make other adjustments approved by the City, unless prior approval of said deviation was granted by the City in writing. Upon completion of construction, the utility shall provide the City as-built construction plans in accordance with Subsection 210.18.P below. The City's receipt of as-built construction plans containing deviations from the City-approved plans shall not constitute the city's approval of those deviations.

6. The requirements of Section 160 of this manual shall apply to any revisions of the City-approved construction plans for private utility facilities governed by site development permits and right-of-way permits, including, but not limited to, descriptions of

aboveground enclosures and the method of construction to be used for installing underground utility lines (i.e., trench or trenchless construction), except that if an unforeseen condition is encountered during construction and requires a revision of the approved site development permit or right-of-way permit plans, as applicable, and to obtain the City's prior approval of the appropriate Permit revision would create a traffic disruption, a safety hazard or an unreasonable financial burden for the permitee due to a construction delay or other factors, the permitee may proceed with the work, but shall inform the city of the revision as soon as possible and shall promptly seek City Approval of the Permit revision. However, nothing in this subsection constitutes a waiver of the requirements of the preceding subsection. Further, failure to comply with said Section 160 and this subsection will be grounds for the penalty imposed under *City Code* Title 16 for each incident of unapproved revision(s) in the approved permit plans.

P. As-built Drawings.

1. In addition to meeting the requirements of Subsection 115.8 regarding as-built drawings, as-built drawings for utility work governed by the *City Code* and these standards shall:

   a) Be submitted in a generally recognized format (electronic file, i.e. autocad or pdf file),

   b) Show all material deviations from the original approved plans,

   c) Indicate the location and depth of the completed facilities, and

   d) To the extent practicable, be accurate to within plus or minus 1 foot in the horizontal and plus or minus ½ foot in the vertical for underground utility facilities, and to within plus or minus 2 feet in the horizontal and plus or minus 1 foot in the vertical for aboveground utility facilities.

2. Upon request, the City will provide a person any pertinent as-built information on existing utility facilities that the City has on file and is approved for public distribution.

3. When the City, from any information available to it, discovers errors in as-built information provided by a utility, the City may require the utility to correct the as-built drawings for said facilities and to provide the City copies of the corrected drawings within a reasonable time after the City notifies the owner of the inaccuracies.

4. As-built drawings for projects designed on a CAD system shall be submitted to the City in hard copy form (on Silver Halide Contact Mylar) and, with matching detail, in electronic form (on CD ROM disks). As-built drawings in electronic form shall be in Auto CAD (latest version) format (.dxf or .dwg), and shall be compatible with the City's Windows software.

5. As City staff time and resources allow, the City may create and maintain as-built overall system maps for the private utilities that request such maps and reimburse the City for their preparation and maintenance thereafter. The City may deem such product

proprietary and may recover its costs incurred in developing and reproducing the product as allowed by Oregon law. The City will include in the maps only the facilities of those private utilities that provide the City copies of their maps of their existing systems and provide financial support for the City's mapping program. The details of the City's private utility system mapping program shall be defined in interagency agreements between the City and utilities.

Q. Requests for Exemptions

1. Requests for exemptions from the requirements of Section 210.18 require approval by the City Engineer. The procedures for processing such requests shall be the same as specified in Section 145 Design Modifications, except in order for the City Engineer to grant an exemption, the following criteria must be met:

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

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

   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, or

   d) The requested exemption is minor and, if granted, will not materially compromise public safety, accessibility for the disabled, community esthetics, the stability of adjacent property values, land use compatibility between proposed aboveground utility facilities and neighboring land uses, the capacity of the City's infrastructure, the cost-effective use of public rights-of-way, or the cost-effective construction, operation, maintenance and repair of the City's infrastructure, or

   e) In cases where the applicant is claiming an economic hardship relative to a proposed aboveground facility and is proposing an equivalent alternative for the proposed above ground facility, and the proposed alternative can accomplish the same design objectives and will not compromise community esthetics, the stability of adjacent property values, land use compatibility between proposed aboveground utility facilities and neighboring land uses, the capacity of the City's infrastructure, the cost-effective use of public rights-of-way, or the cost effective construction, operation, maintenance and repair of the City's infrastructure.

2. The City Engineer shall notify the applicant of the decision within 14 calendar days of receiving the applicant's request. The applicant may appeal the City Engineer's decision to the City Council.

210.19 Trenching and Street Cuts

A. This subsection applies to all trenching and street cuts performed within the City of Sherwood, regardless of whether the work requires a permit or not.

B. Prohibited Street Cuts.

The City will not allow, without the appropriate City right-of-way permit or prior written approval of the City Engineer or Public Works Director, potholing (exploratory excavations), "keyhole" cuts or other circular street cuts that are 2-inches in diameter or greater, or installation of an underground facility requiring a street cut. The following is a list of exceptions to this policy. These exceptions do not require the City Engineer's approval; however, the appropriate documents must be submitted with the application for any street cut permit:

1. An arborist determines that boring would pose greater risk to a significant or protected tree than a conventional open street cut, and the applicant provides the City Engineer a letter documenting that determination; or

2. The engineer of record determines that the only possible vertical location of the line would be within the structural section (i.e., the existing required aggregate base course) of the street and applicant provides the City Engineer a letter documenting that determination; or

3. The street cut is in AC pavement and will be restored by a 2-inch deep grind and 2-inch thick (minimum) HMAC inlay. A transverse street cut shall also include a minimum of a 2-inch deep grind and 2-inch thick (minimum) HMAC inlay that extends for a distance equal to the street width from both sides of the trench, or an inlay with an alternative distance from both sides of the trench as required by the City Engineer to ensure that no settling or loss in pavement life is expected. A longitudinal street cut shall also include a minimum of a 2-inch deep grind and new HMAC inlay that extends over the entire width of the street and over the entire length of the trench plus the street width beyond both ends of the trench, or an inlay with a 2-inch thickness (minimum) with larger dimensions as required by the City Engineer, to ensure that no settling or loss in pavement life is expected. On street cuts for excavations over 10 feet deep, and on street cuts for excavations over 5 feet deep that are in weak pavement sections, severely deteriorated pavement, poor soils, saturated soils, or high groundwater, the City Engineer may require the owner or developer to retain the services of an engineer specializing in pavement design to analyze the inlay requirements, recommend inlay dimensions that will ensure that no settling or loss in pavement life is to be expected, document the analysis with supporting data in a written report bearing the engineer's seal, and submit the report to the City Engineer for approval.

4. A permitee may apply for additional exceptions by submitting a formal request for a Design Modification to the City Engineer in accordance with Section 145 Design Modifications of this manual.

C. Requirements for Street Cuts and Pavement Restoration.

1. General

a) Street cuts and pavement restoration (repair and resurfacing/replacement) shall be in conformance with Section 210.19, the Standard Details for street cuts, the conditions of the permit and the current requirements of other agencies.

b) The final cut of existing pavement shall be a "T-cut" (also known as a T-section or cutback), in which the existing pavement is cut back a specified distance away from the edge of the excavation as shown on the standard details for street cuts except that circular street cuts 12-inches or less in diameter do not require T-cuts.

c) The minimum dimensions of any initial street window cut for an exploratory excavation shall be 2 feet by 2 feet, except that the maximum size for street cuts for potholes using non-destructive vacuum excavation shall be 1 foot in diameter.

d) If a street cut is parallel with, and less than 3 feet from an existing curb or curb-and-gutter, the permitee shall remove the existing pavement within the street cut and the intervening existing pavement between the street cut and the curb or curb-and-gutter using a T-cut that encompasses the entire area of pavement that has been removed, and shall replace the removed pavement in accordance with this manual and standard details.

e) If a street cut is parallel with, and less than 5 feet from another street cut made by the permitee or a visible, pre-existing street cut that shows signs of distress determined to be unacceptable by the City Engineer, the permitee shall remove the existing pavement in the two street cuts and the existing pavement between the two street cuts using a T-cut that encompasses the entire areas of pavement that has been removed, and shall replace the removed pavement in accordance with this manual and the standard details.

f) All street cuts shall be in a straight line and to a vertical plane. The cut lines shall be parallel to the centerline of the trench and shall be neat, straight and vertical.

g) Irregularly shaped (non-rectangular or non-circular) street cuts and street cuts with more than 4 sides will be allowed only with the express approval of the City Engineer.

h) A street cut that will be partially or wholly within an existing pavement patch will not be allowed unless the street cut is widened to include the entire width of the existing patch.

i) A street cut within 5 feet of two or more valve box covers, manholes covers, grates or other castings, or combinations thereof, in the street shall encompass all of those castings that are within 5 feet or less of another casting.

j) Angles in T-cut Lines. The number of angles in a final pavement cut shall be kept to a minimum. At intersecting pavement cut lines, no angle shall be less than 75 degrees, unless expressly approved or required by the City Engineer.

k) Marking T-cuts, inspection and approval by City Engineer. Before the final pavement cuts for the permanent resurfacing are made, the boundaries of the T-cuts shall be marked with white spray paint and must be inspected and receive the approval of the City Engineer.

l) Contiguous Street Cuts. To ensure the structural integrity of the pavement, at each location where a permitee has made 2 or more contiguous street cuts (i.e., trenches or window excavations), or a combination thereof, the City Engineer may require final pavement cuts and restoration in a single rectangular area that encompasses the contiguous intersecting street cuts and may also require an HMAC inlay in that rectangular area.

m) T-cut lines for trenches that are 12-inches wide or less shall be a minimum of 6-inches outside the excavation's walls. T-cut lines for trenches that are more than 12-inches wide shall be a minimum of 1 foot outside the trench walls, except that the City Engineer may require T-cuts to be further outside the trench walls if the trench walls are widened after the initial cut due to sloughing, additional excavation or other causes, in which case the City Engineer may require the T-cuts to be widened to more than 1 foot outside the trench walls as required to reach undisturbed, stable subgrade. In such cases the permitee shall remove the additional pavement and replace the entire area of removed pavement in accordance with this manual and the Standard Details entirely at the permitee's expense.

2. HMAC Pavement Street Cuts.

a) Street cuts in HMAC pavement shall be in accordance with Sections 210.19.A and 210.19.B, the following requirements and the Standard Details for street cuts in PCC streets, unless otherwise directed by the City Engineer.

b) The minimum dimensions of the final street cut for a trench in HMAC pavement will be greater than the size of its initial cut because the City requires that all final cuts be T-cuts, which are outside the initial street cut.

c) Cutting Methods. In HMAC pavement, all initial pavement cuts (cuts prior to excavation) shall be made by saw cutting or grinding. Final cuts (T-cuts) shall be by grinding or saw cutting, except that for HMAC overlays and inlays the final cutting shall be done only by milling or grinding with a drum grinder.

3. PCC Concrete Pavement, Sidewalks, Curbs and Curb-and-Gutter Cuts.

a) Street cuts in PCC pavement, driveways and sidewalks shall be in accordance with Sections 210.19.A and 210.19.B, the following requirements and the Standard Details for street cuts in PCC streets, unless otherwise directed by the City Engineer.

b) On PCC-paved arterial streets and non-arterial streets that are bus routes or truck routes, the minimum pavement restoration shall be full panel replacements of all cut panels and all damaged panels.

c) On PCC-paved non-arterial streets that are neither bus routes nor truck routes, a minimum pavement restoration area that is less than full panel (partial panel) replacement may be approved by the City Engineer unless one or more of the following conditions exists:

(1) Unstable subgrade conditions. The street cut is in an area of pavement with subgrade that is known to be unstable or frequently saturated from subsurface drainage and the City Engineer requires full panel replacement to compensate for such subgrade conditions.

(2) Removal of more than 50 percent of a panel: In any panel where the cut removes (or requires removal of) more than 50 percent of the panel.

(3) Diagonal Cuts: Any diagonal cut that is not parallel to a diagonal panel joint will require full panel replacement.

(4) Cuts leaving a panel in 3 pieces: Where a proposed cut will leave a panel in 3 or more pieces, the entire panel shall be removed and replaced.

d) Less than Full Panel (Partial Panel) Replacement. Partial panel replacement will be allowed if the cut is not in an arterial street, bus route or truck route or if the cut is entirely within the median lane or center turn lane of an arterial street, bus route or truck route, and if none of the conditions listed in Section 210.19.B above exist. Except for window cuts for exploratory excavations that are 2 feet or less in length and width, if the cut is entirely within the median lane or center turn lane of an arterial street, bus route or truck route, in order for the cut to be allowed, it must first meet the following criteria:

(1) The cut must be a longitudinal cut that is at least 100-feet long and at least 6 feet wide, and

(2) One edge of the cut must be on one of the lane lines along its entire length, and

(3) The cut must remove less than 50 percent of the panel width at all points, and

(4) Both ends of the cut must be at least 200-feet from the nearest intersections on each end (as measured from the intersecting centerlines of the intersection.), and

(5) The cut must be 3 feet or more from an existing longitudinal joint or 5 feet or more from an existing transverse joint, any other patches (new or existing) or any existing cracks in the panel being cut that are determined by the city Engineer to require removal and replacement.

e) Initial street cuts in other roadways, except window cuts for exploratory excavations, shall be 6 feet by 6 feet, minimum.

f) Additional panel removal. If the initial cut is less than 3 feet from a longitudinal joint or 5 feet from a transverse joint or other patches (new or existing) or cracks, the intervening portion of the panel must be removed.

g) Pavement Panels with Curbs. If the edge of the initial cut is less than 36-inches from the face of a curb, the intervening portion of the panel and curb must be removed and replaced.

h) Pavement Replacement on Edges of Panels without Curbs: Pavement replacement on the longitudinal (outside) edge of panel without a curb shall be a minimum of 3 feet in width.

i) Additional Responsibility. If any pavement between the cut and the nearest joint, crack, or another cut, as described above, becomes disturbed or unserviceable before the time of restoration, it must be removed and replaced entirely at the permitee's expense.

j) Saw cutting. The minimum depth of any saw cut on PCC pavement or on asphalt over PCC pavement shall be in accordance with the Standard Details for street cuts. Subsequent removal shall be accomplished by using a jackhammer. The use of a machine utilizing a falling or swinging weight (a "head-ache ball" will not be permitted. No cutting wheel runout will be permitted beyond the limit of the opening of the cut or on adjacent panels on arterials, bus routes and truck routes. The slurry resulting from the cutting operation shall be contained, collected and disposed at an appropriate disposal site. No such material shall be disposed of in any storm drain system.

k) Jackhammers and Line Drilling. Use of jackhammers and line drilling is authorized (for initial cuts only) providing the holes shall be 1½-inches in diameter, and the maximum spacing between holes shall be 6-inches, center to center. The holes shall be drilled perpendicular to the base and completely through the pavement.

l) Direction of Cuts. Cuts shall be made parallel and/or perpendicular to longitudinal and transverse joints.

m) Cut Enlarged by City. If the cut conforms to the above rules and the Department removes additional pavement, the replacement of the additional portion of the panel shall be at the expense of the city. Note: The application of these rules may sometimes require the replacement of more than 50 percent of a pavement panel requiring full panel replacement, even though the initial cut itself covered less than 50 percent.

n) Damage to Adjacent Panels. If an existing PCC pavement panel adjacent to a street cut is spalled, chipped, cracked, uplifted, tilted, undermined, depressed or otherwise damaged during construction, it shall be replace in its entirety by the permitee's expense.

o) Sidewalk cuts. The minimum cut in a concrete sidewalk shall be one full sidewalk panel.

p) Structural Failure of and Damage to Restored PCC Pavement. Restored PCC pavement, whether full panel or partial panel, that fails structurally or is damaged prior to the end of the maintenance period shall be replaced completely. See Section 210.19.B.13 for additional requirements.

q) Cutting Methods. In streets other than arterials, collector streets, bus routes and truck routes, the final cut of PCC concrete pavement, curs, curb-and gutter and sidewalks shall be sawcut to a minimum depth of 4-inches or half the concrete thickness, whichever is greater. Subsequent removal may be accomplished by using a jackhammer. The final pavement cut shall be ground or sawcut, as applicable, consistent with these standards. The pavement shall be cut in a straight line and to a vertical plane, regardless of the shape or condition of the initial cut. The cut lines shall be parallel to the centerline of the trench and shall be neat, straight and vertical. Full-depth saw cutting and doweling may be done at the permitee's option, per the Standard Details, at the permitee's expense. The use of a machine utilizing a falling or swinging weight (a "head-ache ball") will not be permitted. If an existing PCC pavement panel adjacent to a street cut is spalled, chipped, cracked, uplifted, undermined, depressed or otherwise damaged during construction, it shall be replaced in its entirety by the permitee entirely at the permitee's expense.

r) Re-cutting Unsatisfactory Cut Edges. Prior to resurfacing (patching), if the ground or sawcut face of a final cut is spalled, jagged, frayed, cracked, uplifted, undermined, depressed or otherwise unsatisfactory, the City may require the cut to be re-done by saw cutting in sound pavement up to 12-inches from the edge, in continuous straight cuts, which shall be done by the permitee in accordance with Subsection 210.19.C.10 below.

4. Temporary Pavement Patching and Steel Plating. Pavement restoration shall be as required by this section and the approved plans. After the trench has been backfilled, the pavement may be patched temporarily by using cold mix HMAC or bridged over by steel plates. (Exception: Circular cuts in HMAC pavement shall be patched temporarily only with hot mix asphalt concrete. Cold-patched are not allowed.)

a) Pavement repairs made to emergency excavations will be considered temporary and must be inspected and restored in accordance with the requirements for final pavement cuts and permanent pavement restoration hereinafter.

b) Permanent replacement of pavement, curb-and-gutter, sidewalk and driveway cuts shall e completed within 30 calendar days from the date the pavement is initially cut,

unless and extension is granted by the City Engineer for inclement weather or other adverse conditions.

c) If cold mix asphalt is used as a temporary patch, the compacted thickness of the cold mix shall be at least 2-inches. The contractor shall monitor the patch and maintain a smooth driving surface by promptly correcting any irregularities in the pavement surface that deviate from the proper street grade or cross-section by plus or minus 1/4-inch or more. All temporary patches shall be replaced with a permanent resurfacing no more than 30 calendar days after the pavement is cut, provided the applicant makes daily inspections and makes any necessary repairs on a timely basis. If the temporary patch is not monitored and maintained, or if the temporary patch creates uncomfortable driving conditions, the City Engineer may shorten the 30 day time limit to as few as 14 calendar days. If the temporary patch creates unsafe driving conditions, the City reserves the right to shorten the time limit as conditions warrant.

d) If steel plates are used, they shall be secured firmly to the pavement with cold mix around their perimeter so that they do not move horizontally, rattle, bounce or make unnecessary noise. If a steel plate becomes detached from the pavement or makes unacceptable noise, the Contractor shall take remedial action within 4 hours or less. If a steel plate becomes detached from the pavement repeatedly, the City may require the Contractor to secure said steel plate to the pavement with anchors and/or spikes. Steel plates may be used for a maximum of 14 calendar days, at the end of which the contractor shall complete permanent restoration of the pavement. If requested by the permitee, the City Engineer may grant an extension of this time frame for inclement weather or other adverse conditions. If the steel plates create unsafe driving conditions, the City reserves the right to shorten the time limit as conditions warrant.

5. Restoration of Damaged Adjacent Pavement.

a) Before paving, the City Engineer may require the permitee to expand the pavement restoration area and T-cut beyond 1 foot from the initial cut lines, at no additional expense to the City, and require the permitee to repair subsidence, rutting, cracks, gouges, punctures, contamination and other damage to the adjacent pavement that occurred after the permitee's initial pavement cut.

b) If any pavement between the cut and the nearest joint, crack or other cut becomes disturbed or unserviceable before the time of restoration, and prior to the end of the performance period, it shall be removed and replaced by the permitee entirely at the permitee's expense.

6. Backfilling. All backfilling shall be in conformance with this and other sections of this manual and the standard details.

a) All approved rectangular street cuts that are 12-inches wide or less and in streets of a higher functional classification than "local" shall be backfilled with approved Controlled Density Fill (CDF).

b) All approved rectangular street cuts that are 12-inches wide or less and in streets classified as residential or local streets may be backfilled with compacted crushed rock aggregate backfill material or approved CDF. A permitee desiring to use CDF must submit a written request to the City Engineer and obtain the City Engineer's approval in writing prior to use.

c) All other approved street cuts shall be backfilled with compacted crushed rock aggregate backfill material except as may be approved or required otherwise by the City Engineer, except that circular or "keyhole" cuts shall be backfilled with CDF, or approved lean concrete mix for the entire depth of the core below subgrade.

d) In narrow trenches that are wider than 12-inches, the permitee may substitute CDF for crushed aggregate backfill with the express approval of the City Engineer.

