

CHAPTER I

GENERAL DESIGN REQUIREMENTS

110 REQUIREMENTS FOR PUBLIC IMPROVEMENTS

110.1 General

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 subdivisions, for all improvements intended for maintenance by the City, and for all other improvements for which the *Beaverton Code* requires approval of the City Engineer. These improvements include street, bikeway, drainage, water, and sanitary sewer improvements as required by the development review process, City ordinance, and other City policies adopted by the City Council. Standards for site grading, erosion control, parking lot, and driveway construction on private property are also contained in this manual and the *Beaverton Code*.

The standards contained in this manual are established by the City as rules governing the quality of workmanship to which designers, developers, and others shall adhere in preparing plans 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 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 *Development Code* standard that is directly related to an *Engineering Design Manual* standard, as allowed by law.

The City has adopted standard construction specifications, including standard drawings. The standard specifications and standard drawings shall be used in the design, construction and reconstruction of improvements intended for public use and maintenance in the City. Where the design standards, standard specifications, or standard drawings do not cover improvements, the City Engineer shall establish appropriate standards.

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:

- A. Misspellings. Misspelled words may be corrected.
- B. Histories. Erroneous legislative histories may be corrected.
- C. Cross-references. Cross-references may be changed to agree with new, amended, reenacted, renumbered, re-lettered, reallocated or corrected ordinances or resolutions.
- D. Capitalization. Improper capitalization may be corrected.
- E. 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.
- F. Renumbering; re-lettering. 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.
- G. 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.
- H. Punctuation. Punctuation, including hyphenization, may be corrected.
- I. Clerical Errors. Typographical or grammatical errors may be corrected.
- J. 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.
- K. 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.
- L. 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 standards 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.

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

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. A Site Development Permit (SDP) will be issued at the pre-construction conference (with the City Senior Engineering Inspector, 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 Clean Water Services (CWS), if applicable.
2. Completion of the Director, Board of Design Review, and Planning Commission approval or other appropriate land use approval, including City Council appeal periods, if applicable.
3. Performance of all applicable Conditions of Land Use 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).
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 City Standard Agreement to Construct Required Improvements and Retain a Project Engineer or Coordinating Design Professional Registered in the State of Oregon.
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 permit per the adopted fee schedules.
11. Submittal of copies of permits from all other affected governmental jurisdictions.
12. Completion of all appeal periods (land use approval and floodplain modification notices).

110.1.2

Property owners, developers and others proposing to do any work on the site that will change it to a significant degree (as defined by the City, and including those changes itemized in the *Development Code* and Chapter 9 of the *Beaverton Code*) will be required to obtain all applicable land use approvals, complete all of the aforementioned steps, and obtain a Site Development Permit, Right-of-Way Permit, or Facilities Permit as appropriate, before commencing work.

110.1.3

Submitted designs shall be stamped by a registered Professional Engineer licensed to practice in the appropriate engineering discipline in the State of Oregon. At the discretion of the City Engineer, registered Architects licensed to practice in the State of Oregon may be permitted to stamp construction plans for site grading, erosion control, parking lots, sidewalks, and driveways except in the following cases:

1. A proposed floodway or floodplain modification.
2. Grading of an area that is within a fire access route designated by the Fire Marshal.
3. A cut or fill that is greater than 2 feet from original ground level.

If grading is in the public right-of-way, is closer than ten (10) feet from an exterior property line, and it changes the ground surface more than two (2) feet vertically, the Architect shall obtain an evaluation of the proposed cut and fill slopes and erosion control measures by a soils engineer and shall provide six (6) copies to the City. The soils engineer shall also provide an erosion control plan specifically outlining methods that meet or exceed the minimum-standards adopted by Clean Water Services (CWS). In such cases, an Architect's Oregon registration number must appear on or next to the soil engineer's professional stamp on each page submitted.

110.1.4

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

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 Beaverton *Engineering Design Manual*.
- Fourth:** City of Beaverton *Development Code*.
- Fifth:** Clean Water Services (CWS) *Design and Construction Standards*.
- 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 ASCE, AWWA, APWA, ACI, and ASTM.
- Seventh:** *ODOT Pavement Design Guide*.
- Eighth:** *Uniform 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.

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

The public water systems shall be designed to meet the minimum design life as defined in AWWA standards. 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 *Beaverton Code* section 9.05.020 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

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 Manual* is deemed a civil infraction and a public nuisance and is subject to the provisions and remedies of *Beaverton Code* sections 2.05.050 through 2.05.066, sections 2.10.010 through 2.10.050, and sections 9.05.005 through 9.05.170. 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.

Notwithstanding the provisions of *Beaverton Code* sections 2.05.050 et seq., the City Council declares that a violation of this *Engineering Design Manual* or *Beaverton Code* sections 9.05.005 through 9.05.