7. Approval of Final Pavement Cuts/T-cuts. The City Engineer must approve the edges and corners of final pavement cuts/T-cuts before permanent pavement reconstruction may proceed. If the edge or corner of the final pavement cut, or the face, edge, or surface of the pavement immediately adjacent to the final pavement cut/T-cut, becomes deteriorated, deformed, rolled (rounded), depressed, undermined, dirty, contaminated, raveled, cracked, unsound or damaged in any way that, in the City Engineer's opinion, might interfere with the proper bonding of the new asphalt to the existing asphalt, interfere with proper sand sealing of the joint, or create an irregular pavement surface at the joint, the City Engineer may require re-sawcutting of the existing pavement along a new cut line that is further from the initial street cut, at no expense to the city. If required by the City Engineer, irregular edges of pavement cuts shall be prepared by the permitee for permanent resurfacing by either grinding the edges smooth or sawcutting a new, smooth edge before resurfacing.

8. Pavement Restoration after T-cuts. The restoration of pavement after T-cutting shall be in accordance with the Standard Details for street cuts, as applicable, and the additional requirements below:

a) HMAC Surfacing on Flexible Base: The compacted thickness of the permanent HMAC pavement resurfacing shall be at least 2-inches thicker than the original HMAC up to a maximum total thickness of 6-inches in local streets and neighborhood routes and 7-inches in collectors and arterials, unless the City Engineer requires a thicker pavement section. The top 2-inches of the HMAC resurfacing (the HMAC wearing course) shall be constructed of Level 2, ½" Dense hot mix AC compacted to 92 percent of theoretical maximum density (Rice), and the underlying HMAC base course shall be Level 2, ¾" Dense or Level 2, ½" Dense hot mix AC compacted to 92 percent of theoretical maximum density (Rice). The AC shall be placed in a minimum of 2 lifts, with the maximum thickness of any one lift not exceeding 2½-inches. The Rice theoretical maximum density shall be as determined in conformance with AASHTO T209, as modified by ODOT.

b) Full-depth HMAC Pavement on Compacted Subgrade: The compacted thickness of permanent HMAC pavement resurfacing replacing existing full-depth HMAC pavement shall be at least 2-inches greater than the original HMAC's thickness, unless the City Engineer requires a thicker pavement section of up to a maximum of 4-inches greater than the original thickness. The top 2-inches of the HMAC resurfacing (the HMAC wearing course) shall be constructed of Level 2, ½" Dense hot mix AC compacted to 92 percent of theoretical maximum density (Rice), and the underlying HMAC base course shall be Level 2, ¾" Dense or Level 2, ½" Dense hot mix AC compacted to 92 percent of theoretical maximum density (Rice). The HMAC shall be placed in a minimum of 2 lifts, with the maximum thickness of any one lift not exceeding 2½-inches. The Rice theoretical maximum density shall be as determined in conformance with AASHTO T209, as modified by ODOT.

c) AC Surfacing on Cement Treated Base (CBT) or Portland cement concrete (PCC) Base. CTB and PCC base courses shall be replaced with new PCC pavement conforming to Section 210.2.4. The thickness of the PCC base replacing original base shall be at least 2-inches thicker than the original base, but not less than 8-inches thick in any case. The HMAC wearing course shall conform to the requirements for HMAC wearing course and base course in the preceding subsection.

d) Full-depth PCC Pavement. The permanent resurfacing for full-depth portland cement concrete pavement shall be new full-depth PCC pavement that is 2-inches thicker than the original pavement it is replacing, but not less than 8-inches thick in any case. The permanent PCC resurfacing shall be high early strength 5,000 p.s.i concrete and shall be constructed in accordance with Subsection 210.2.4. In addition, Fibermesh be Synthetic Industries, Inc. and Eclipse concrete shrinkage reducing agent by Grace Construction Products shall be incorporated into the PCC resurfacing in accordance with the manufacturers' recommendations.

9. Replacement to Proper Grade and Cross-section. When existing pavement abutting a curb or curb-and-gutter is removed and restored, the gutter's existing/original grade and cross-section shall be maintained (matched) except that when the existing/original pavement did not drain properly and exhibited areas of localized ponding (i.e., a "bird bath") such areas of ponding shall be eliminated when the pavement is restored. The City Engineer shall provide documentation of said ponding upon request from the permitee. Elsewhere, the surface of the final resurfacing shall match the existing/original pavement's grade and cross-section, except that a patch or inlay may increase the height of the street's crown and the street's cross-slope if expressly approved by the City Engineer. When existing structures such as manholes, catch basins, concrete curb-and-gutter, and valve boxes are within the area to be resurfaced and are to be preserved, the resurfacing shall match the top of the existing finished grade of these facilities unless otherwise required or approved by the City Engineer.

10. City Request for Additional Resurfacing. If the existing pavement adjacent to a street cut has failed or is defective with respect to surface quality, structural condition, grade, cross-section or any other aspect before the work begins, by no fault of the permitee, or is damaged during the work by no fault of the permitee, the City Engineer may request the

permitee to expand the pavement restoration area, at the City's expense, to correct high or low spots in the pavement surface or to repair deteriorated or damaged pavement, and to replace pavement markings and stripes removed from the expanded restoration area. The permitee may decline such request without penalty.

11. Replacement of Existing Driveways, Sidewalks, Curb, Curb-and-Gutter, Castings and Structures. Existing driveways, sidewalks, curb, curb-and-gutter, castings and structures that are to be preserved but have been removed by the permitee or its excavator shall be replaced with the same material or better as required to meet current construction standards, and to the same section, width, depth, surface texture, color and finish, line and grade as that removed unless current standards require otherwise. If high early strength concrete is being used in restoring pavement that is adjacent to other PCC concrete improvements that must be restored, the same concrete mix shall be used in reconstructing the other PCC concrete improvements, if all of the concrete can be poured successively without additional expense other than the additional cost of the high early strength concrete. Damaged sidewalk ramps shall be reconstructed in accordance with current ADA requirements. Broken or jagged ends of existing concrete shall be sawcut on a straight line and to a vertical plane. Prior to replacing the concrete sections, the subgrade shall be backfilled to proper grade and cross-section and compacted to 95 percent AASHTO T-99 to prevent subsequent settlement. All concrete replacement work shall be completed prior to the placement of adjacent AC resurfacing.

12. Joints in permanent HMAC Resurfacing. Tack coat shall be emulsified asphalt grade CSS-1 and shall be applied to the existing pavement, existing curb or gutter, and edges of sawcuts and grinds as specified in the *Oregon Standard Specifications for Construction*. After the resurfacing and inlay areas are permanently paved and rolled, the joints shall be sand sealed the same day with paving asphalt cement, grade AR4000W, or CSS-1 emulsified asphalt, and dry paving sand, which shall be applied before the asphalt cement solidifies. If the joints are not sand sealed the same day, the Contractor shall seal the joints with crack sealing compound, cold or hot pour type, conforming to ASTM D3405. All sand sealed joint surfaces and crack-sealed joint surfaces shall be smooth and flush with the adjacent pre-existing pavement surface. There shall be no bumps, dips or noticeable roughness in the riding quality of the completed resurfacing.

13. Surface Smoothness. The surface smoothness of pavement, driveways, sidewalks, monolithic curb-and-gutter, and barrier curbs restored by the contractor (i.e., the permanent resurfacing) shall conform to the *Oregon Standard Specifications for Construction*. Resurfaced pavement shall provide motorists a smooth, quiet ride equal to or better than the original pavement. Resurfacing that does not meet these requirements shall be corrected only by removing the resurfacing by sawcutting and re-paving the unacceptable area.

14. Correction of Defective Work. If a street cut is repaired and the replacement pavement fails to meet the pavement mix requirements, compaction requirements, surface smoothness requirements or any other pavement requirements of the Engineering Design Manual or permit conditions upon completion of the pavement repair, or anytime within a

period of 2 years thereafter, the defective pavement shall be replaced by the permitee entirely at the permitee's expense.

a) Defective Restored HMAC Pavement. In addition to removal of the area of defective pavement, a new wider "corrective" T-cut and removal of the entire original restoration area in which the defect exists and for a minimum distance of 25 feet beyond the defective restoration area longitudinally in both directions and 3 feet transversely outside the original T-cut area in both directions or 9 feet in width, whichever is greater, will be required, unless expressly approved or required otherwise by the City Engineer.

b) Defective Restored PCC Pavement. Replaced PCC pavement shall be deemed "defective" if it does not meet the above requirements, does not drain properly, does not meet or exceed the required compressive strength or other material specifications, or if it exhibits temperature cracks, excessive shrinkage cracks, structural failure (breakage), spalling, gouging, differential settlement, edge chipping at joints, defective joints or unsightly damage due to external causes. Replacement of a defective area of a PCC pavement panel shall be no smaller than the entire original restoration area of the panel in which the defect exists, up to the full panel, as determined by the City Engineer. Defective PCC in more than one panel of an Arterial street, bus route or truck route will require full panel replacement of all those panels containing defective pavement. The minimum dimensions of T-cuts in PCC pavement, driveways and sidewalks shall be in accordance with sub-section the Standard Details for PCC street cuts, unless otherwise directed by the City Engineer. The PCC concrete used in replacing defective concrete shall have the same color, same finish, same joint pattern, same panel size, shall match the existing concrete that was replace in all other respects, and shall meet the City's standards that are current when the defective concrete is replace, except as may be allowed or required otherwise by the City Engineer.

15. Corrective AC Pavement Inlays. In addition to Subsection 14, immediately above, in existing HMAC pavement that is more than 1 year old, certain types of street cuts, if not restored properly, can shorten the service life of the existing pavement excessively. Therefore, if the HMAC pavement restored by the permitee fails upon completion of the pavement restoration or anytime within a period of 2 years thereafter, the City Engineer may require the permitee to reconstruction the pavement as required in Subsection 210.19.B.14 and, in addition, construct a pavement inlay over the failed area, and for a distance of 25 feet beyond the defective restored pavement in both directions longitudinally, to ensure the structural integrity of the pavement in the restoration area and the adjacent existing pavement.

a) If HMAC replacement pavement does not continue to meet the HMAC pavement requirements of this manual for a period of 2 years after completion of the pavement repair, and the street cut falls into any of the categories listed under the heading "Type of Street Cut" in the table below, then in addition to a wider, corrective T-cut in the failed restoration area and replacement of the failed pavement section as specified in Subsection 210.19.B.14., the City Engineer may require the permitee to

grind the pavement and construct a pavement inlay throughout the area of defective pavement restoration.

b) If the City Engineer requires a corrective inlay, the permitee shall, in accordance with the T-cut and reconstruction requirements above, remove the top 2-inches of the existing pavement by grinding and construct an inlay of Level 2, ½" Dense HMAC in the pavement reconstruction areas specified in the table below:

CORRECTIVE INLAY REQUIREMENTS

TYPE OF STREET CUT	AREA OF CORRECTIVE T-CUT AND PAVEMENT RECONSTRUCTION REQUIRED	AREA OF TWO (2) INCH DEEP (NOMINAL GRINDING AND PAVEMENT INLAY REQUIRED
(1) Street cut is 3 feet or less from existing curb or edge of pavement	a. The area of existing pavement that is within the new street cut, plus b. The area of existing pavement that is between the street cut and the curb or edge of pavement, plus c. The area of existing pavement that is outside and adjacent to the street cut and is at least 3 feet from it in all directions. d. Per Standard Details.	a. The area of existing pavement that is outside, adjacent to, and within at least 1 feet of the corrective "T" cut area. b. Per Standard Details.
(2) Street cut is 5 feet or less from another street cut (inches another new street cut and a visible preexisting street cut)	a. The area of existing pavement that is within the new street cut, plus b. The area of existing pavement that is between the two street cuts, plus c. The area of existing pavement that is outside the street cuts and is at least 3 feet from them in all directions. d. Per Standard Details.	a. The area of existing pavement that is outside adjacent to, and within at least 1 foot of the corrective "T" cut area. b. Per Standard Details.
(3) Series of two or more longitudinal street cuts along the same axis of which two or more are less than 15 feet apart	a. The area of existing pavement that is within the new street cut, plus b. The area of existing pavement that is between the street cuts, plus c. The area of existing pavement that is outside all of the street cuts and is at least 3 feet from them in all directions.	a. The area of existing pavement that is outside adjacent to, and within at least 1 foot of the corrective "T" cut areas, plus b. The area of existing pavement that is 15 feet longitudinally beyond the ends of the end street cuts.
(4) Two or more parallel or transverse street cuts, or two or more small street cuts in succession along the same axis, any two or more of which are	a. The area of existing pavement that is within the new street cuts, plus b. The area of existing pavement that is between the street cuts that are less than 15 feet apart, plus c. The area of existing pavement that is outside the all of the street cuts and	a. The area of existing pavement that is outside adjacent to, and within at least 1 foot of the corrective "T" cut areas of the street cuts that are less then 15 feet apart, plus b. The area of existing

less than 15 feet apart longitudinally or transversely.	is at least three feet from all of them in all directions.	pavement that is between the street cuts that are less than 15 feet apart, plus c. The area of existing pavement that is 15 feet longitudinally beyond the transverse edges of the end street cuts.
(5) Intersecting street cuts, including new street cuts intersecting other new street cuts and new street cuts intersecting visible, pre-existing street cuts, window cuts or pot-holes that are larger than 20 square feet in area.	a. The area of existing pavement that is within the new street cuts, plus b. The area of existing pavement that is outside and adjacent to the new street cuts and is at least 3 feet from all of them in all directions, plus c. The area of additional existing pavement that is necessary to form a single rectangular inlay shape that encompasses the intersecting street cuts at their longest and widest parts.	a. The area of adjacent existing pavement that is outside, adjacent to and within at least 1 foot of the corrective "T" cut, plus b. The area of existing pavement that is within the full width of any travel lanes that have been encroached upon by a new street cut area covering 50 percent or more of their width.

c) Pavement grinding shall be the minimum width necessary for a paving machine to be used for repaving, but shall be limited in maximum width to keep the impacts and cost of pavement restoration reasonable. Unless expressly permitted otherwise by the City Engineer, pavement grinding and inlays shall not be less than 9 feet wide nor more than 13 feet wide, except that where two or more adjacent travel lanes are affected, the City Engineer may require the grinding and inlay to exceed 13 feet in width.

d) Inlay shall fill the entire area of the grind and shall have a compacted thickness of at least 2-inches. The surface of the compacted inlay shall match the surface of the existing pavement at its edges, and the thickness of the inlay shall exceed the depth of the grind where required to produce a smooth, properly graded driving surface, up to a maximum thickness of 2½-inches thick inlay, the City Engineer may request additional thickness as provided in Subsection 210.19.B.8. The additional cost of additional AC that is in excess of 2 percent of the total cost of the AC used in the inlay shall be borne by the city, providing such additional AC is not required as a result of defective work by the permitee.

e) If a corrective inlay is required, the permitee is responsible for all grinding, inlays adjusting the height of all affected existing structures and castings, and replacing pavement markings and stripes removed for the street cut, all of which shall be done by the permitee entirely at the permitee's expense unless the work is being performed under a city contract and the pavement cuts are required by the construction plans and specifications.

f) If an inlay is required, the permitee may elect as an alternative, entirely at the permitee's expense, to sawcut the full depth of the pavement section for the full length and width specified above, rather than grinding only the top 2-inches of the existing pavement. If the permitee so elects, the thickness of the permanent resurfacing shall be at least as the minimum thickness specified in Subsection 210.19.B.8.

16. Conformance with Other City Standards. Replacement of damaged pavement, driveways, sidewalks, sidewalk ramps, curb, curb-and-gutter, and other damaged improvements shall be in accordance with all other applicable City standards, including without limitation those standards for materials, construction procedures, weather conditions, ground temperature, air temperature, asphalt mix temperature and all others. Material testing is required for backfill, aggregate base, HMAC pavement, PCC concrete pavement, concrete driveways, sidewalks, curb, and curb-and-gutter. Compaction shall be as specified elsewhere in the City's standards. If pipe, conduit, backfill, aggregate base, compaction, pavement, sidewalk or driveway replacement, or any other work does not meet City standards and the defective work is expressly, conditionally allowed to remain by Subsection 210.2.2 or another standard, or if the defect is minor and immediate correction is not required by the City Engineer, the City Engineer may require an Extended-period Maintenance Warranty for a period of up to 5 years and in the amount of 100 percent of the City Engineer's estimate of the cost of correcting the defective work by competitive bid contracting, including without limitation construction, engineering, administration, inflationary cost, permits and other appropriate costs.

D. Controlled Density Fill (CDF).

1. The use of approved CDF as trench backfill is an approved method of backfill that the city Engineer may require or allow in lieu of aggregate or native materials as specified elsewhere in this document.

2. Approved street cuts to be backfilled with CDF (also referred to as "flowable fill") shall be backfilled with CDF conforming to Section 00442 of the *Oregon Standard Specifications for Construction* as modified herein. Only CDF approved by the City Engineer shall be used for backfilling.

3. CDF shall not be used for lengths greater than 100 feet. Should the required trench exceed 100 feet, then the City will determine where CDF will be required on a case-by-case bases. When CDF is used, at a minimum, pipe and conduit bedding and pipe/conduit zone material shall be ¾"- 0" aggregate. In addition, the top 12-inches of the trench backfill (below the pavement) shall also be ¾"- 0" minus aggregate to allow subgrade drainage.

4. CDF shall be designed for a minimum compressive strength of 50 psi, a maximum compressive strength of 100 psi in 28 days, and a maximum compressive strength of 150 psi in 90 days. The maximum size of the aggregate shall be ¾-inch of which the mix design shall not contain more than 25 percent by weight.

5. The Engineer of record (or designee) shall be on site while the CDF is being placed in order to ensure that the proper mix is supplied and to ensure that the above minimum drainage requirements are met and, if subsurface drainage is excessive, to instruct the contractor to increase the depth of the ¾-inch minus aggregate to ensure adequate subgrade drainage, especially in conditions where cross drainage occurs (at the low point of sag vertical curves, for example).

6. CDF shall be field tested by an independent laboratory per ASTM PS 28, 29, 30, and D 4832 standards (the field technician shall be ACI Certified or equivalent). The Engineer of Record and the independent laboratory shall record: the name of the supplier (the engineer of record shall include with the daily report a copy of all batch tickets), the temperature of the air, ground, and mix (at time of placement), the weather conditions, ground water conditions, other utilities encountered, and any other information which may affect the material. At a minimum four cylinders shall be taken for each trench and other separate excavation and for each 100 linear feet of trench for trenches that are in excess of 100 feet long, and for each different mix used. These cylinders shall be broken one at 7 days, one at 28 days, and one at 90 days with one reserve cylinder.

7. Prior to paving, the CDF shall be tested per ASTM PS 31 by the independent laboratory.

8. All test reports shall be sent to the City Engineer, the engineer of record, and the supplier. If the test results do not meet the requirements of Section 210 the City shall reject the unacceptable CDF. If the City rejects the CDF, the permitee shall remove the rejected CDF and replace the rejected CDF and pavement above it with approved material and pavement entirely at the permitee's expense.

E. Repair of Circular Exploratory Excavations (Potholes). This section applies to potholing of the type defined in Subsection 1 below and to the restoration of the existing street subgrade and pavement section as specified in Subsection 2 through 6 below:

1. Potholing – any exploratory excavation within the pavement of the curb to curb section of the public right-of-way for the purposes of determining location and depth of existing public or private utilities using a Vactor and resulting in an approximate 2-inch or larger diameter hole of varying depth.

2. Excavated material – All excavated material shall be removed from the site and shall NOT be used for backfill.

3. Backfill Material – The pothole shall be backfilled with clean sand or controlled low strength material for the entire depth of the excavation below subgrade in accordance with Section 210.19.C.6. of this design manual. Crushed aggregate, ¾"- 0", may be used as a backfill material for the top 3 feet of the backfill if the depth of the pothole is more than 3 feet. See Section 210.19.C of this design manual for specification concerning controlled low strength material.

4. Backfill Compaction – The top 3 feet of sand and crushed aggregate shall be compacted with a pneumatic (rammer) type compactor in a manner satisfactory to the City Engineer.

Sand material below the top 3 feet shall be compacted in a manner satisfactory to the City Engineer.

5. Pavement Restoration – The thickness of pavement restoration shall match the thickness of the surrounding pavement or as directed by the City Engineer. The pavement restoration material shall be Level 2, ½" Dense HMAC compacted to a minimum of 92% of the maximum density. PCC pavement material shall be Class 5000 as specified in Section 210.2.4.B.3 of this design manual. The interior surface of the core shall be cleaned before the new concrete is placed in the pothole. For a period of up to 1 month from the date of excavation, temporary cold mix asphalt concrete with a compacted depth of no less than 4-inches may be used until permanent paving can occur. In all cases, the surface restoration shall be flush with the surrounding surface.

6. Pothole Maintenance – The pothole excavator shall be responsible for maintaining the pothole restoration in good condition, free from settlement greater than ½-inch, raveling, cracking and other deterioration for a period of 6 months from the date of excavation.

F. Temporary Steel Plating. Where steel plates are used as temporary road surface they shall comply with the following:

1. Plates shall be A-36 steel meeting AASHTO H-20 loading specifications.

2. Steel plates shall be centered over the roadway cut or trench. No more than ½ of the plate shall span a trench that has been completely backfilled, or no more than 1/3 of the plate shall span a trench that has not been completely backfilled.

3. Uneven pavement surfaces must first be leveled with cold mix before laying plates over trench.

4. Plates shall be secured to the roadway with a minimum of two 1/2-inch or larger steel pins driven a minimum of 6-inches below the surface and at least 18-inches from the edge of the roadcut.
5. Cold patch shall be used to ramp up to the steel plate edges, with a minimum 6-inch ramp per ½-inch difference in grade change between the road surface and the top of the steel plate.

6. Contractor is responsible for maintaining the cold mix around the steel plates until the steel plates are permanently removed.

7. Use of steel plates in travel lanes shall require the contractor to place a 30-inch by 30-inch "BUMP" warning sign for each affected travel direction.

8. Plates shall not be left in the travel lane for more than 5 working days unless approved in writing by the City Engineer.

210.20 Construction Limited Street Requirements

A. Definition

A construction limited street is any of the following City streets, as identified in the City Transportation Master Plan that has been constructed, reconstructed, paved or repaved, overlaid or surface treated, within the following time periods by the City, a City contractor, or a private party pursuant to a right-of-way or development permit.

TSP Street Classification	Construction Limited Time Length
Arterial Streets	5 years
Collector Streets	3 years
Local and Neighborhood Streets	2 years
Downtown Streets (Asphalt)	2 years
Downtown Streets (Concrete)	Indefinite (Construction not allowed)

B. Duration of Limitation

Except as provided in Section 210.20.C. below, the pavement of a construction limited street may not be ground, drilled through, saw cut, or excavated through within the time period described in Section 210.20.A above. The restrictions of this section shall commence on the day that the street has been accepted by the City, as defined by the initiation of the maintenance period, and shall continue through the period described in Section 210.20.A above.

C. Utility and Emergency Repairs within Public Right-of-Way

Construction activity related to the maintenance and/or emergency repair of existing underground utility services shall be allowed with proper notification of the Public Works Director and being in compliance with Section 210.018 – "*Utilities and Other Work in the Public Right-of-Way*", and Section 2010.19 – *"Trenching and Street Cuts"*, except as modified hereinafter.

D. Exceptions

The City Manager or his/her designee may grant an exception to the limitations in Section 210.20.B in order to facilitate development on adjacent properties, provide for emergency repairs to subsurface facilities, provide for underground connections to adjacent properties, or allow the upgrading of underground utility facilities.

When granting exceptions to this regulation, the City Manager or designee may impose conditions determined appropriate to ensure the rapid and complete restoration of the street and the surface paving. Pavement restoration requirements may include surface grinding, base and sub-base repairs, trench compaction, or other related work as needed, and may include up to full-width street pavement removal and replacement.

In addition to the above conditions, any person requesting to work within the City construction limited street right-of-way will be required to:

1. Submit a request to obtain an exception from the requirements of the construction limited street related to the project. The submittal shall include all technical design documents, prepared by a Civil Engineer registered in the State of Oregon, which supports the exception request.

2. Provide a description of any severe economic hardship that the applicant may incur due to the delay of construction until the construction limited street designation has ended.

3. A description of any economic benefit that the City may gain from the construction that will outweigh the loss of pavement service life of the construction limited street.

Upon approval of the exception by the City Manager or designee, the applicant shall provide and obtain the following:

1. Obtain a right-of-way permit from the Engineering Department.

2. Provide stamped engineering plans, specifications, and an engineer's estimate of the work proposed within the right-of-way.

3. Be responsible for the full cost of plan review, construction inspection, material testing, bonding, and all other City expenses related to the work.

4. Provide a performance bond in the amount of 125% of the cost of construction and provide a 2-year maintenance bond in the amount of 10% of the construction cost.

5. Comply with Section 210.18 - "*Utilities and Other Work in the Public Right-of-Way*", and Section 210.19 – "*Trenching and Street Cuts",* of the City's Engineering Design and Standard Details Manual.

E. Exception Review and Determination of Approval

The City Manager or designee will review the exception request submittal and determine if the design and related impacts meet the requirements for additional work delineated in the Engineering Design and Standard Details Manual. The City Manager or designee may impose additional design requirements which meet the intent of maintaining the quality, integrity, and service life of the impacted street surface to the greatest extent practicable.

The City Manager or designee will issue a written decision either approving or denying the application. The City Manager's or designee's decision may be appealed in the manner provided for a writ of review under ORS Chapter 34.

F. Unauthorized Work or Repairs

Violations of this Chapter 210.20 may be enforced by the City in the manner of a violation subject to the jurisdiction of the Sherwood Municipal Court. If a construction limited street pavement is ground, drilled through, saw cut, or excavated through for any reason without authorization, the extent of the damages caused by such actions shall be determined by the City in its sole and exclusive discretion.

The Municipal Court may order the person responsible for a violation to restore the street pavement surface to the standards described in Section 210.18-“Utilities and Other Work in the Public Right-of-Way”, and Section 210.19 – “Trenching and Street Cuts” of the City’s Engineering Design and Standard Details Manual. The Court may include in the order such other conditions the Court deems necessary to ensure adequate and appropriate restoration of the street pavement section.

Alternatively, the Municipal Court may direct the City to perform, either directly or indirectly, the street restoration with the costs of such restoration assessed against the person responsible for the violation.

F. Listing of Construction Limited Streets

The City’s Engineering Department will generate and make public a listing of all construction limited streets within the City’s jurisdiction.

The construction limited street listing will provide the following information:

a. The street name, and beginning and end points of the construction limited street section relative to the nearest cross street intersection.
b. The date (month/day/year) that the designation was established.
c. The date (month/day/year) that the designation will end.

The construction limited street listing shall be updated by the Engineering Department whenever:

a. A construction limited street section has reached the end of the duration of limitation.
b. A construction limited street section is accepted by the City as noted above in Section 210.20.B.

CHAPTER III
STREET SIGNAGE AND TRAFFIC CONTROL DEVICES

310 STREET SIGNAGE AND SIGNAGE SUPPORTS

A. Street signage shall be furnished and erected in conformance with the latest version of the *MUTCD,* the *Oregon Supplements to the MUTCD*, the latest version of the *Oregon Standard Drawings Oregon Department of Transportation*, and the APWA/ODOT *Oregon Standard Specifications for Construction*, modified as noted below. Modifications to these standards must be approved in writing by the City Engineer.

B. Materials:

Aluminum: All post mounted standard highway signs shall have a minimum thickness of 0.08-inches. All overhead signs and street signs shall have a minimum thickness of 0.10-inches.

Plywood: No plywood will be permitted on any sign without prior approval from the City Engineer.

Polyplate: The use of polyplate is not allowed.

Sheeting: Prismatic sheeting shall be used as a background, except for street name signs which can be engineering grade background with prismatic letters.

Posts: When a sign or combination of signs on a post is 36-inches or less in total height, the post shall be a minimum of 2 x 2-inch x 10 foot long, 12-gauge perforated steel post.

When a sign or combination of signs is more than 36-inches in height, the post shall be a minimum of 2 x 2-inch x 12 foot long, 12-gauge perforated steel post or "Unistrut Telespar". The post shall use V-Loc Model 200-VS2, embedded in ¾"- 0" crushed rock, compacted to prevent movement.

Rounded metal posts will not be permitted. Wood posts may be used only with prior approval of the City Engineer and must be configured and drilled for breakaway as per ODOT specifications.

Fastening: Drive rivets shall be used to fasten signs onto metal posts. To prevent vandalism, no nuts or bolts will be permitted to fasten any sign to metal posts. Galvanized steel washers shall be used behind all drive rivets used to affix signs to posts. Two drive rivets at right angles or right angle bolts shall be used to fasten the post to the base.

Medium-Density Overlay: The medium-density overlay shall be a smooth, post saturated resin-fiber surface of Crezon II with a phenolic resin content of not less than 22 percent by weight. Each Crezon II sheet shall weigh not less than 58 pounds per 1,000 square feet of single-face surface area. After application, the thickness of the material shall not be less than 0.012 inch. Panels shall have plugged "C" inner plies and shall be primed on the sign bearing surface with medium oil alkyd primer (buff).

Letter Spacing: Spacing between letters, words, numbers, and/or symbols shall be in conformance with the *Standard Alphabets for Highway Signs* manual.

Abbreviations for Street Name Suffixes:

Avenue	**AVE**	**Loop**	**LP**
Boulevard	**BLVD**	**Place**	**PL**
Circle	**CIR**	**Parkway**	**PKWY**
Court	**CT**	**Road**	**RD**
Drive	**DR**	**Street**	**ST**
Lane	**LN**	**Terrace**	**TER**
		Way	**WY**

Reflective or Non-Reflective Sheeting Application: Manufacturer's splices of sheeting will be permitted. Only one manufacturer's splice will be permitted per sign. No splices by the Contractor will be permitted. If the reflective sheeting needs to be spliced, the splice(s) shall be horizontal with the upper section(s) of the sheeting overlapping the lower by a minimum of 3/8-inch. Only one splice will be permitted per sign.

320 STREET SIGNS

A. Post Mounted: Street name signs shall 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. At least two sets of street name signs will be mount at each intersection.

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

C. Overhead: All overhead street name signs shall be a minimum of 15-inches in height. The minimum letter size shall be 8-inches, Series "C". Prefixes and suffixes shall be 4-inches, Series "C". The City Engineer may, under special circumstances, allow 6-inch letter height in Series "C". The minimum border width for overhead street name signs shall be 5/8-inch and have zero margin. Wide angle prismatic sheeting (3M 3990) shall be used on all overhead signs.

D. See the Standard Details for street signage configuration and details.

330 TRAFFIC CONTROL DEVICES

330.1 Design and Installation Requirements

A. Traffic signal installation shall conform with the latest version of the following:

1. *MUTCD.*
2. Oregon Supplements to the *MUTCD.*
3. *Oregon Standard Specifications Construction* (APWA/ODOT).

4. *Oregon Standard Drawings* (ODOT).

5. *Washington County Signal Construction Standards.*

Note: The Contractor shall submit a copy of the final electrical inspection to the City prior to City acceptance of the signal.

330.2 Design Drawing Requirements

A. Traffic signal installation plans shall consist of the following sheets:

Plan Sheets	Minimum Scale*
1. Legend and General Notes	NTS
2. Signal Plan	1-inch = 20 feet (half size sheets)
3. Detection Plan	1-inch = 40 feet (half size sheets)
4. Pole Entrance Chart Sheet	NTS

*Larger scales than the minimum scales shown may be necessary to depict features clearly and to allow reduction of drawings to one-half their original size without reducing their clarity.

340 TRAFFIC STRIPING AND MARKING

340.1 General

A. Traffic striping and markings shall comply with the *MUTCD* and the *Oregon Supplements to the MUTCD*.

B. Material specifications shall conform to *Oregon Standard Specifications for Construction* and *Oregon Standard Drawings*.

C. Approved striping material and layout shall be submitted to and approved by the City Engineer prior to installation.

340.2 Materials

A. Permanent pavement striping and markings shall conform to the requirements noted on the Standard Details.

B. All Alkyd Hot Thermoplastic pavement marking material shall conform to Section 00850 and Section 00862, of the latest version of APWA/ODOT *Oregon Standard Specifications for Construction.*

C. All painted pavement markings shall conform to the most current ODOT specifications for bead binder paint as listed in ODOT's QPL.

D. Foil back tape may be used for temporary pavement markings only. Temporary markings may be used for:

1. Traffic control during construction only.
2. When the markings are used for a time period not exceeding one (1) month.
3. The use of temporary pavement markings beyond 1 month will require the approval of the City Engineer.

350 STREET ILLUMINATION

350.1 General Requirements

A. All street lighting shall be designed and constructed per the current Illuminating Engineering Society of North America Standards and Washington County Roadway Illumination Standards (Washington County Road Design and Construction Standards, Section 350).

B. All street light plans shall include pole, conduit, junction box, photocell, disconnect boxes and transformer/controller locations.

C. The developer shall submit a photometric analysis showing how the light distribution patterns meet the minimum illuminance and uniformity averages for the road classification and pedestrian night activity levels.

D. The Contractor shall be responsible for making arrangements with PGE to connect new streetlights to the local power distribution system.

E. For installation of a new streetlight or the repair of a streetlight on an existing system that is not associated with a land-use approval for development or a capital improvement project, contact the City of Sherwood Public Works Department.

F. For installation of a new street lighting system associated with a residential subdivision contact PGE Outdoor Lighting Service Dept. The Engineer-of-Record shall submit to PGE electronic survey and site development base files including all existing and proposed underground utilities located in public ROW and easements

G. All street light poles should be located in the planter strip and at least 15 feet from street trees or outside of the mature street tree canopy zone, unless otherwise approved in writing by the City Engineer.

H. The Contractor shall submit a copy of the final electrical inspection notice to the City prior to acceptance of the public improvements.

I. The City and the appropriate natural resource agencies shall determine whether or not lighting shall be provided for shared-use paths in designated natural resource and wildlife areas.

J. Lighting Levels

a. Average Maintained Illuminance on Roadways

MINIMUM AVERAGE MAINTAINED IN FOOT CANDLES (E-avg/E-min)			
Roadway Classification	**High Pedestrian Conflict Area**	**Median Pedestrian Conflict Area**	**Low Pedestrian Conflict Area**
Arterials	1.7 (3.0)	1.3 (3.0)	0.9 (3.0)
Collectors	1.2 (4.0)	0.9 (4.0)	0.6 (4.0)
Neighborhood & Local	0.9 (6.0)	0.7 (6.0)	0.4 (6.0)

b. Average Maintained Illuminance for Intersections

MINIMUM AVERAGE MAINTAINED IN FOOT CANDLES (E-avg/E-min)			
Roadway Classifications	**High Pedestrian Conflict Area**	**Median Pedestrian Conflict Area**	**Low Pedestrian Conflict Area**
Arterial/Arterial	3.4 (3.0)	2.6 (3.0)	1.8 (3.0)
Arterial/Collector	2.9 (3.0)	2.2 (3.0)	1.5 (3.0)
Arterial/Local	2.6 (3.0)	2.0 (3.0)	1.3 (3.0)
Collector/Collector	2.4 (4.0)	1.8 (4.0)	1.2 (4.0)
Collector/Local	2.1 (4.0)	1.6 (4.0)	1.0 (4.0)
Local/Local	1.8 (6.0)	1.4 (6.0)	0.8 (4.0)

350.2 Option "C" Lighting

A. PGE Option "C" lighting shall be the standard lighting option for City required streetlights unless otherwise approved or directed by the City Engineer. Under this option, the developer/contractor installs the required street lights. Once approved and accepted, the street lights are City owned and City maintained. Options "A" or "B" lighting approved by Design Modification only.

B. Lighting Design Responsibilities

a. **Private Development Projects.** The developer is responsible to provide the PGE Lighting Design Specialist with the subdivision streetlight design layout stamped approved by the municipality under whose jurisdiction it falls. This approved layout is to be submitted simultaneously with the subdivision plans.

b. **Capital Street Improvements.** The municipality shall submit the streetlight layout plan to the PGE Lighting Design Specialist along with an approved photometric analysis and streetlight detail.

c. **Park improvements.** The municipality shall provide the PGE Lighting Design Specialist with a set of plans, which include complete streetlight design details.

350.3 Poles and Street Lighting Fixtures

A. Westbrook streetlights with fluted poles shall be installed in residential zones. Aluminum cobra head streetlights with flat lenses and davit arms shall be installed in industrial zones. See standard details for more information on styles. All poles, arms and fixtures shall be listed on the current PGE Approved Street Lighting Equipment Outdoor Lighting Services parts list. Any request for variance from Option "C" and the approved parts list shall be submitted in writing to the City Engineer and Public Works Director for consideration and approval.

350.4 Street Lighting Controls

A. All streetlights and appurtenances shall be provided and installed by the developer at their expense.

B. Streetlights shall be controlled by individual photocells.

C. In systems with lights on both sides of the street, the circuitry shall allow for the lights on one side of the street to be "de-energized" without affecting operation of the lights on the opposite side of the street.

D. Option "C" street lighting shall have a City electrical disconnect box and a PGE electrical disconnect box as approved.

CHAPTER IV
BICYCLE AND PEDESTRIAN FACILITIES

410 GENERAL

A. All bikeway and pedestrian facility development and construction provided and intended for public use shall conform to the following standard specifications. In addition, the City uses the *Oregon Bicycle and Pedestrian Plan* published by the Oregon Department of Transportation and the *Guide for Development of Bicycle Facilities* published by the American Association of State Highway and Transportation officials as guidelines in design of bikeway and pedestrian facilities.

420 SHARED-USE PATHS

420.1 Width and Clearance

A. The minimum paved width for shared-use paths shall be 10 feet. In extenuating circumstances that are due to unique topographic or other constraints such as transitions to existing narrower paths, the City Engineer may approve path widths as narrow as 8 feet. A path width of 12 feet is desirable in areas with high density and mixed use and in areas where a high volume of path user is expected.

B. A minimum of 3 foot width of clear area shall be maintained adjacent to both sides of the pavement, trees, poles, walls, fences, guardrails, or other lateral obstructions.

C. The vertical clearance to obstructions shall be a minimum of 8 feet. However, vertical clearance may need to be greater to permit passage pf maintenance vehicles and, in under crossings and tunnels, a vertical clearance of 10 feet is desirable for adequate vertical clearance.

420.2 Horizontal Curves

A. Shared-use path horizontal curves shall have a minimum 35-foot centerline curve radius. Easements or right-of-way shall be provided as needed to preserve required sight distance.

B. The super-elevation rate (i.e., a raised elevation of one side of the path) may vary from a minimum of 2 percent (the minimum necessary to provide adequate drainage) to a maximum of 5 percent (beyond which maneuvering difficulties by slow bicyclists and adult tri-cyclists might be expected.

420.3 Pavement Structure

A. The minimum acceptable pavement structure shall be three (3)-inches of Level 2, ½" dense hot-mix asphalt concrete (HMAC) above 4-inches of ¾" – 0" crushed rock compacted to a dry density of 95 percent. The path subgrade shall be placed over a soil surface stripped free of any organic material and compacted to 95 percent dry density.

B. Additional asphalt and subgrade reinforcement shall be provided in path sections projected to bear heavy maintenance vehicle traffic. No less than 1-inch additional asphalt should be provided in these areas.

C. Concrete pavement, of a comparable design section, is an acceptable path surface alternative. Longitudinal joints should be avoided.

420.4 Grade

A. Steep grades on shared-use paths should be avoided, especially long inclines. Grades steeper than 6 percent are undesirable because the ascents are difficult for many bicyclists to climb and the descents cause some bicyclists to exceed the speeds at which they are competent. Where terrain dictates, grades over 6 percent and less than 100 feet in length are acceptable if adequate sight distance and stopping distances are provided and approved by the City Engineer. In areas of generally steep terrain, it may be desirable to meander path alignments in order to attain reasonable grades for steep slope ascent. In no case should the approach grade of the intersection of a shared-use path to a sidewalk or street exceed 6 percent for the last 50 feet.

420.5 Sight Distance

A. Adequate sight distance should be provided at curves and intersections to maintain user safety. Along the path, a minimum sight distance of 125 feet shall be provided. On two-way paths, a minimum sight distance of 250 feet is desirable. At path intersections with streets or other paths, all abutting fences, landscaping, and other objects interfering with users' line of sight shall not exceed 3 feet in height above the path centerline grade for 15 feet from the intersecting right-of-way.

420.6 Landscaping

A. There are a number of important design considerations to review when selecting materials and planning planting schemes. Trees are the primary concern regarding location and variety.

B. Specifically, placement and selection of trees should evaluate:

1. Tree rooting characteristics – to avoid potential path surface upheaval.

2. Tree size – trees should be of satisfactory caliper to permit a minimum trimmed height of 8 feet to the lowest branch.

3. Tree placement – to avoid creating "hiding" areas or permitting foliage to block path lighting (if present).

4. Foliage characteristics – the fallen leaves from many species of deciduous trees can create voluminous leaf piles and slippery hazards during the fall season of the year. Therefore, judgment should be given to tree selection based on the respective foliage "shedding" characteristics and the potential to produce resultant hazards.

C. Selection of shrubbery, bushes, and ground covers should include low maintenance varieties that are drought hardy, require little pruning, and are low growing (under 3 feet at mature height). Location and placement of these materials should not promote growth over or onto the path surface.

D. All proposed plant materials shall be approved by the City Planning Department.

E. All trees shall be on the City's approved tree listing.

420.7 Signage and Marking

A. Signage and markings shall be provided in accordance with the *MUTCD*.

420.8 Intersections

A. When intersections occur at grade, a major consideration is the establishment of right-of-way. The type of traffic control to be used (signal, stop sign, yield sign, etc.) shall be selected by application of the warrants in the *MUTCD*. Bicycles shall be counted as vehicles in these determinations, and thus bicycles may be given priority at some intersections.

B. Shared-use path intersections and approaches should be on relatively flat grades (see sections on Grade and Sight Distance). Stopping sight distances at intersections should be checked and adequate warning should be given to permit bicyclists and other users to stop before reaching the intersection, especially on down grades.

C. Where a shared-use path intersects another shared-use path, a minimum radius of 5 feet shall be provided at all corners of the intersection.

D. Where ramps are used at street intersections, the ramp shall have a minimum width of 8 feet.

420.9 Structures

A. Shared-use paths constructed on steep hillside slopes or along drainage ditches where the fill is steeper than 3:1 shall be protected with a handrail system.

B. An overpass, underpass, small bridge, or facility on a highway bridge may be necessary to provide continuity to a shared-use path. On new structures, the minimum clear width should be the same as the approach pave shared-use path and the desirable clear width should include the minimum 1-foot side clear areas.

C. Railings, fences, or barriers on both sides of a shared-use path bridge shall be a minimum of 4.5 feet high. Smooth rub rails should be attached to the barriers at a handlebar height of 3.5 feet.

D. Bridges designed exclusively for bicycle traffic may be designed for pedestrian live loadings. On all bridge decks, special care should be taken to ensure that bicycle safe expansion joints are used. Decking boards shall be placed so that board joints are transverse to the direction of normal bike travel.

420.10 Lighting

A. Fixed-source lighting reduces conflicts along paths and at intersections. In addition, lighting allows users to see the shared-use path direction surface conditions and obstacles. Lighting for shared-use paths is important and should be considered for-shared-use paths serving commuters, providing access to transit stops, and at highway intersections. Lighting should also be considered through underpasses or tunnels and when nighttime security could be a problem. However, lighting is not appropriate in some wildlife habitat areas where wildlife may be disturbed. The City and the appropriate natural resource agencies shall determine whether or not lighting shall be provided for shared-use paths in significant natural resource and significant wildlife areas.

B. Pedestrian pathways shall be lighted to the standards of Section 350.

420.11 Vehicle Traffic Restrictions

A. Shared-use paths often need some form of physical barrier at roadway intersections to prevent unauthorized motor vehicles from using the facilities. Provisions can be made for a lockable, removable post (or "bollard") to permit entrance by authorized vehicles. See the Standard Details for Removable Vehicle Barrier Post. A single bollard in the center of the path is preferred in order to allow two-way bicycle travel. When more than one post is used, a 5-foot spacing between posts is desirable. Wider spacing can allow entry to motor vehicles, while narrower spacing might prevent entry by adult tricycles and bicycles with trailers.

B. An alternative method of restricting entry of motor vehicles is to split the entryway into two 5-foot sections separated by low landscaping. Emergency vehicles can still enter, if necessary, by straddling the landscaping. The higher maintenance costs associated with landscaping should be acknowledged and approved by the Public Works Director before this alternative method is selected.

420.12 Property Dedication

A. If the shared-use path is intended for public use, it shall be located in a property corridor having a minimum width of 15 feet. At the time of site development, the property corridor shall be dedicated to the public or to an appropriate public agency. The dedication may be as an easement, right-of-way, or dedication of property. Documents showing such dedication shall be submitted for the City's approval prior to issuance of a site development permit.

430 ON-STREET FACILITIES

430.1 Bicycle Lanes

A. Bicycle lanes shall 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 (e.g., those caused by heavy bus traffic).

B. The minimum width for bike lanes shall be 5 feet and the maximum width shall be 6 feet. Where a longitudinal joint exists (such as the joint between street paving and gutter) within the bike lane, there shall be a minimum clear width of 3.5 feet between the joint and the edge of the bike lane.

430.2 Shared Roadway

A. On highway sections without bicycle lanes, a right lane wider than 12 feet can better accommodate both bicycles and motor vehicles in the same lane and thus is beneficial to both bicyclists and motorists. In many cases where there is a wide curb lane, motorists will not need to change lanes to pass a bicyclist.

B. Also, more maneuvering room is provided when drivers are exiting from driveways or in areas with limited sight distance. In general, a lane width of 4 feet of usable pavement width is desired for a shared lane. Usable pavement width would normally be from curb face to lane stripe, or from edge line to lane stripe, but adjustments need to be made for drainage grates, parking, and longitudinal ridges between pavement and gutter sections. Widths greater than 15 feet can encourage the undesirable operation of two motor vehicles in one lane, especially in urban areas, and consideration should be given to striping as a bicycle lane when wider widths exist.

440 BICYCLE PARKING STANDARDS

440.1 Number and Location of Bicycle Parking Spaces

A. The number and location of bicycle parking spaces required in new development is specified in the *Community Development & Zoning Code.*

B. Bicycle parking shall be visible and conveniently located for cyclists.

C. Bicycle parking shall offer security in the form of either a stationary rack to which the bicycle can be locked, a bicycle locker, or inside a building or lockable enclosure.

D. Bicycle parking spaces shall not obstruct walkways.

E. Bicycle parking for multiple uses may be clustered in one or several locations.

F. Short-term bicycle parking is encouraged to be located on site within 50 feet of a primary entrance. If there are site, setback, building design, or other constraints, short-term bicycle parking shall be located no more than 100 feet from a primary entrance in the closest available area to the primary entrance as determined by the decision-making authority.

G. For buildings with multiple entrances, short-term bicycle parking spaces shall be distributed proportionately.

H. Directional signage to the bicycle parking should be provided if the parking is not directly visible and obvious from an entrance or public right-of-way.

440.2 Bicycle Parking Design

A. A bicycle parking space shall measure at least 19-inches wide by 6 feet in length and shall have a vertical clearance of 7 feet. A width of 2 feet is encouraged.

B. The minimum distance between rows of bicycle parking spaces shall be 5 feet.

C. Minimum clearance between a bicycle parking space and a wall or structure shall be 2 feet.

D. Bicycle parking spaces shall be separated from motor vehicle parking spaces by at least 5 feet of clear space.

E. Every bicycle parking space shall be accessible without moving another bicycle.

F. Examples of acceptable bicycle parking space configurations are shown in the standard details.

440.3 Covered Bicycle Parking Spaces

A. Required covered bicycle parking spaces shall be provided in a location that protects the bicycle from prolonged direct exposure to the elements. The locations shall be acceptable to the City review authority. Examples include but are not limited to: inside a building or a bicycle locker, under a roof overhang or awning, within or visible from an individual's office, or in the case of multi-family residential units, within a unit.

B. Cover for required long-term bicycle parking is required. School buildings are exempt from covering long-term bicycle parking is required. School buildings are exempt from covering long-term bicycle parking.

440.4 Bicycle Parking Facility Design

A. A bicycle rack shall accommodate common bicycle frame sizes and styles including bicycles without kickstands.

B. A bicycle rack shall support the bicycle frame at a minimum of two contact points; one contact point shall be the frame.

C. A rack shall allow both the frame and two wheels to be locked to the rack with the use of a cable or the frame and one wheel to be locked to the rack with a U-type lock.

D. Bicycle racks and bicycle lockers shall be securely anchored to concrete with vandal-resistant concrete mounting hardware.

440.5 Bicycle Parking Lighting

Bicycle parking spaces shall be lighted to the standards of Section 350.

CHAPTER V
WATER SYSTEM

510 WATER SYSTEM DESIGN

A. The following section is intended as a guide for the design, installation, and testing of water system improvements. All design, construction, testing, and maintenance, where applicable, shall conform to the latest adopted revision of the Oregon Department of Health Services Administrative Rules Chapter 333 on Public Water Systems except where the provisions herein exceed same. 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. 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. All products shall be “American made”.

2. Minimum size mains shall be 6-inch, except that 4-inch may be permitted on runs less than 300 feet, when there will not be more than eight 1-inch services, where no fire hydrants are required, and when there is no possibility of future extensions.

3. 10-inch and 14-inch size pipes are not accepted by the City.

4. Water mains will generally be located on the south and east sides of the street 6-feet from face of curb to pipe centerline. Water mains along looped streets or curved streets will not switch sides of the street (in looped streets keep the water main on either the inside or outside of the loop). Water mains in streets with development only along one side of the street will be placed 6-feet from the face of curb adjacent to the lots served in order to minimize service line length and to avoid “long side” connections to fire hydrants. The Engineer may provide preliminary sketches to the City Engineer and request advice regarding water main layout prior to submittal of drawings for approval. The Engineer is responsible for the design of the pipeline to insure maximum pipe joint deflection is not exceeded.

5. Dead end mains normally shall not be allowed. When they are permitted, a blow off assembly will be required. In the event that the "dead end" finishes where there is risk of a vacuum being created due to water shut down, then a combination air and vacuum release valve meeting the city’s standard drawings requirements shall be installed.

6. Main extensions shall be installed through new developments to allow a logical extension of the City waterline grid and to allow future development of adjacent undeveloped or underdeveloped properties (*Sherwood Municipal Code*). Mainline extensions will be located within the public right-of-way unless the City grants specific exception.

7. Valves shall be located at intersections whenever possible. In general, sufficient valves should be provided to permit shutting down any section of the line, not exceeding 800 feet, with valve operations in not more than three locations.

8. Valves shall be installed in clusters at pipeline intersections. Mechanical joint valves shall be installed at fittings with a pipe spool between the valve and fitting of not less than 12-inches or greater than 18-inches in length. Valve boxes shall be one-piece, cast-iron type as manufactured by Olympic Foundry, or approved equal. The valve box and cover shall be No. VB910 with a "W" cast into the top. 6-inch D-3034 PVC pipe shall be used as a spacer for the lower portion of the valve box length as necessary. See standard details W-3 and W-4 for typical setting details.

9. Valves 8-inches and smaller shall be gate valves. Valves shall be iron body, bronze mounted, resilient seat, NRS valves with O-ring seals, and shall open when the stem is rotated counterclockwise. Valves shall have a 2-inch square operating nut. Only resilient wedge gate valves shall be installed. Valves shall conform to AWWA C509 and C515 for ductile iron body valves. The City only accepts valves from the following manufacturers:
    - Kennedy
    - Clow
    - Mueller
    - M&H
    - American Flow Control

10. Valves 10-inches and greater shall be butterfly valves. All butterfly valves shall be rubber seated type, suitable for direct burial and rated for 150 psi working pressure and 150 psi pressure differential across the valve. Valve shall be equipped with iron-body and 304 stainless steel journals. Shaft and disc seals shall be designed for a bottle-tight seal. Valve disc shall be either cast iron alloy conforming to ASTM A 436, Type 1, or chrome-edged cast iron with Bun-N rubber seat bonded to the valve body, or shall be cast iron with rubber disc seat and 304 Stainless steel mating surface attached to the valve body in accordance with AWWA C504, Section 4.5.5.3. Except as herein noted, the butterfly valve shall conform to AWWA C504 for Class 150B. The City only accepts valves from the following manufacturers:
    - Kennedy
    - Dresser
    - Mueller
    - M&H
    - American Darling

11. If a 10-inch or larger live tap is required, see Section 560 for valve requirements at the tapping location. The preferred method will be to cut in a tee, however, the City Engineer and Public Works Director may require a live tap due to shutdown disturbance.

12. Butterfly valves shall be furnished with totally enclosed, integral valve operator designed to withstand a minimum of 300 foot-pound input torque without damage to the valve or operator. Operators shall be fully gasketed and grease packed and designed to withstand submersion in water to a pressure of 10 psi. Valves shall have a 2-inch square operating nut and shall open when the stem is rotated counterclockwise. A minimum of 30 turns of the operating nut shall be required to move the disc from the fully open position to the fully closed position.

13. Where the depth of the operating nut is more than three feet, operating extensions shall be provided to bring the operating nut to a point 18-inches below the surface of the ground or pavement. The extension shall be constructed of steel. The operating extension shall have a steel disc attached to allow centering of the stem in the valve box. A disc shall be located directly below the top operator nut and no less that 6-feet apart if the extension is 8-feet or more in length. See detail W-5 for valve operator extension.

14. Pressure reducing valves (PRV) shall maintain a constant pressure regardless of varying inlet pressure. The PRV shall be a hydraulically operated, diaphragm actuated, globe pattern valve, equipped with a resilient, synthetic rubber disc forming a tight seal against a single moveable seat insert. The diaphragm assembly containing the valve stem shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. The diaphragm shall be a nylon fabric bonded with synthetic rubber. The rubber shall not be used as a seating surface. No packing glands or stuffing boxes are permitted, nor will valves with pistons to operate the valve or pilot controls. Repairs shall be possible without removing the valve from the pipeline.

15. The pilot control shall be direct acting, adjustable, spring loaded, normally open, diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. A fixed orifice shall be included in the control system. The main valve and body shall be cast iron conforming to ASTM A48; the main valve trim shall be brass (QQ-B-626), bronze (ASTM B61) and 303 stainless steel; and the pilot control system shall be cast bronze (ASTM B52) with stainless steel trim. The PRV shall be furnished with an internal and external 12 mil protective coating with an FDA approved epoxy resin. The epoxy powders shall be applied using the fusion method and cured in accordance with the manufacturer's recommendations.

16. PRV's shall be pressure rated to accommodate the upstream pressure including an allowance of 100 psi for surge. PRV's shall be Clayton 90G-01AB or 90G-01AS as manufactured by Cal-Val Company, or approved equal.

17. No backfill of the water system shall take place until inspected and approved by the City Public Works Department.

Summary of PRV Features

Cal-Val, 3-inch and Smaller (90G-01)

Item	Description
1	Clayton 100-01 Hightail Globe Valve (Main Valve)
2	X58 Restriction Fitting
3	CRD Pressure Reducing Control Pilot (Range)
B	CK2 Shutoff Cocks (Isolation Valves)
C	CV Speed Control Valve (Closing)
S	CV Speed Control Valve (Opening)

Y	X43Y Strainer (Outside Valve Body)
/	X101 Valve Position Indicator

Cal-Val, 4-inch and Larger (90G-01)

Item	Description
1	Clayton 100-01 Hightail Globe Valve (Main Valve)
2	X58 Restriction Fitting
3	CRD Pressure Reducing Control Pilot (Range)
4	CRL Pressure Relief Pilot (Range) **
B	CK2 Shutoff Cocks (Isolation Valves)
C	CV Speed Control Valve (Closing)
S	CV Speed Control Valve (Opening)
Y	X43Y Strainer (Outside Valve Body)
/	X101 Valve Position Indicator
**	Add CRL (pressure reducing feature) as needed on a case-by-case basis. Verify with the City and/or TVWD prior to ordering.

18. Cast iron "Y" strainers shall be installed upstream of the pressure reducing valves to protect the regulator solenoid valves and control surfaces from rust, dirt and scale. Strainers 1-inch through 2-inch shall be Apollo International TCG Series (or approved equal), 250 lb WSP rated strainers constructed from high-tensile cast iron (ASTM A-126, Class B) with blow-off connections and easily removable cylindrical screens. Tapered seat allowing screens to be self-cleaning and tight fit shall be provided. Self-cleaning shall be accomplished by opening the blow-off connection.

19. Strainers 3-inch and larger shall be Class 125 or 250, as applicable for the system pressure at the location of the device. Apollo International FC1 or FC2 Series (or approved equal) shall be furnished with flanged connections. FC1 and FC2 Series strainers shall conform to TCG Series for materials.

20. Valve boxes shall be one-piece cast iron type as manufactured by Olympic Foundry (or approved equal). The valve box and cover shall be No. VB910 with a "W" cast into the top. 6-inch ASTM D-3034 PVC pipe shall be used as a spacer for the lower portion of the valve box, length as necessary. See standard details W-7 and W-8 for installation.

21. Fire hydrants shall not be connected to mains less than 6-inches in diameter. As per the *Uniform Fire Code*, fire hydrants shall be located to allow a 36-inch clear space surrounding the hydrant. For example, street lights, sign posts, 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.

22. The City only accepts fire hydrants from the following list:

    D. Mueller Centurion or Super Centurion
    E. Clow Medallion

F. Kennedy K-81
G. Waterous Pacer
H. M&H Style 129

23. Fire hydrants shall conform to AWWA C502. Fire hydrants shall be equipped with two 2½-inch hose outlet nozzles and one 4½-inch pumper outlet nozzle with threads conforming to NFPA 194 for National Standard Fire Hose Coupling Screw Threads. Minimum hydrant valve opening shall be 5¼-inches. The minimum hydrant branch line shall be 6-inches. The inlet connection to the base of the hydrants shall be 6-inches with end type as shown on the drawings or specified elsewhere in the specifications. Hydrants shall open to the left or counterclockwise. Hydrants shall be of the "break away" type to minimize breakage of hydrant parts in case of damage. The 4½-inch port shall have a Storz quick adaptor. Hydrants shall be painted yellow above the ground line.

24. A solid pre-cast 3,300 psi concrete pier block, having nominal dimensions of 8-inches thick by 16-inches square base shall be installed under the fire hydrant footing. Washed ¾-inch crushed rock or graded river gravel free of organic matter, sand, loam, clay, or other small particles that would tend to restrict porosity, shall be placed around the fire hydrant for drainage. Drainage rock shall be placed to a minimum depth of 6-inches above hydrant drain opening.

25. Fire hydrant joint thrust restraint shall be mechanical joint (MJ) follower glands as manufactured by MegaLug, unless otherwise approved in writing by the City.

26. Fire hydrant locations shall be as shown on the project drawings or as directed by the City Engineer to provide complete accessibility and minimize possibility of damage from vehicles or injury to pedestrians. **NOTE: Improperly located fire hydrants shall be disconnected and relocated at the Contractor's expense.**

27. For fire hydrants placed within planter strips or behind sidewalks, set hydrant barrel so that no portion of the pumper hose nozzle cap will be less than 18-inches from the street side face of curb or backside of sidewalk. Set hydrants plumb and nozzles parallel with, or at right angles to the curb. With the pumper nozzle facing the curb, set hydrant so that the safety flange is a minimum of 3-inches and a maximum of 6-inches above finish grade or sidewalk level to clear bolts and nuts, or as directed by the City.

28. Requirements for fire hydrant locations (These criteria are subject to change. For the most current information, contact the Fire Marshal's office):

    a) Commercial, Industrial, Multi-Family Buildings: Fire hydrants shall be located so that no part of a commercial, industrial, or multi-family building is more than 250 feet from a fire hydrant measured along a route accessible to fire department vehicles.

    b) When a fire department connection (FDC) is installed in conjunction with an automatic sprinkler system, it is required to have a fire hydrant located within 70 feet of the FDC.

c) Exception**:** When such buildings are protected with an approved automatic fire protection system, the Fire Marshal may allow variations from the 250-foot requirement up to a maximum of 500 feet measured along a route accessible to Fire Department vehicles.

d) Residential Buildings: Unless otherwise approved by the Fire Marshal, a fire hydrant shall be placed at each street intersection. Place hydrants at the radius point at intersections or at property lines when placed at mid-block locations. Fire hydrants shall be placed within planter strips or behind sidewalks. No concrete shall be poured around or within a 4-foot square of the fire hydrant barrel, unless approved in writing by the City.

e) Intermediate hydrants are required when the distances to any part of residential buildings exceeds 400 feet measured along a route accessible to fire department vehicles.

f) For the purpose of a and b above, a 'commercial, industrial, or multi-family building' means a building used for other than VLDR, LDR, MDRL occupancy as such occupancy is defined in *Sherwood Code Title 16 –Community Development & Zoning Code*. Specific location of fire hydrants requires the approval of the Fire Marshal.

29. For design of public water system improvements, system hydraulics must be analyzed using the worst-case scenario envisioned in the City's current *Water System Master Plan*. The water system analysis shall be conducted using a simultaneous demand for the maximum (peak) day demand or peak hour non-fire demand, whichever is greater, and the fire demand. Parameters to be used to calculate non-fire demand shall be approved by the City. The fire demand shall be as specified by the Fire Marshal as applicable for the location, land use type, buildings contemplated and occupancy hazard.
30. All public water system improvements shall be designed to provide pressure within a range of no less than 50 pounds per square inch (psi) and not greater than 80 psi at peak demand (residual water system pressures at peak hour and peak day using network analysis modeling) excepting demand during fires. For practical application of the minimum 50 psi pressure requirement, a static pressure of 60 psi (theoretical pressure calculated from elevations or measured in the field) at non-peak times is required assuming a 10 psi drop during peak hour or peak day use. Exception may be granted or required by the City from the 80 psi maximum pressure for extenuating circumstances, including topography, water demand requirements, system configuration, and system operation. Developers will be responsible for construction of a facility (i.e. a vault housing pressure reducing valves (PRVs) and ancillary appurtenances) to reduce pressure when the pressure exceeds 80 psi.
31. Water system improvements shall also be designed to operate during a fire, to provide a system pressure of no less than 20 psi with a simultaneous peak day non-fire demand. Required fire flow capacity of the public water system is to be designated by the Tualatin Valley Fire and Rescue Fire Marshal in conformance with the *Uniform Fire Code* adopted by the City of Sherwood.

32. If a water system flow test and analysis is required as a condition of approval, they are to be conducted by the developer under the supervision of the Engineer of Record for the project ("Engineer of Record"). This information must be accompanied by supporting documents (requirements listed below) certified by a professional engineer registered in the State of Oregon, specifically for each project under their responsibility for design.

33. The following steps are to be performed by the engineer in order to conduct the flow test and water system analysis:

    a) Applicant to comply with all Oregon Department of Environmental Quality (DEQ) rules and regulations regarding discharge of chlorinated water onto the ground and/or any public or private storm drainage system. Access DEQ's guidance on *Management Practices for the Disposal of Chlorinated Water* at: http://www.deq.state.or.us/wq/wqfact/DisposalofChlorinatedWater.pdf or contact DEQ at (503) 229-5292 for the current State statute and administrative rules.

    b) A written request by the applicant/engineer to utilize the permit or written permission issued by the City must be submitted to the City Public Works Director, phone (503) 625-5722, at least 48 hours prior to any flow test. Time and manpower requirements will be determined by the City's Public Works Director.

    c) Two stamped copies (by a registered professional engineer) of the test data and other relevant documentation are to be provided by the design engineer to the City Engineer and the Public Works Director at Sherwood City Hall for review and evaluation. The documentation must include a determination by the engineer that the test data is representative of normal water system operating conditions and an interpretation of the data with respect to the hydraulic capacity of the City's water system, the pressure zone in which the test is taken, and the accuracy of the test results for purposes of the design.

    d) Upon request the City may perform flow tests for system analysis (see fee charges).

B. Backflow devices, when required, shall be installed as per the City's standard drawings.

C. Pressure reducing devices are to be approved on a per project basis to ensure compliance with the *Uniform Plumbing Specialty Code*. Vaults for pressure reducing devices shall be in accordance with section 520.6 of this manual.

D. Water service size shall be evaluated by the Engineer and shall be of sufficient size that the requirements of 510.C. and 510.E. shall be met. Booster pumps shall not be allowed on meter service lines in order to meet this requirement. The meter size shall be no smaller than the service line size. At the discretion of the City Public Works Director, a smaller meter may be installed but in no event should the meter be more than one size smaller than the service line.

E. The Engineer shall provide a "pressure available" chart on the water system plan sheet of the construction plans; this sheet shall indicate the calculated pressures theoretically available to each lot during static and peak demand periods.

F. Water service lines may be single service or double (yoked) services. Buried water service lines shall be copper pipe. For above ground installations, galvanized pipe and fittings shall be used.

G. At high points in the water system, combination air and vacuum release valves (CARV) shall be installed as required by the City. All Air-Vac, Air Evacuation, and Vacuum Prevention Valves shall vent to the outside of the vault.

H. Blowoff valves assemblies are to be used at the end of cul-de-sacs and at the end of water lines that may be extended in the future. Blowoffs are to be not less than 2-inches in diameter and sized at a minimum of 25 percent of the line diameter (see standard drawings).

520 MATERIALS

520.1 Water Pipes

A. Pipe shall be push-on joint ductile iron pipe except where specifically shown or detailed otherwise. Fitting joints shall be mechanical joint ends, except where specifically shown or detailed otherwise. Push-on joint ductile iron pipe shall be cement-mortar lined and conform to ANSI/AWWA C151/A 21.50 and C104/A21.4 and shall be U.S. Tyton joint pipe, as manufactured by United States Pipe and Foundry Company and Pacific States Cast Iron Company, or as approved. The type and thickness class shall be as shown below unless otherwise required by the City:

Pipe Size	**Pipe Class**
10-inch diameter and smaller	Class 52
12-inch diameter through 16-inch diameter	Class 51
18-inch diameter and larger	Class 50

B. 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 non-toxic vegetable soap lubricant shall be supplied with the pipe in sufficient quantities for installing the pipe furnished.

520.2 Pipe Fittings

A. Mechanical Joint Fittings:

1. Mechanical joint ductile iron fittings shall conform to AWWA C110 and shall be of a class at least equal to that of the adjacent pipe. Ductile iron fitting shall be provided with 6 to 8 mil nominal thickness coating and lining of fusion bonded epoxy conforming to the requirements of ANSI/AWWA C550 and C116/A21.16. Bolts shall be Cor-Ten or ductile-iron tee-head bolts.
2. Mechanical joint cast iron fittings shall conform to ANSI/AWWA C104/A21.4 and shall be of a class at least equal to that of the adjacent pipe. Mortar lining for fittings shall be the same thickness specified for pipe.

B. Flanged Cast 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. Alternatively and the City's preference, ductile iron fittings shall be provided,

and shall meet ANSI/AWWA C110/A21.11 for all other aspects. Flange bolts and nuts shall be Grade 2 conforming to Section A.1 of AWWA C153 or C110, standard course thread and domestic cadmium plated.

C. Gaskets: Gasket material for flanged joints in cast iron pipe and ductile iron pipe shall be ⅛-inch thick, full face one-piece, cloth inserted, rubber gaskets conforming to Section 4 of AWWA C207 and ANSI B16.21. 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 cast iron couplings with rubber rings and ductile iron bolts and nuts. Couplings shall be Dresser, Smith-Blair, or as approved in writing by the City.

520.3 Service Connections and Valves

A. Service connections and service valves shall meet the following requirements. In these requirements, the term "connection" refers to the outlet end of corporation stops, the inlet and outlet end of curb valves, the inlet of meter valves, and the inlet and outlet end of service fittings; the term "service valves" refers to corporation stops, curb valves/stops and meter valves/stops.

B. Buried service lines ¾-inch to 1-inch in diameter shall be American, Type K copper, soft, seamless pipe, conforming to ASTM B88. Buried 2" copper shall be American, Type K, rigid, seamless pipe, conforming to ASTM B88. Above ground installations shall use galvanized standard weight pipe with threaded ends, conforming to ASTM A120. Galvanized fittings for use with ferrous pipe having American Standard Pipe threads shall conform to Federal Specifications WW-P-406.

C. For installation of water service connections above 2-inches, contact the City's Public Works Director for installation specifications and details.

D. Service fittings and connections shall be manufactured in accordance with the latest revision of AWWA C-800.

E. Corporation stops for ¾-inch and 1-inch copper service lines shall be CC thread inlet and compression connection outlet and shall be Ford F600, or as approved. Corporation stops for 2-inch copper services shall be Mueller H-15023, or as approved.

F. Tapping saddles shall be Romac, Style 202S, Smith-Blair No.313, or approved equal, double- or triple-strap service saddle tapped for FIPT and with neoprene gaskets. Service saddles shall have an epoxy coated ductile iron boss with stainless steel straps. Service saddles shall be adequate for use with size, type, and class of water pipe. Approval for deletion of the service saddle is at the discretion of the City.

G. Branch piece (yoke) used with double services shall be Ford U-28-43-14-inch or Mueller H-15363 (compression), 1-inch copper flare x ¾-inch IPT x ¾-inch IPT, or approved equal.

H. Minimum size service shall be 1". ¾" service shall be used for sampling stations. Angle valves vary based on service line size as follows:

Service Line Size	Angle Valve
¾" Service Line Sample Station	Ford KV43-332WQ (compression), or equal.
1" Service Line	Ford KV43-444WQ (compression), or equal.
2" Service Line	Mueller H-14277, or equal.
¾" U-Branch	Ford KV13-332, or equal.

I. Resetter for 1½-inch and 2-inch services shall be provided with 1-inch Hi-Inline bypass, except for irrigation services. Bypass valve shall be equipped with padlock wings.

Service Line Size	Meter Resetter
1" Service Line	Ford V42-12", or equal.
2" Service Line	Ford VVF77-12Bx17", or equal.

520.3.1 Approved Products and Acceptance of Warranties

A. Only approved service connections and service valves shall be provided and installed. All service connections and service valves shall be of approved material, properly installed and in good working order, safe for public use. Public water system shall be inspected and approved by the City prior to backfill.

520.4 Water Meter Boxes

A. General: All water meter boxes furnished under this specification for the City of Sherwood shall comply with the provisions of this specification.

B.

Service Meter Size	Meter Box and Cover
⅝" - 1" Meter	DFW486WBC4-12-Body or equal.
	DFW486C-4MP-NHK-LID or equal.
1½" Meter	Carson No. 1730-18-5BML or equal.
2" Meter	Carson No. 1730-18-5BML or equal.

520.5 Air and Vacuum Release Valve Assembly

A. Air and vacuum release valve assemblies shall meet the following requirements:

   A. Service saddles for 1½-inch and larger services shall be Romac Style 202S, Smith-Blair No. 313, or equal, double- or triple-strap services saddles tapped for FIPT and with neoprene gaskets. Service saddles shall have an epoxy coated ductile iron boss with stainless steel straps. Service saddles shall be adequate for use with the size, type, and class of the water system pipe main. Taps for 1-inch air and vacuum release valve assemblies shall be direct tapped (see Section 560).

   B. An air valve is required when the pipe has a high point of one diameter or more than the rest of the installation. The air and vacuum release valves shall be constructed to permit the escape of large volumes of air when the line is being filled with water, to permit smaller amounts of accumulated air to be release under normal operating conditions, and so that air may re-enter the line to break any vacuum caused by the water leaving the line rapidly. The valves shall be designed to operate under working pressures of 150 psi and shall have been tested at a pressure of not less than 300 psi. The air and vacuum release valves shall be similar to APCO heavy-duty combination air release valves, as manufactured by the Valve and Primer Corporation, Chicago, Illinois:

Valve Size	Air and Vacuum Release Valve
1" Assembly	Model No. 143C.
2" Assembly	Model No. 145C

   C. The valve inlets shall have iron pipe threads.

B. Air and vacuum release valves shall be installed in concrete vaults meeting the following requirements:

Valve Assembly Size	Vault
1" Size	Carson, Model No. 1730D-P15L
2" Size	Carson, Model No. 1730D-P15L

520.6 Precast Concrete Vaults

A. Vaults – The precast concrete vault shall be furnished to the dimensions shown on the drawings and as specified herein. The vault shall be as manufactured by Utility Vault Co., Pipe Inc., or approved equal. The concrete vault shall include a base section, extension section(s), center section, and top section. Vaults shall be equipped with an access ladder meeting OSHA requirements, and as shown on the drawings. The ladder shall extend a minimum of 40-inches above the top rung of the ladder. Ladders shall be fabricated steel with deformed rungs and shall be hot-dipped galvanized after fabrication. Vaults 6-feet and greater in depth shall be equipped with a Utility Vault Company, Model 1672, or equal, aluminum ladder extension. Vaults shall

be provided with a sump and sump pump when drainage to daylight is not possible. The vault sump shall conform to dimensions shown on standard details no. W-42 and/or W-44. Pipe blockouts shall be provided at locations as shown on the drawings.

B. The vault top section shall be furnished with an aluminum sidewalk door conforming to the following manufacturer and model/type:

Manufacturer	Door Model or Type
Bilco	Type J or JD, or equal.
Syracuse Casting Sales Corporation	Type CH or CHD, or equal.
L.W. Products	Type "S" or "D", or equal.

The sidewalk door shall be furnished with a channel frame with an anchor flange around the perimeter; a 1½-inch drain coupling; aluminum diamond plate cover capable of withstanding a live load of 300 psf; equipped with compression springs to assist operation; automatic hold-open arm with release handle; a locking hasp and a snap lock with removable handle. Furnish sidewalk door with 316 stainless steel hardware and forged brass hinges with stainless steel pins. Coat any aluminum surfaces that are in contact with concrete surfaces with bituminous coatings conforming with manufacturers specifications. The drain from the sidewalk door shall be stubbed out to the exterior of the vault into curb or above-ground with sloping gradient.

C. Preformed plastic gaskets for horizontal vault joints shall conform to the following manufacturer and product:

- Hamilton Kent Manufacturing Company, Kent Seal No. 2, or equal.
- K.T. Snyder Company Inc., Ram-Nek, or equal.

Plastic gaskets shall meet all requirements of Federal Specification SS-S-00210. Prior to backfilling around vaults, all joints, all pipe and conduit wall penetrations, and wall areas with rock pockets, using a non-shrink grout.

D. Damp-proof the exterior below grade wall and base with Type A, A.C. Horn Dehydratine 4, with CrystalSeal, a water based blend of penetrating ingredients that react with the free lime in the concrete and crystallizes with the calcium hydroxides to seal the concrete surface, or equal. Asphalt compound of brush or spray consistency conforming to Federal Specification SS-A701 or ASTM D449 may be used with the Engineer's approval. Vaults damp-proofed using clear compounds such as CrystalSeal, shall be marked in black paint as having received such a coating. The markings shall include the type of material used.

E. Vaults sump pumps shall be Grundfos Model KP250, ⅓ hp stainless steel sump pump, with a free floating liquid level switch with normally open contact that closes on rising liquid level. Pump shall be equipped with a 1¼" discharge and miscellaneous piping for discharge including an inline check valve and isolation gate valve (size equal to the discharge line size) downstream of the check valve. Provide power source at a voltage compatible with the sump pump motor. Conduit for power shall be a minimum of 24-inches from any other pipe penetration.

520.7 Casing Pipe, Spacers and Seals

A. Casing Pipe: Casing pipe shall be smooth steel conforming to ASTM A36 with a minimum yield strength of 36,000 psi. The minimum wall thickness shall be as required by the jurisdiction governing the highway, railroad, or stream bed (for creek crossings) in question. In no case shall the wall thickness be less than ¼-inch.

B. Casing Spacer: Casing spacers shall be 12-inches wide, 2-piece construction, and all stainless steel. The spacer shall have a minimum of 4 runners through 14-inch pipe sizes, 6 runners through 36-inch pipe sizes, and 7 runners through 48-inch pipe sizes, to secure the carrier pipe within the casing and to resist movement of the pipeline. Casing spacers shall be as manufactured by Cascade Manufacturing, Calpico Inc., or approved equal.

C. Casing Seals: Casing seals shall Model "C" custom pull-on casing ends, as manufactured by Capico Inc., or approved equal.

530 PIPELINE INSTALLATION

A. The work necessary to excavate, bed, and backfill water pipelines shall conform to the requirements of Sections 150, 155, 210, and Chapter VIII Standard Drawings.

B. 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 2 days' supply of material in advance of the laying.

C. 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.

D. 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.

E. 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 it is necessary to place pipe in such a manner that bedding material may enter pipe because of trench configuration or shoring detail, then the Engineer shall require tight woven canvas boots be used and removed when placing pipe.

F. 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.

G. 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. <u>Do not flame cut.</u>

H. Dressing Cut Ends: Dress cut ends of push-on joint pipe by beveling, as recommended by the manufacturer.

I. 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.

J. Installation of mechanical joint pipe shall be as specified in AWWA C111 Appendix A, including bolt torque ranges. Mechanical joint gaskets shall be vulcanized rubber and no more than 3 years old.

K. All material shall be of new manufacture. No rebuilt or reconditioned material will be allowed.

L. 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 - Minutes**	**Deflection Inches**	**Angle Degrees**	**Deflection Inches**
4	8-18	31	5	19
6	7-07	27	5	19
8	5-21	20	5	19
10	5-21	20	5	19
12	5-21	20	5	19

*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 ten (10) percent for each 150 pounds added pressure.

M. Alignment: Pipelines intended to be straight shall not deviate from the straight line at any joint in excess of one inch horizontally or vertically.

N. Unsuitable Conditions for Laying Pipe: Do not lay pipe in water or when, in the opinion of the City, trench conditions are unsuitable.

O. 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.

P. Anchorage and Thrust Blocking (see standard drawings): On all pipelines 4-inches in diameter or larger, securely anchor all tees, plugs, caps, and bends 11¼ degrees and greater by an engineered system of suitable mechanical joint restraint devices, and at other locations where unbalanced forces exist, as determined by the Engineer and approved by the City. Restraint devices for mechanical joint pipe, fittings, and appurtenances shall conform to ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 as applicable and consistent with City requirements. Bolts for mechanical joint shall be domestic Cor-Ten or ductile iron tee-head bolts. Bolts and nuts for flanged fittings shall be standard course thread and domestic plated.

Q. Thrust blocks can only be substituted for engineered mechanical restraint upon written approval by the City. Provide reaction or thrust blocking as directed. The concrete mix shall have a compressive strength of not less than 3,300 pounds per square inch. Place blocking between the undisturbed ground and the fitting to be anchored. The bearing surface shall be as shown on the standard drawing for thrust blocking. Place the blocking so that all pipe and fitting joints (new and existing) will be accessible to repairs. Replace any existing thrust blocks that have been disturbed with new thrust blocks meeting all City requirements.

R. Downtime Protection: When stopping work for extended periods of time or 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 watertight when submerged up to 15 feet.

S. Bolts for flange fittings shall be full-nut installation (i.e., three full threads showing past nut). Flange fittings shall be fully wrapped with 3 layers of 3 mil PVC sheet.

T. Completely encapsulate the completed valve and fitting installations with 4 layers of 4 mil PVC sheet to fully cover the valve and fitting body and 6-inches beyond the ends prior to placing pipe base and pipe zone material. Secure PVC to valves to prevent entry of backfill materials under the wrap.

U. Color coded (blue) marker balls shall be placed during the pipe installation process. The marker balls shall be Technology Inc., Omni Marker Model 161, or equal. The markers balls shall contain three orthogonal tuned circuits. These passive circuits, when excited by the standard marker locator, shall produce a uniform, spherical RF field in every direction. The markers shall not require any particular orientation when buried to produce a uniform signal and may by simply tossed into the trench or excavation and covered.

V. No backfill of water system shall take place prior to Public Works approval.

540 HYDROSTATIC TEST OF NEWLY INSTALLED WATERLINE

A. The contractor shall make pressure and leakage tests on all newly laid pipe, service lines, including mainline pipe, valves, blow-offs, fire hydrant and other appurtenances. Furnish all necessary equipment and material, make all taps in the pipe as required, and conduct the tests. The City will monitor the tests. 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 of the tests:

Amount	Description
2	Approved graduated containers.
2	Pressure gauges (maximum 2 psi increments).
1	Hydraulic force pump approved by the City.
	Suitable hose and additional equipment as required.

B. Conduct the tests after the trench has been 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 City.

C. Conduct pressure tests in the following manner, unless otherwise approved by the City. 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). For lines working with operating pressures in excess of 100 psi, the minimum test pressure shall be one and one-half times the operating pressure, with the same loss allowances. Operation of City water system valves by non-City Public Works employees is prohibited.

D. Duration: The duration of each pressure test shall be 60 minutes, unless otherwise directed by the Engineer.

E. 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. If the line pressure drops more than 5 psi during the test, repeat the test (again for 60 minutes each time) until the drop in line pressure is 5 psi or less, and then measure the leakage amount. 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.

F. 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 corresponding to a pressure drop of 5 psi or less is greater than one-half the number of gallons per hour calculated by the following formula:

$$L = \frac{SD\ (\sqrt{P})}{133\ ,200}$$

In the above formula: L = Allowable leakage, in gallons per hour for a 2-hour test.

S = Length of pipe to be tested.
D = Nominal diameter of pipe, in inches.
P = Average test pressure during the leakage test, in pounds per square inch.

Therefore, the maximum amount of leakage allowed by the City is equal to 0.5L.

G. Correction of Excessive Leakage: Should any test of pipe laid exhibit leakage greater than that allowed or a loss in pressure greater that 5 psi during the pressure test, locate and repair the defective joints, pipe or other leaking water system component(s) until the leakage and pressure loss of a subsequent test are within the specified allowance.

H. 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.

I. All piping laid shall be fully-joint restrained.

550 STERILIZATION OF NEWLY INSTALLED WATERLINE

A. Pipeline intended to carry potable water shall be sterilized before placing in service. Sterilizing procedures shall conform to AWWA C-651 as hereinafter modified or expanded.

B. Flushing: Before sterilizing, flush all foreign matter from the pipeline. Provide hoses, temporary pipes, ditches, etc. as required to dispose of flushing water without damage to adjacent properties. Disposal site and method shall be approved by the City Engineer prior to use. Flushing velocities shall be at least 2.5 feet per second (fps). For large diameter pipe where it is impractical or impossible to flush the pipe at 2.5 fps, clean the pipeline in place from the inside by brushing and sweeping, then flush the line at a lower velocity.

C. Sterilizing Mixture: Sterilizing mixture shall be chlorine-water solution having a free chlorine residual of 40-50 ppm. The sterilizing mixture shall be prepared by injecting (1) a liquid chlorine mixture, or (2) a calcium hypo chlorite or sodium hypo chlorite and water mixture into the pipeline at a measured rate while fresh water is allowed to flow through the pipeline at a measured rate so that the chlorine-water solution is of the specified strength. See the following chart for a guideline to mixing the chlorine-water solution:

CHLORINE-WATER CONCENTRATION CHART
(Guideline Only)

PIPE SIZE (INCHES)	GALLONS PER 100 FOOT LENGTH	AMOUNT REQUIRED TO GIVE 50 PPM CI PER 100 FEET OF PIPE LENGTH				
		A	B	C	D	E

4	65.3	0.028 LB	0.04 LB	0.08 LB	0.06 GAL	0.02 GAL
6	146.5	0.062 LB	0.10 LB	0.18 LB	0.14 GAL	0.04 GAL
8	261.0	0.108 LB	0.16 LB	0.32 LB	0.24 GAL	0.08 GAL
10	408.0	0.170 LB	0.24 LB	0.48 LB	0.38 GAL	0.14 GAL
12	558.7	0.240 LB	0.36 LB	0.70 LB	0.56 GAL	0.20 GAL

A - 100 percent Chlorine
B - High Test Calcium/Sodium Hypochlorite (65-70% Cl)
C - Chlorinated Lime (32-35 percent Cl)
D - Liquid Laundry Bleach (5.25 percent Cl)
E - Concentrated Liquid Bleach (15 percent Cl)

D. The liquid chlorine gas-water mixture shall be applied by means of an approved solution feeding chlorination device. Dry chlorine gas shall be fed through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine or the gas itself must provide means for preventing the backflow of water into the chlorine cylinder.

E. If the calcium hypo chlorite procedure is used, first mix the dry powder with water to make a thick paste, then thin to approximately a one percent solution (10,000 ppm chlorine). If the sodium hypo chlorite procedure is used, dilute the liquid with water to obtain a one percent solution. The following proportions of hypo chlorite to water will be required.

Product	**Quantity**	**Water**
Calcium Hypo chlorite (1) (65-70 percent Cl)	1 lb.	7.5 gal.
Sodium Hypo chlorite (2) (5.25 percent Cl)	1 gal.	4.25 gal.

1. Comparable to commercial products known as HTH, perchloron, and pittchlor.
2. Known as liquid laundry bleach, Clorox, Purex.

F. Point of Application: Inject the chlorine mixture into the pipeline to be treated at the beginning of the line through a corporation stop or suitable tap in the top of the pipeline within 18" of the water source filling the line. Water from the existing system or other approved source shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine. The rate of chlorine mixture flow shall be in such proportion to the rate of water entering the pipe that the combined mixture shall contain 40-50 ppm of free available chlorine. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Use check valves if necessary. At no time will dry chlorine be introduced into the pipeline. Operation of City water system is prohibited.

G. Retention Period: Treated water shall be retained in the pipeline long enough to destroy all nonspore-forming bacteria. With proper flushing and the specified solution strength, 24-hours is adequate. At the end of the 24-hour period, the sterilizing mixture shall have a strength of at least ten (10) ppm of chlorine.

1. Operate all valves, hydrants, and other appurtenances during sterilization to assure that the sterilizing mixture is dispersed into all parts of the line, including dead ends, new services, and similar areas that otherwise may not receive the treated water.

2. Do not place the concentrated quantities of commercial sterilizer in the line before it is filled with water.

3. After chlorination, flush the water from the line until the water through the line is equal chemically and bacteriologically to the permanent source of supply. Under no circumstance shall pressure testing occur while chlorine solution is in the line.

4. Disposal of Sterilizing Water: Dispose of sterilizing water in an approved manner. Do not allow sterilizing water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine to a safe level. Dechlorinization procedures are to be submitted in writing and approved by the City prior to flushing system.

5. After disposal of the disinfection mixture, there will be a 24-hour retention period prior to the taking of samples for the bacteriological test. The Contractor's representative under the City's supervision will take the purity samples. A 24-hour advance notification is required for scheduling the sample taking.

560 TAPPING

A. Tapping sleeves shall be ductile iron, epoxy coated steel, or stainless steel fittings as specified hereinafter. Branch outlet from tapping sleeve shall be Schedule 10 material thickness, minimum.

B. For size on size taps, tapping sleeves shall be mechanical joint (MJ) type sleeves as specified herein:

Tapping Sleeve Size	Manufacturer & Model
12-inches and less in diameter	• JCM, Model 452 stainless steel 2-piece sleeve with outlet seal. • Or equal.
Larger than 12-inches in diameter	A. JCM, Model 532 with stainless steel outlet. B. Or equal.

C. Taps 1-inch in diameter and smaller shall be tapped directly into the ductile iron pipe using corporation stops.

D. If a live tap is required in order to extend a line over 10-inches in diameter, and the maximum design pressure is less than 75 psi, a gate valve will be allowed with no butterfly valve. If the maximum design pressure is over 75 psi, a butterfly valve will be required to be directly bolted to the gate valve. All valves shall be installed with valve boxes and lids per City standards.

E. 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 6- inches outside the tapping area).

570 SAMPLING STATION

A. All sampling stations shall be Eclipse Number 88. The sampling station shall have a ¾- inch FIP inlet, and a ¾-inch hose nozzle. All stations shall be enclosed in a lockable, non-removable, aluminum-cast housing. When opened, the station shall require no key for operation, and the water will flow in an all-brass waterway. All working parts will also be of brass and be removable from above ground with no digging. A copper vent tube (standard) will enable the station to be pumped free of standing water to prevent freezing and to minimize bacteria growth. The exterior piping will be brass, and a ¼-inch ball valve shall be provided in place of the ¼-inch pet cock on the vent pipe.

580 CROSS CONNECTION CONTROL AND BACKFLOW ASSEMBLIES

580.1 General

A. Cross connection control and backflow assemblies shall conform to the requirements of this section and the standard drawings. An approved customer-owned and maintained backflow prevention assembly shall be installed on each service line to a consumer's water system at or near the property line when any of the following conditions exist:

1. There is an auxiliary water supply, which is, or can be, connected to potable water piping. If the auxiliary supply is a well and the well is abandoned per State of Oregon Water Resources Department requirements and a copy of a certificate to that effect is provided to the City, no backflow assembly is required behind the meter.

2. If the waterline transmitting water from the well to the building is left intact, water service cannot be provided from the City facilities until an RP type device* is installed at the meter and a test report is filed with the City.

B. When a backflow assembly is installed behind the meter, thermal expansion may occur due to heating of water in the building's hot water heater. The *Uniform Plumbing Code* (UPC) requires additional equipment to be installed to control the thermal expansion (See Section 608.3 of the UPC0. Note this reference to the UPC is provided for convenience of the reader only.

1. There is piping for conveying liquids other than potable water, and where that piping is under pressure and installed in proximity to the potable water piping.

2. There is intricate plumbing, which makes it impractical to ascertain whether or not a cross connection exists.

3. There is a pipeline 1½-inch or larger, nominal pipe size, supplying public water to the premises.

4. There is a structure more than thirty (30) feet in height (as measured between the highest peak of that structure and the elevation of the service at the public water main to those premises).

5. There is a risk of back siphoning or back pressure.

6. There is a cross-connection or a potential cross-connection.

7. There is an irrigation/sprinkler system (see detail W-70).

8. The owner of a mobile apparatus, to which the City supplies water, shall provide for backflow prevention by installing a backflow prevention assembly or provide an approved air gap separation on the mobile apparatus (see detail W-91).

9. When there is a standby fire line/sprinkler system, a double check detector assembly (DCDA) will be the minimum protection required. In addition:

    a) Any system with provision for adding foamite or toxic fire retardants, whether directly connected or not, will require a reduced pressure principle detector assembly (RPDA) at the property line.

    b) Any system connected to or with provisions for connecting to an unapproved auxiliary water supply will require a reduced pressure principle (RPDA) at the property line.

    c) Any system that utilizes antifreeze will require a reduced pressure principle backflow assembly (RP) on the antifreeze loop.

    d) Any system with private fire hydrants will require a double check detector assembly (DCDA) at the property line.

    e) Residential flow through and multipurpose sprinkler systems require no backflow assembly to be installed.

10. All commercial, multi-family, industrial, and institutional properties, regardless of size.

C. Backflow prevention assemblies shall be installed at the property line (on private property outside of public easements).

D. Backflow prevention assemblies, where required for protection of the public water system, shall meet the requirements set forth in the current Oregon Administrative Rules, Chapter 333-61-070, the *Uniform Plumbing Code*, the NFPA, and the City requirements. The Oregon DHS, Drinking Water Section, provides a list of approved assemblies.

E. It is the design engineer's responsibility to select the proper backflow prevention assembly and vault and to include the proper City standard drawings for them in the detail sheets provided with both site development permit and site plumbing permit application plan sets as applicable for the particular circumstances. The design engineer is also responsible for coordinating selection of the proper backflow prevention assembly and vault design with the owner, architect, contractor, the City Engineer, the City Public Works Director, and the City Building Official.

580.2 Types of Backflow Prevention Assemblies

A. There are eight types of backflow prevention assemblies that the City will allow as protection of the public water system. They are as follows:

- Double Check Assembly (DC)
- Reduced Pressure Principle Backflow Assembly (RP)
- Pressure Vacuum Breaker Assembly (PVB)
- Air Gap
- Double Check Detector Assembly (DCDA)
- Reduced Pressure Detector Backflow Assembly (RPDA)
- Atmospheric Vacuum Breaker Assembly (AVB)
- Spill Resistant Vacuum Breaker (SVBA)

B. The type of backflow prevention assembly that is 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 some basic guidelines.

C. Reduced Pressure Backflow Assembly: An approved Reduced Pressure Backflow Assembly shall be installed above ground on the service connection to the following premises:

1. 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.)
2. Commercial buildings that are located within an industrial zone.
3. Hospitals, medical centers, and clinics.
4. Mortuaries and nursing homes.
5. Fueling stations and/or automotive service facilities.
6. Sewage pump and lift stations.
7. Dry cleaners and commercial laundries.
8. Any water system that has a pump to supplement pressure.
9. Irrigation systems that are designed to use chemical injection.
10. Any fire system that is designed or required to use a chemical solution within the piping (such as an antifreeze loop fire sprinkler system).

D. The above list may change from time to time and it is the design engineer's responsibility to ensure that the latest version of the list is consulted.

E. Double Check Backflow Assembly or Double Detector Check Backflow 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:

1. Any fire system or water line to a private fire hydrant.
2. Multi-story buildings which are in excess of 30 feet above the water main at the service connection.
3. Shopping centers or large retail stores.
4. Restaurants or fast food establishments.
5. Any tax lot that is served by two water services supplied by the City.
6. Any water service that is 1½-inch or larger nominal pipe diameter.
7. Standard fire sprinkler system line.
8. Waterline to private fire hydrant.
9. The detector meter shall be a Model 25 Badger Recordall meter that complies with ANSI/AWWA C710. Meter shall be provided with Badger Meter Read-O-Matic generator calibrated for reading in gallons. Remote registers will be provided by others.
10. The above list may change from time to time and it is the design engineer's responsibility to ensure that the latest version of the list is consulted.Reduced Pressure Detector Backflow Assembly: An approved Reduced Pressure Detector Backflow Assembly shall be installed above ground on the standby sprinkler system service connection where:

1. The system has provisions for adding foamite or toxic fire retardants whether directly connected or not.
2. The system is connect to, or may have provisions to connect to an unapproved auxiliary water supply.
3. The detector meter shall be a Model 25 Badger Recordall meter that complies with ANSI/AWWA C710. The meter shall be provided with a Badger Meter Read-O-Matic generator calibrated for reading in gallons. Remote registers will be provided by others.

G. Pressure Vacuum Breaker Assembly: An approved Pressure Vacuum Breaker Backflow Assembly shall be installed above ground on the irrigation system service connection.

H. Atmospheric Vacuum Breaker Assembly: An approved Atmospheric Vacuum Breaker Backflow Assembly shall be installed above ground on the irrigation system service connection.

I. Air Gap: A physical separation between the free flowing discharge end of a potable water supply pipeline and an open or non-pressure receiving vessel shall be provided. The "Approved Air Gap" shall be a minimum of twice the diameter of the supply line measured vertically above the overflow rim of the vessel and in no case less than 1-inch. The air gap shall be installed away from walls or any other obstruction that may restrict the air flow into the outlet pipe and may nullify the effectiveness of the air gap to prevent back-siphoning. A properly maintained approved air gap is the best means available for protection against backflow, however, an air gap is not always practical.

J. Spill Resistant Vacuum Breaker: An approved Spill Resistant Vacuum Breaker Backflow Assembly shall be installed above ground on the irrigation system service connection.

K. After installation, all backflow prevention assemblies that are installed must be tested upon installation by a State of Oregon certified tester. The results of the testing shall be received by the City prior to issuance of "final occupancy." The City will perform backflow tests of all dedicated irrigation premise and fireline assemblies (see fee charges for rates).

580.3 Location of Backflow Prevention Assemblies and Vaults/Boxes

A. Backflow assemblies shall be installed at the water service connection or customer side of the meter when used for premises containment. All reduced pressure principle backflow assemblies should have a strainer installed in front of the device. This strainer should be cleaned and inspected once per year. Whenever a backflow assembly is used for premises containment, a closed plumbing system is developed and special precautions should be taken for thermal expansion.

580.4 Installation and Testing of Backflow Prevention Assemblies

A. The following are installation and testing standards for all backflow prevention assemblies:

a. Double check backflow assemblies shall comply with the following requirements:

a) 2½-inch and smaller double check valve assemblies used for system containment shall be installed at the water service connection on the customer side of the water meter.

b) 1-inch and smaller double check valve assemblies shall be installed in a Brooks meter box, 1419 Series, or equal. 1½-inch and 2-inch double check valve assemblies shall be installed in a Carson 1730D P15L meter box, or equal. 2 ½-inch double check valve assemblies shall be installed in Brooks 2436 (HDPE), or Brooks 2448 (ABS) meter box, or equal.

c) The meter box shall be installed on a crushed rock base (¾" minus, or 1" minus).

d) The assembly shall be installed in such a way as the test cocks are easily accessible and the check valve may be removed without removing the device.

e) Unions shall be installed on the inlet and outlet piping.

f) The assembly must be protected from freezing during cold weather.

g) Plugs to be installed on test cocks of below ground installations (no dissimilar metals).

h) 3-inch and larger double check backflow assemblies may be installed in a below ground vault or above ground. Vault installation shall comply with the following:

(1) Below ground vaults shall be in accordance with Section 520.6 - Precast Concrete Vaults.
(2) Inlet piping shall be ductile iron Class 52, spool with flange by plain end (FLG x PE).
(3) The double check backflow device must be flanged and shall be an Oregon DHS, and City approved device.
(4) The connection made between the downstream piping and the backflow assembly must be made with a flange coupling adapter.

(5) Clearance between the device and the interior vault wall must be a minimum of 12-inches. The clearance between the test cock side of the assembly and the interior vault wall must be a minimum of 24-inches.
(6) A minimum clearance of 3-inches is required from a fully open stem to the top of the vault lid when "OS&Y" valves are used.
(7) Clearance from the bottom of the backflow assembly to the floor shall be a minimum of 12-inches and the device must be supported with "Stand-On" pipe stands.
(8) The vault must be free of standing water. A rodent screen is required if a drain line to daylight is approved. If a drain line to daylight is not approved, then a sump pump will be required.
(9) Plugs shall be installed on test cocks for below ground installations (no dissimilar metals).

2. Above ground backflow assembly installations shall comply with the following requirements:

a) The backflow assembly connection to the service line must be flanged.

b) Underground 90-degree bends shall be restrained with Mega-Lug retainer glands and concrete thrust blocking. Above ground 90-degree bends shall have flanged connections.

c) Inlet and outlet piping spools shall be ductile iron Class 52 flanged by plain end (FLG x PE).

d) The backflow assembly must be installed in a horizontal position and be level.

e) The backflow assembly concrete support slab shall be 6-inches minimum thick 3,300 psi concrete with #4 bars placed at 12-nches on center each way within the slab. A rock leveling course beneath the slab shall be 4-inches of ¾" minus crushed rock, compacted.

f) The clearance between the backflow assembly and any obstruction shall be 12-inches minimum. The clearance between the test cock and any obstruction shall be 24-inches minimum. The clearance between the bottom of the backflow assembly and the concrete slab shall be 12-inches minimum with a maximum of 60-inches.

g) The backflow assembly shall be supported by "Stand-On" pipe supports, or equal.

h) The backflow assembly security enclosure shall include an adequate bore sighted drain.

i) The backflow assembly security enclosure shall be insulated or have a heat source that will keep the enclosure above 40º F minimum. Wiring shall be installed to meet local code requirements.

j) A door or other approved access to the backflow assembly enclosure shall be provided.

k) All backflow assembly enclosures shall comply with local building codes. Manufactured enclosures are available from; HydroCowl, Hot Box, and NW Utilities Products.

3. Reduced pressure backflow assemblies shall comply with the following requirements:
    a) All reduced pressure (RP) backflow assemblies shall be installed above ground in a horizontal position and be level. The location of the RP backflow assembly shall require approval of the City.
4. 1-inch, 1½-inch and 2-inch RP backflow preventer assemblies shall comply with the following requirements:
    a) The RP backflow preventer assemblies may have threaded connections. The pipe material shall meet the local plumbing code requirements.
    b) The RP backflow preventer assembly shall include a union for ease of removal.
    c) The RP backflow preventer assembly concrete support slab shall be 6-inches minimum thick 3,300 psi concrete with #4 bars placed at 12-nches on center each way within the slab. A rock leveling course beneath the slab shall be 4-inches of ¾" minus crushed rock, compacted.
    d) The clearance between the bottom of the RP backflow preventer assembly and the concrete slab shall be 12-inches minimum.
    e) The RP backflow preventer assembly enclosure shall comply with local building codes. Manufactured enclosures are available from; HydroCowl, Hot Box, and NW Utilities Products.
    f) The RP backflow preventer assembly security enclosure shall be insulated or have a heat source that will keep the enclosure above 40º F minimum. Wiring shall be installed to meet local code requirements.
    g) The RP backflow preventer assembly enclosure shall have a bore sighted drain. The drain size for the 1-inch RP backflow preventer assemblies is 1½-inches. The drain size for the 1½-inch and 2-inch RP backflow preventer assemblies are 2-inches.
5. 2 ½-inch and larger RP backflow preventer assemblies shall comply with the following requirements:
    a) 2 ½-inch and larger RP backflow preventer assemblies must have flanged connections.
    b) Underground 90-degree bends shall be restrained using Mega-Lug retainer glands and concrete thrust blocking. Above ground 90-degree bends shall have flanged connections.
    c) Inlet and outlet piping spools shall be ductile iron Class 52, flanged by plain end (FLG x PE).
    d) The RP backflow preventer assembly concrete support slab shall be 6-inches minimum thick 3,300 psi concrete with #4 bars placed at 12-inches on center each way within the slab. A rock leveling course beneath the slab shall be 4-inches of ¾" minus crushed rock, compacted.
    e) For underground installations, the clearance between the RP backflow preventer assembly and any interior wall shall be 12-inches minimum. The clearance between the test cock side of the assembly and the interior wall shall be 24-inches minimum.

The clearance between the bottom of the RP backflow preventer assembly and vault floor shall be 12-inches minimum and 60-inches maximum.

f) The RP backflow preventer assembly shall be supported by "Stand-On" pipe supports, or equal.

g) The RP backflow preventer assembly enclosure shall include a bore sighted drain, sized to accommodate the assembly relief valve discharge.

h) The RP backflow preventer assembly security enclosure shall be insulated or have a heat source that will keep the enclosure above 40º F minimum. Wiring shall be installed to meet local code requirements.

i) A door or other approved access to the backflow assembly enclosure shall be provided.

j) All backflow assembly enclosures shall comply with local building codes. Manufactured enclosures are available from; HydroCowl, Hot Box, and NW Utilities Products.

6. Backflow prevention assemblies two (2) inches and smaller and their boxes shall be installed:

   a) At the water meter, which is usually at the property line, unless an alternative location for the assembly away from but near the meter, is approved by the City, and

   b) On the customer side of the meter.

7. Backflow prevention assemblies larger than 2-inches shall be installed entirely on private property, in a vault or in the building to be served if the main water line is within 20 feet of said building, and at a location approved by the City, as appropriate to the design of the premises to be served.

8. Standby Fire Lines. All fire lines shall be protected with a minimum of a double check detector assembly (DCDA). If the fire line has provisions for adding foamite or toxic fire retardants, or any system connection to or with provisions for connecting to an unapproved auxiliary water supply, the public water system must be protected with a reduced pressure principle detector check assembly (RPDA). Backflow assemblies used for fire line protection must be installed on the owner's property (i.e. just behind the ROW or property line). An easement may be required when it is not possible to locate the assembly at the property line. Placement of an RPDA at a location other than at the ROW or property line shall require approval of the City.

9. Installation of reduced pressure principle detector backflow preventer assembly shall comply with the following requirements:

   a) 2 ½-inch, 3-inch and larger RDPA's shall have flanged connections.

   b) Below ground 90-degree bends shall be restrained with "Mega-Lug" retainer glands and concrete thrust blocking.

   c) Above ground 90-degree bends shall have flanged connections.

d) Inlet and outlet pipe spools shall be ductile iron Class 52 flanged by plain end (FLG x PE).

e) The RPDA concrete support slab shall be 6-inch minimum thick 3,300 psi concrete with #4 bars placed at 12-inches on center each way within the slab. A rock leveling course beneath the slab shall be 4-inches of ¾" minus crushed rock, compacted.

f) For underground installations, the clearance between the RPDA and any interior wall shall be 12-inches minimum. The clearance between the detector meter side of the assembly and the interior wall shall be 24-inches minimum. The clearance between the bottom of the RPDA and vault floor shall be 12-inches minimum and 60-inches maximum.

g) The RP backflow preventer assembly shall be supported by "Stand-On" pipe supports, or equal.

h) The RP backflow preventer assembly enclosure shall include a bore sighted drain, sized to accommodate the assembly relief valve discharge.

i) The RP backflow preventer assembly security enclosure shall be insulated or have a heat source that will keep the enclosure above 40º F minimum. Wiring shall be installed to meet local code requirements.

j) A door or other approved access to the backflow assembly enclosure shall be provided.

k) All backflow assembly enclosures shall comply with local building codes. Manufactured enclosures are available from; HydroCowl, Hot Box, and NW Utilities Products.

l) The detector meter shall be model 25 Badger Recordall Meter that complies with ANSI/AWWA C710. Meter shall be provided with Badge Meter Read-o-Matic Generator, calibrated for reading in gallons. Remote registers will be provided by others.

10. Installation of double check detector backflow preventer assemblies (DCDA) shall conform to the following requirements:

    a) 3-inches and larger DCDA's will normally be installed in a vault below ground, or may be installed above ground with the City's approval.

11. Below ground installation shall comply with the following requirements:

    a) The assembly vault shall be a vault manufactured by Utility Vault Company, or equal, installed per section 520.6 of this manual.

    b) Inlet and outlet spool piping shall extend a minimum of 5 feet beyond the vault wall and shall be ductile iron Class 52, with flange by plain end connections (FLG x PE).

    c) The double check backflow device must have flanged ends and be an Oregon State Health Department and City approved device.

    d) The connection between the downstream piping and the backflow device must be made with a flanged coupling adapter.

e) Clearance on the backside of the DCDA to the vault wall will be 12-inches minimum. Clearance from the test cock side of the DCDA assembly to the vault wall will be 24-inches minimum.

f) OS&Y valve clearance from the fully opened position to the bottom the vault lid will be 3-inches minimum.

g) Clearance from the bottom of the DCDA to the vault floor shall be between 12-inches minimum and 60-inches maximum.

h) The vault must be free from standing water. If gravity draining the vault to daylight, the outlet pipe shall have a rodent screen installed. If drainage the vault to a piped storm drainage system, a check valve shall be installed on the discharge pipe to prevent storm water from backing into the vault. If unable to gravity drain vault to either daylight or a storm drainage system, a sump pump shall be installed. Electrical power for the sump pump shall meet electrical code standards. See Section 520.6.E of this manual for sump pump specifications.

i) The detector meter shall comply with ANSI/AWWA C710. The meter shall be provided with touch read calibrated for reading in gallons. Remote registers shall be provided by others.

12. Above ground installations shall comply with the following requirements:

a) Above ground installations must obtain written approval by the City.

b) The backflow assembly must use flanged connections.

c) Underground 90-degree bends shall be restrained with Mega-Lug retainer glands and concrete thrust blocking. Above ground 90-degree bends shall have flanged connections.

d) Inlet and outlet piping spool shall be ductile iron Class 52 with flanged by plain end (FLG x PE) connections.

e) The backflow assembly shall be installed in the horizontal position and be level.

f) The RP backflow preventer assembly concrete support slab shall be 6-inches minimum thick 3,300 psi concrete with #4 bars placed at 12-inches on center each way within the slab. A rock leveling course beneath the slab shall be 4-inches of ¾" minus crushed rock, compacted.

g) The clearance between the backflow assembly and any obstruction shall be 12-inches minimum. The clearance between the test cock and any obstruction shall be 24-inches minimum. The clearance between the bottom of the backflow assembly and the concrete slab shall be 12-inches minimum with a maximum of 60-inches.

h) The backflow assembly shall be supported by "Stand-On" pipe supports, or equal.

i) The backflow assembly enclosure shall include a bore sighted drain, sized to accommodate the assembly relief valve discharge.

j) The backflow assembly security enclosure shall be insulated or have a heat source that will keep the enclosure above 40º F minimum. Wiring shall be installed to meet local code requirements.

k) A door or other approved access to the backflow assembly enclosure shall be provided.

l) All backflow assembly enclosures shall comply with local building codes. Manufactured enclosures are available from; HydroCowl, Hot Box, and NW Utilities Products.

m) Electrical wiring and building structures shall comply with electrical and building code requirements.

n) The detector meter shall comply with ANSI/AWWA C710. The meter shall be touch read calibrated for reading in gallons. Remote registers shall be provided by others.

B. Backflow prevention assemblies shall be tested promptly:

1. Upon installation, all backflow prevention assemblies must be tested by a State of Oregon Certified Backflow Assembly Tester in accordance with *Sherwood Municipal Code*. A "final certificate of occupancy" shall not be issued for the premises served until the results of the testing have been received and approved by the City.

2. One year after installation and annually thereafter, as required by state law.

3. After any repair of the assembly.

4. Any time the assembly has been moved.

590 REQUIREMENTS FOR WATER SYSTEM VAULT INSTALLATIONS

590.1 General

A. Vaults for water meters, PRVs, backflow devices and assemblies, fire services, and combination air and vacuum release valves, and vaults' appurtenances including but not limited to ladders, access doors, sump pumps, and drains, shall conform to the requirements of section 590, and the standard drawings for water vaults.

B. The vault shall be sealed with Crystal Seal on the outside of the vault. Vault penetrations shall be sealed with non-shrink grout from the outside. Apply waterproof coating over grout. Backfill around vault per the manufacturer's specifications.

C. Access into the vault shall be through a standard Bilco door per the standard drawings. All Bilco doors on any public vault in the public right-of-way shall be structurally adequate for an H-20 loading. If any public or private vault is within a parking or maneuvering area (including the travel lane of any public or private street), the engineer shall evaluate the specific loading conditions and specify the proper door for those loading conditions. The engineer's evaluation and recommended lid design shall be submitted to the City for review and approval prior to submittal to the City Building Division for plumbing permit issuance.

D. Provide approved ladder if the vault or chamber depth is 5 foot or greater and entry is through the vault or chamber roof. Provide approved ladder extension meeting OSHA requirements as required by City, state, and federal standards.

E. Adequate drainage that prevents water from accumulating on the vault or chamber floor shall be provided for the vault or chamber. Trapped water in the vault shall be drained to daylight by gravity or pump, in conformance with the *Uniform Plumbing Code*. In no case shall the drainage be connected to a piped sanitary or storm water system. If a sump pump is used, the pump shall be capable of removing accumulated water at a minimum rate of 5 gallons per minute (GPM) from the vault. The pump shall be equipped with an automatic flow switch; the pump and all wiring shall conform to the *National Electrical Code*.

F. Vault must be equipped with a moisture proof light fixture if adequate lighting is not available.

G. Vault is to have no other use, except for use described by these standards.

H. Vault shall be installed on undisturbed base or compacted ¾" minus gravel base.

I. No piping shall be installed in excess of 3 feet above the vault floor.

J. Assembly is to be adequately supported from the floor, and suitably restrained from movement. Supports shall consist of steel supports; no wood supports shall be used.

K. All electrical wiring shall be inspected by the City of Sherwood Electrical Inspector (permit is required). Engineer to obtain copy of final electrical inspection from the contractor and submit it to the City along with his daily inspection reports.

L. The assembly shall be readily accessible with adequate room for maintenance.

M. 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.

590.2 Backflow Prevention Device Assembly Vaults

A. Backflow prevention device assembly vaults shall be constructed in accordance with Subsections 580.3 and 590.1 of this manual and the standard drawings.

590.3 Fire Services and Domestic Services

A. No part of the backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. In a vault or chamber, adequate drainage shall be provided and test cocks shall be plugged. The plugs shall not be of dissimilar metals.

B. The backflow assembly shall be protected from freezing and other severe weather conditions.

C. All backflow assemblies shall have a minimum 12-inch clearance on the backside, 24-inch clearance on the test-cock side, and 12 inches below the assembly. Adequate clearance (3-inches minimum) must be maintained above gate-valve stem at full extension. Headroom of 6 feet is

required in vaults without a full opening top. Access to the device and to any vault or chamber shall remain clear at all times.

590.4 Water Meter Vaults

A. The vault is to be provided and installed by the contractor per the City's standard drawings.

B. The contractor shall provide a meter size uni-flange on the inside of the vault 6-inches from the wall on the inside of the vault on the incoming (upstream) side. The City will install the meter, bypass, valves, and tees. The contractor will then provide the other flange and exit the vault.

590.5 Pressure Reducing Valve Vaults

A. The City Public Works Division shall provide consultation for the design of each proposed pressure reducing valve vault installation. Contact the City Public Works Division for assistance. All pressure reducing valve vaults shall be constructed per the standard drawings unless otherwise approved by the City.

590.6 Special Requirements for Fire Service Only

A. Fire Service backflow prevention assemblies shall be installed at the property line or edge of the public water line easement. The fire service from the public main to the backflow assembly shall be privately owned and meet all City Water System Standards as outlined in this Chapter. The delineation between the public and private line shall occur as close to the public main as possible and delineated with an in line public valve as defined in section 510. A backflow prevention assembly for a fire service line may be installed inside of a building if the "developed length," as defined in the *Uniform Plumbing Code*, between the backflow prevention assembly and the mainline source valve is 10 feet or less.

B. Only approved resilient seat indicating valves are allowed on fire line assemblies.

C. Only approved Double Detector Check Valve Assemblies are to be used for system containment on fire line services in the City of Sherwood. The meter on the bypass assembly shall read in gallons.

D. Fire Line Flow and Tamper Switches installed, as required by UBC Section 3803, must be connected to a monitored Fire Detection System approved by the Fire Marshal. The tamper switches are required on the OS&Y gate valves in the vault, as well as any other indicating control valves on the fire protection system. Electrical inspection and permit is required.

E. The remote reader (if allowed) shall be rigidly mounted on an exterior building wall (near the domestic meter), enclosed in a metal box with a slot opening which allows reading the remote without opening the box, and at an elevation of 5 feet above the ground level.

F. The remote reader shall have the same number configuration as the metering device itself, and read in gallons. All wires to the remote reader shall be enclosed in a heavy plastic or rigid metal

conduit. All wiring shall be in conformance with appropriate sections of the *National Electric Code*.

590.7 Inspection of Water Lines and Appurtenances

A. The Public Works Department will provide inspection services. No portion of the public water system shall be backfilled until receiving written approval. Contractors who fail to leave the water system open for inspection will be required to uncover any or all portions for inspection.

590.8 Relocation Design Work

A. Any relocation work within existing right-of-way that's required of the development will be performed by the Developer or at the Developer's expense.

590.9 Repair of Damage of the City Facilities

A. Repair of any damage to the City's facilities shall be made at the Developer's or Contractor's expense. The City, at its option, may make repairs to facilitate maintaining service. The City shall charge for repairs at based on time and material costs.

CHAPTER VI
STORM DRAINAGE

610 GENERAL

A. The City of Sherwood has adopted the Clean Water Services (CWS) *Design and Construction Standards*. All City standards meet or exceed CWS requirements.

B. The *Sherwood Municipal Code*, the City's *Zoning and Community Development Code,* and the City's current *Stormwater Master Plan* 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, which are intended to minimize any potential flooding damage and allow for efficient operation, repair, and maintenance of the storm drainage system.

C. Provisions must be made for gravity drainage of roofs and foundation drains for all new buildings and structures. For all new development in the City of Sherwood storm drains shall be piped directly to the public storm drain system. Storm drain connections at the street gutter are not allowed unless otherwise approved by the City Engineer. All public storm infrastructure constructed outside of the public right-of-way shall have the appropriate easements established and recorded with the City of Sherwood and Washington County. Public storm drains located along the back lot line of single family residential shall be a minimum depth of 30 inches.

D. 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.

E. The City enforces CWS standards as written unless otherwise noted herein. Two CWS standards that the City enforces vigorously are as follows:

    1. "Variance from the established line and grade shall not be greater than 1/32-inch per inch of pipe diameter and shall not exceed ½-inch, providing that such variation does not result in a level or reverse-sloping invert."

    2. "All pipe for side sewers shall be white in color."

F. The City has adopted CWS standards with the following amendments:

    1. All steps within structures must comply with OSHA standards for fixed metal individual rung ladders (OAR 437) and CWS standards.

G. Manhole components shall conform to the following requirements unless otherwise approved by the City Engineer:

    1. One 2-inch concrete grade ring conforming to CWS requirements shall be installed on every new manhole.

2. No more than one 2-inch grade ring shall be used per new manhole, except that on pavement overlays up to eight (8) inches of grade rings may be used for adjusting the elevation of each manhole's castings.

3. Manhole castings (frames and covers) shall conform to CWS requirements, including but not limited to, the following: "Casting shall be tough, close-grained gray iron, smooth and clean, free from blisters, blowholes, and defects, and conform to ASTM A48, Class 30. Covers shall be true and set within the ring [frame] at all points. To ensure flat, true [bearing] surfaces *that attain a true bearing all around*, all bearing surfaces shall be planed [machined] or ground" by the manufacturer prior to delivery to the jobsite. It is the contractor's responsibility to ensure manhole covers are installed on the proper frames prior to inspection and acceptance by the City. Castings shall not make any noise whatsoever when exposed to traffic.

4. Paving rings are not allowed without the City Engineer's written approval except on overlay projects.

H. The City does not allow the use outside drop manholes in new sewer lines. All enclosed inside drops, pollution control, and flow control manholes shall be constructed with pipe or structural partition. No fiberglass or plastic partitions panels will be allowed in manholes. All partitions plates shall be rigid and with appropriate connections to the manhole structure.

I. All inside drop manholes, pollution control, and flow control manholes must be 60-inch or larger diameter structures, or equivalently sized rectangular structures approved by the City Engineer.

J. All pipes shall be installed with watertight joints.

K. All non-ferrous pipes for side storm sewers shall be laid with magnetic tape per CWS standards. All side storm sewers in the public right-of-way not hooked up to private storm drains at the time of installation shall have white 2x4 markers installed per the Side Sewer/Side Storm Pipeline detail drawing SS-62. In addition to magnetic tape, tracer wire shall be installed on all new side storm pipes that are not connected to a private system at the time of construction. Tracer wire shall be 12-gage stranded copper with green HMW-PE insulation. Tracer wire shall be run to the top of the 2x4 marker.

L. All backfill material shall be specified by referencing the *Oregon Standard Specifications for Construction* and *Oregon Standard Drawings*.

M. No private storm drain shall be located within any lot other than the lot which is the site of the building or structure served by such sewer. The exception to this will be common areas in planned unit developments, and/or City rights-of-way, or as otherwise approved by the City Engineer.

N. All intersections, changes in direction and changes in pipe cross-sectional dimensions of public lines shall have an access structure approved by the City Engineer.

O. No change of pipe materials permitted unless specifically approved by the City Engineer on a project-specific basis. Approved changes in pipe materials on main lines shall occur only at access structures.

P. For new mainline construction in developed areas, existing side storm laterals shall be located and marked at the property line prior to making a connection at the mainline. Side laterals should be installed perpendicular to the mainline whenever possible.

Q. All manhole joints shall be grouted with "Tams Speedcrete Redline" non-shrink grout or "Allcrete" non-shrink grout. Contractor shall not re-temper grout after initial mixing. Any re-tempered grout shall be rejected.

R. Manhole channels constructed with insufficient depth or excessive drop shall be repaired only by removing the defective channel completely and re-pouring the channel to the correct depth in accordance with CWS standards. Adding a layer of non-shrink grout to the top of the manhole floor to increase the channel's depth is not acceptable.

S. Proprietary water quality systems are not allowed unless approved by the City Engineer in writing. Storm water structures employing proprietary water quality equipment within the structure shall be drawn to scale. The equipment's manufacturer, model number, outside dimensions, "in" and "out" pipe sizes, materials, invert elevations and method(s) of attachment, shall be clearly noted in the drawings. The minimum clearance between any equipment, supports, or connections that requires side access for maintenance, repair or replacement and any interior wall shall be twenty-seven (27) inches except for removable filter-cartridge canister installations.

T. Non-shrink grout used in storm water structures shall be "Tams Speedcrete Redline" non-shrink grout or "Allcrete" non-shrink grout. Contractor shall not re-temper grout after initial mixing. Any re-tempered grout shall be rejected.

U. Unless expressly approved by the City Engineer, no repair sleeves shall be installed on new lines.

V. All maintenance access turn-arounds and landings shall have a maximum slope of five (5) percent in any direction.

W. Prior to acceptance, all new public storm sewer lines shall be thoroughly cleaned, mandrelled and TV scanned by the contractor in accordance with the City's requirements for such work. Such work shall be performed by the contractor just prior to asphalt paving over said lines and again a second time after the final lift of asphalt is compacted, or as directed otherwise by the City Engineer or project specifications.

620 MAINTENANCE PERSONNEL & VEHICLE ACCESS FOR PUBLICLY MAINTAINED STORM WATER QUALITY/QUANTITY FACILITIES & STRUCTURES

A. In the event private property exists between the public right-of-way and the stormwater facilities (facilities located in a tract and in some limited cases, an easement), a public access easement between these two points shall be provided. This access easement shall be a minimum of 20 feet wide.

B. Any slope in the tract/easement area of a publicly maintained stormwater facility shall be no steeper than 3:1, however, a direct route from the gate(s) to the structures in the pond area shall be no steeper than 4:1. This direct route shall be a minimum of four (4) feet wide and have a paved or unpaved surface consisting of the equivalent of three (3) inches (compacted) of ¾ inch-minus crushed rock (to allow walking access in winter), and adjacent vegetation shall not prevent or impair access. This direct access route shall be delineated on the plans.

630 TELEVISION SCANS

A. In additional to television scans performed by the contractor prior to initial paving and after the final lift of asphalt is placed, the City Operation Department will scan all new public storm pipes and all existing sections of pipe that are disturbed or affected by new construction prior to the end of the maintenance period.

640 STORMWATER QUANTITY STANDARDS

A. The minimum standards for the design and construction of storm water quantity facilities in the City of Sherwood shall be the same as the current standards of CWS.

B. If a fence is required to be provided at a water quantity facility, in addition to the standard CWS requirements, it shall be black vinyl clad chain link (unless otherwise approved by the City Engineer) with a top bar added.

650 STORMWATER QUALITY STANDARDS

A. The minimum standards for the design and construction of storm water quality facilities in the City of Sherwood shall be the same as the current standards of CWS.

B. If a fence is required to be provided, in addition to the standard CWS requirements, it shall be black vinyl clad chain link (unless otherwise approved by the City Engineer) with a top bar added.

660 DRAINAGE REPORTS

A. Drainage reports shall document the final design and shall include adequate documentation and summary sheets to allow City staff to easily follow the assumptions, calculations, and conclusions. The use of a flowchart type graphic shall be provided as part of the drainage report, this graphic will communicate pertinent details for the stormwater quality and quantity control facilities such as, but not limited to, stage/storage/discharge, references to posts of hydrographs, flow control

structure elevations, drainage areas, etc. In addition, a sketch of the flow control structure and the relevant elevations shall be included in the calculations. The elevations shall include the pre and post development 2, 10, 25, and 100-year events, the rim, and the invert elevations of the structure(s) and pipes.

B. The report shall clearly show any drainage basin that is being proposed to be forced into another basin along with a justification. The City Engineer may at his discretion deny any request to force a basin. All forced basins shall be fully detained through the 100-year event as measured relative to the pre-developed condition to the receiving basin.

C. All final approved storm reports shall be submitted to the City in both hardcopy and electronic format. The preferred electronic format is one single color PDF file submitted on a CD or DVD. The electronic file shall be submitted with the final hardcopies of the storm report.

670 PUBLICLY MAINTAINED PONDS, SWALES AND OTHER VEGETATED AREAS

A. Topsoil shall be compacted at 90 percent of an AASHTO T-99.

B. Topsoils shall be placed to a minimum depth of twice the rootball of shrubs and/or trees, or 24 inches, whichever is greater. Care should be taken to prevent pockets of standing water due to poor drainage where clay material is excavated in a pocket. Where grass is proposed, the minimum depth of the topsoil shall be 12 inches after compaction. The bottom 12 inches of topsoil shall be tilled into the soil below for roots and trees. The bottom 4 inches of topsoil shall be tilled into the soil below for grass areas.

C. Topsoil shall have an adequate percentage of humus material and shall have adequate properties to promote growth.

D. Topsoil shall be free of weeds, large roots, and large rocks.

E. A landscape architect prepared plan for topsoil preparation and vegetation planting is required. The landscape architect shall show on the plans the depth and placement method of topsoil in order to ensure healthy growth of vegetation shown on the landscape plans. Topsoil will be placed on all areas within the stormwater quality/quantity facilities tract/easement area with the exception of the vehicle maintenance access ways. Appropriate soil amendments (compost) shall be incorporated into the topsoil. The use of topsoil generated from the on-site grading that is relatively weed free may be allowed. Refer to CWS's *Design and Construction Standards* for guidance on the vegetation planting.

F. In addition to these standards the City adheres to the planting requirements set forth by CWS Design & Construction Standards, Appendix A.

CHAPTER VII
SANITARY SEWER SYSTEM

710 GENERAL

A. The City of Sherwood has adopted the Clean Water Services (CWS) *Design and Construction Standards*. All standards meet or exceed these requirements.

B. All sanitary sewer systems shall be designed and constructed so as to conform to the requirements of the Oregon State Department of Environmental Quality (DEQ), CWS, and the City of Sherwood, including but not limited to the City's current *Sanitary System Master Plan* and this manual.

C. Public sanitary sewer 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, at owner's or developer's expense, to all adjacent parcels approximately equal to or higher in elevation to facilitate future development. Sanitary sewer facilities shall be designed to handle all future (full build out) flows from upstream development.

D. The City enforces CWS standards as written unless otherwise noted herein. Two CWS standards that the City enforces vigorously are as follows:

    1. "Variance from the established line and grade shall not be greater than 1/32-inch per inch of pipe diameter and shall not exceed ½-inch, providing that such variation does not result in a level or reverse-sloping invert."

    2. "All pipe for side sewers shall be GREEN in color."

E. The City has adopted CWS standards with the following amendments:

    1. All steps within structures must comply with OSHA standards for fixed metal, individual rung ladders (OAR 437) and CWS standards.

F. Manhole components shall conform to the following requirements:

    1. One 2-inch concrete grade ring conforming to CWS requirements shall be installed on every new manhole.

    2. No more than one 2-inch grade ring shall be used per manhole, except that on pavement overlays, up to eight (8) inches of grade rings may be used for adjusting the elevation of each manhole's castings.

    3. Manhole castings (frames and covers) shall conform to CWS requirements, including but not limited to, the following: "Casting shall be tough, close-grained gray iron, smooth and clean, free from blisters, blowholes, and defects, and conform to ASTM A48, Class 30. Covers shall be true and set within the ring [frame] at all points. To ensure flat, true [bearing] surfaces *that attain a true bearing all around*, all bearing surfaces shall be

planed [machined] or ground by the manufacturer prior to delivery to the jobsite. It is the contractor's responsibility to ensure manhole covers are installed on the proper frames prior to inspection and acceptance by the City. Castings shall not make any noise whatsoever when exposed to traffic.

4. All manhole joints shall be grouted with "Tams Speedcrete Redline" non-shrink grout or "Allcrete" non-shrink grout. Contractor shall not re-temper grout after initial mixing. Any re-tempered grout shall be rejected.

5. Paving rings are not allowed without the City Engineer's written approval except on overlay projects.

6. Manhole channels constructed with insufficient depth shall be repaired only by removing the defective channel completely and re-pouring the channel to the correct depth in accordance with CWS standards. Adding a layer of non-shrink grout to the top of the manhole floor to increase the channel's depth is not acceptable.

7. The City does not allow outside drop manholes in new sewer lines. All enclosed inside drops must be constructed with pipe; no partitions will be allowed for sanitary sewer.

8. All inside drop manholes must be 60-inch diameter or larger diameter structures, or equivalently sized rectangular structures approved by the City Engineer.

G. All backfill material shall be specified by referencing the *Oregon Standard Specifications for Construction* and *Oregon Standard Drawings*.

H. No private sanitary sewer shall be located within any lot other than the lot, which is the site of the building or structure served by such sewer. The exception to this will be common areas in planned unit developments, and/or City rights-of-way, or as otherwise approved by the City Engineer.

I. Prior to acceptance, all new public storm sewer lines shall be thoroughly cleaned, mandrelled and TV scanned by the contractor in accordance with the City's requirements for such work. Such work shall be performed by the contractor just prior to asphalt paving over said lines and again a second time after the final lift of asphalt is compacted, or as directed otherwise by the City Engineer or project specifications.

J. In additional to television scans performed by the contractor prior to initial paving and after the final lift of asphalt is placed, the City Operation Department will scan all new public sanitary pipes and all existing sections of pipe that are disturbed or affected by new construction prior to the end of the maintenance or warranty period.

K. Additional testing of sanitary manholes and pipes (hydrostatic, vacuum, air pressure) shall be conducted by the contractor according to CWS standards, Chapter 8. Additional tests on sanitary sewer systems may be performed by City Operations prior to the end of the maintenance/warranty period.

L. All maintenance access turn-arounds and landings in shall have a maximum slope of five (5) percent in any direction.

M. In the event private property exists between the public right-of-way and sanitary infrastructure (located in tract and in some limited cases, an easement), a public access easement between these two points shall be provided. This access easement shall be a minimum of 20 feet wide.

N. The maintenance access shall be designed with approved grading and drainage to protect the access and adjacent land from erosion and flooding from concentrated and diverted surface drainage.

O. All intersection changes in direction and changes in pipe cross-sectional dimensions of public lines shall have an access structure approved by the City Engineer.

P. No change of pipe materials is permitted unless expressly approved by the City Engineer on a project-specific basis. Approved changes in pipe materials on main lines shall occur only at access structures.

Q. For new mainline construction in developed areas, existing side sanitary laterals shall be located and marked at the property line by the contractor prior to making a connection at the mainline. Side laterals should be installed perpendicular to the mainline whenever possible.

R. All pipe for side sanitary sewers shall be laid with magnetic tape per CWS standards. All side sanitary sewers in the public right-of-way not hooked up to private sanitary systems at the time of installation shall have green 2x4 markers installed per the Side Sewer/Side Storm Pipeline detail drawing SS-62. In addition to magnetic tape, tracer wire shall be installed on all new side sanitary laterals that are not connected to a private system at the time of construction. Tracer wire shall be 12-gage stranded copper with green HMW-PE insulation. Tracer wire shall be run to the top of the 2x4 marker.

CHAPTER VIII
STANDARD DETAILS

810 GENERAL

A. The following standard details shall be used in the design and construction of public improvements in the City of Sherwood:

1. Disclaimer and Design Engineer's Responsibilities.

   a) The Standard Details are not to scale, are schematic in nature, and may not be suitable "as is" for a specific use or location. Therefore, it is the Design Engineer's responsibility to ensure that all of the design components in a standard drawing are suitable for the use intended and each specific location intended, safe for use by the general public, and that the sizes of, locations of, and spaces between the components are all sufficient to meet all project requirements and the City's operational and maintenance requirements.

2. Requirements for Modification of a Standard Drawing.

   a) When a standard drawing must be modified to suit the use or location intended, the Design Engineer shall modify said standard drawing in accordance with the procedural requirements of Section 145 of this manual.

   b) All modified standard details and supplemental drawings shall have the City's title block, logo, block information, drawing title and number removed, and shall bear the seal of the Design Engineer responsible for modifying or preparing them, respectively. If the City's title for a standard drawing is re-used on a modified standard drawing, the work "(MODIFIED)" in all upper case letters and enclosed in parentheses as shown herein, shall be added at the end of the title.

   c) In addition, it is the Design Engineer's responsibility to modify and/or supplement the standard details with technical specifications and additional drawings as necessary to provide a complete, properly functioning project that conforms in all respects to the City's requirements.

Small Wireless Facility Design Standards

A. Definitions and Applicability

1. These design standards apply to Small Wireless Facilities ("SWF") installed in the public right-of-way pursuant to SMC 12.02 unless the applicant obtains approval of a deviation pursuant to Section F. SWF are defined as facilities that meet the following:
    a. The proposed facilities meet one or more of the following height parameters:
        i. are mounted on structures 50 feet or less in height including their antennas as defined in 47 C.F.R. Section 1.1320(d), or
        ii. are mounted on structures no more than 10 percent taller than other adjacent structures, or
        iii. do not extend existing structures on which they are located to a height of more than 50 feet or by more than 10 percent, whichever is greater.
    b. Each antenna or antenna enclosure shall not exceed three cubic feet in volume, and the total volume of multiple antennas on one structure shall not exceed fifteen (15) cubic feet.
    c. The total volume of all installed equipment external to the pole (including, but not limited to cabinets, vaults, boxes) shall not exceed twenty-eight (28) cubic feet. This maximum applies to all equipment installed at the time of original application and includes any equipment to be installed at a future date.
    d. The facilities do not result in human exposure to radio frequency radiation in excess of the applicable safety standards specified in the FCC's Rules and Regulations [47 CFR section 1.1307(b)].

B. General Requirements.

1. Dimensional requirements set forth herein shall be superseded by any more restrictive dimensional requirements set forth in an approved SWF light pole design (as set forth in Exhibit B) or approved SWF standalone pole design (as set forth in Exhibit C), as applicable.
2. Ground-mounted equipment in the right-of-way is prohibited. If a deviation from these design standards allowing for ground-mounted equipment is approved, then such equipment shall be concealed in a cabinet, in street furniture, or with landscaping.
3. Replacement light poles, and standalone poles, and the installation thereof, shall comply with the Americans with Disabilities Act (ADA), city construction and sidewalk clearance standards, and city, state and federal laws and regulations in order to provide a clear and safe passage within the right-of-way. Further, the location of any replacement light pole, or standalone pole, must comply with applicable traffic requirements, not interfere with utility or safety fixtures (e.g., fire hydrants, traffic control devices), and not adversely affect public health, safety or welfare.
4. Replacement light poles shall be located as near as feasible to the existing light pole, as determined by the City Engineer based on the required photometric analysis, unless otherwise required by these design standards. The abandoned light pole must be removed within thirty (30) days after installation of the replacement light pole and either disposed of by the applicant or delivered to City, as directed by the City Engineer.
5. Any replacement light pole shall substantially conform to the color, material and design of the existing light pole unless a different color, material, and/or design is required by these design standards.

6. To the extent technically feasible, antennas, equipment enclosures, and all ancillary equipment, boxes, and conduit shall be colored or painted, with graffiti-resistant paint, prepared and powder coated consistent with Section 00593 of the 2018 ODOT Standard Specifications, to match the color of the surface of the pole on which they are attached.
7. No advertising, branding (including manufacturer decals), or other signage is allowed except as permitted as a concealment technique pursuant to these design standards or as follows:
    a. Safety signage as required by law placed in accordance with legal requirements; and,
    b. All poles to which an SWF is attached must be posted with the SWF owner's name, City-assigned pole number, and 24-hour emergency telephone number. This information must be posted on a sign that is a maximum of three (3) inches wide by one and a half (1.5) inches tall, in engraved lettering that is fifteen one-hundredths (0.15) of an inch tall, on a solid black background. The sign must be curved to mount flush to the pole and mounted five (5) feet above the ground on side of the pole that is not facing the street. These requirements may be superseded by requirements set forth in an approved SWF light pole design (as set forth in Exhibit B) or approved SWF standalone pole design (as set forth in Exhibit C), as applicable.
8. Antennas and antenna equipment shall not be illuminated except as required by a federal or state authority.
9. When external equipment is permitted, all connection points between external and internal equipment must be concealed.
10. All cables and connectors for telephone, data backhaul, electric, and other similar utilities must be routed underground in conduits. Underground cables and wires must transition directly into the pole base without any external doghouse.
11. Generators, including backup generators, are not permitted in the ROW.
12. Disconnect switches must be present and accessible by City and local utility staff for each SWF installation, and, if a meter is required, disconnect switches shall be stacked above or below the meter, instead of attached to the side of the meter, if permitted by the electric utility.
13. All SWF installations shall comply with the National Electric Safety Code (NESC) and National Electric Code (NEC) standards and with ANSI/TIA 222-G-2 to Class II standard.
14. When the City is not the owner of the pole on which a SWF is installed, the SWF installation must also comply with any requirements of the pole owner. The applicant must provide documentation of the approval of the pole owner with its application to the City.
15. SWF proposed to be installed in the ROW shall be sited according to the following priorities, in descending order of preference. If an applicant proposes to install a SWF in any location other than a first priority location, the applicant must provide evidence demonstrating why a higher priority location is not suitable for use. For purposes of this subsection, streets shall have the classification set forth in the Sherwood Transportation System Plan.
    a. First priority: principal arterials;
    b. Second priority: arterial streets;
    c. Third priority: collector streets;
    d. Fourth priority: neighborhood routes;
    e. Fifth priority: local streets.
16. SWF must be installed, and maintained by the SWF owner, in a manner that does not:
    a. Obstruct, impede, or hinder the usual travel, or public safety, on the public ROW.
    b. Obstruct the legal use of the public ROW by others.

c. Violate or conflict with any laws, including but not limited to City of Sherwood Ordinances and standards.
d. Obstruct, impede, or hinder any operations of the City's infrastructure or systems, including but not limited to Smart City equipment, street light equipment, traffic signal equipment, etc.

C. Small Wireless Facilities Attached to Existing or Replacement Light Poles.

1. Small wireless facilities attached to existing or replacement light poles shall conform to the following design criteria**:**
    a. **External Equipment**. When external equipment is permitted under these design standards, the antennas and associated equipment enclosure must appear as an integral part of the light pole or be mounted as close to the light pole as feasible and must be reasonably related in size to the intended purpose of the facility and reasonable expansion for future technologies, not to exceed the volumetric requirements described in Section A. If the equipment enclosure is mounted on the exterior of the light pole, the applicant is limited to one (1) equipment enclosure per pole, and is required to place the equipment enclosure behind any banners or signs that may be on the light pole. All external equipment, other than antennas, must be enclosed within this equipment enclosure. Conduit, fiber, and all wiring and cabling must be fully concealed within the light pole.
    b. **Concealed Equipment**. When concealed equipment is required under these design standards, all equipment (excluding disconnect switches), conduit and fiber must be fully concealed within the light pole. The antennas must appear as an integral part of the light pole or be mounted as close to the light pole as feasible.
2. Applications for small wireless facilities attached to replacement light poles must include an accompanying photometric analysis that meets the Illuminating Engineering Society (IES) RP-08-14 for street lighting. The photometric analysis must be sealed by a Professional Engineer in the State of Oregon.
3. Small wireless facilities are only permitted on existing or replacement light poles in geographic areas for which a SWF light pole design has been approved. A description of the areas for which SWF light pole designs have been approved is attached hereto as Exhibit A. Approved SWF light pole designs are attached hereto as Exhibit B.
4. The height of any replacement light pole may not extend more than 10 feet above the height of the existing light pole.
5. The diameter of a replacement light pole shall comply with the city's sidewalk clearance requirements.

D. Small Wireless Facilities Installed with Standalone Poles.

Small wireless facilities may be attached to standalone poles, installed by the wireless provider, subject to the following criteria:

1. Antennas, antenna equipment and associated equipment enclosures (excluding disconnect switches), conduit and fiber shall be fully concealed within the structure, unless such concealment is not technically feasible, or is incompatible with the standalone pole design, then the antennas and associated equipment enclosures must appear as an integral part of the structure or mounted as close to the standalone pole as feasible, and must be reasonably

related in size to the intended purpose of the facility and reasonable expansion for technologies, not to exceed the volumetric requirements in Section A.

2. To the extent technically feasible, all standalone poles and standalone pole-mounted antennas and equipment shall be painted or colored with flat, non-reflective colors or shades that are compatible with other infrastructure in the right-of-way and/or blend with the visual environment.
3. Standalone poles shall be no more than forty (40) feet in height.
4. Small wireless facilities are only permitted on standalone poles in geographic areas for which a SWF standalone pole design has been approved. A description of the areas for which SWF standalone pole designs have been approved is attached hereto as Exhibit A. Approved SWF standalone pole designs are attached hereto as Exhibit C.
5. Standalone poles are only permitted when the applicant can demonstrate that installation on an existing or replacement light pole is not technically feasible or otherwise not possible due to a lack of owner authorization, safety considerations, or other similar reasons.

E. Small Wireless Facilities Attached to Utility Poles with Overhead Lines, Aerial Cable Spans, Traffic Signal Poles, and Other Structures in the ROW

1. Due to the City's requirements relating to transitioning to undergrounding of all utilities, which do not allow new utilities of any kind to be installed on utility poles with overhead lines except for certain electric lines which cannot be undergrounded, and due to aesthetic and safety concerns, SWF are not permitted on utility poles with overhead lines, aerial cable spans (including aerial span power connections), traffic signal poles, or any other structures in the ROW, other than those specifically permitted by these design standards.
2. In areas of the City where utility poles with overhead lines exist, but separate light poles do not exist, SWF may be installed on replacement light poles or standalone poles, subject to the requirements of these design standards relating to replacement light poles and standalone poles. For purposes of such installations, the replacement light pole shall be located as near as feasible to an existing utility pole with a light fixture attached, as determined by the City Engineer based on the required photometric analysis. If required by the City Engineer, the light fixture attached to the nearest utility pole must be removed within thirty (30) days after installation of the replacement light pole and either disposed of by the applicant or delivered to City, as directed by the City Engineer.
1. If a deviation from these design standards is approved under Section F, allowing a SWF to be installed on a utility pole with overhead lines, such installation shall be subject to the following criteria:
    a. If the pole is not owned by the City, the installation must comply with all pole owner requirements.
    b. The existing pole may be replaced with a taller pole or extended for the purpose of accommodating a small wireless facility, provided that the replacement or extended pole does not exceed 50 feet in height or a height that is 10 percent taller than adjacent poles, whichever is less. The replacement or extended pole height may be increased only if required by the pole owner, and such height increase is the minimum amount necessary to provide sufficient separation and/or clearance from electrical and wireline facilities. Replacement poles and extensions must either match the color and materials of the replaced pole or be the standard new pole used by the pole owner in the City.

c. Antennas (to the extent technically feasible), equipment enclosures, and all conduit must match the material, color, and design of the surface of the pole or existing equipment to which they are attached.
d. Antennas and all other equipment must be mounted as close to the pole as is technically feasible and as is consistent with pole owner requirements.
e. No antenna may extend horizontally more than twenty (20) inches past the outermost mounting point.
f. All equipment must be placed in a single enclosure reasonably related in size to the intended purpose of the facility and reasonable expansion for future technologies. The equipment enclosure must be placed behind any banners or signs that may be on the pole. All external equipment, other than antennas, conduit, fiber, and other wiring, must be enclosed within this equipment enclosure.
g. All cables and wiring must be enclosed in conduits, if allowed by the pole owner. The number of conduits must be minimized to the number technically necessary to accommodate the small wireless facilities.

F. Deviations from Design Standards.

1. An applicant may obtain a deviation from these design standards if compliance with the standard: (a) is not technically feasible; (b) unreasonably impedes the effective operation of the small wireless facility; (c) unreasonably impairs a desired network performance objective; or (d) otherwise materially inhibits or limits the provision of wireless service. The City may also approve a deviation from these standards when it finds the applicant's proposed design provides equivalent or superior aesthetic value when compared to strict compliance with these standards.
2. Requests for deviation must be narrowly tailored to minimize deviation from the requirements of these design standards.
3. The City Manager, or designee, has authority to approve all requests for deviation from these design standards only to the minimum extent required.

G. Conflicting Design Requirements.

In circumstances where the design requirements of the pole owner and the City are different, the more stringent of the two shall prevail. City design requirements that are in direct conflict with the pole owner's requirement may be waived by the City Manager, or designee.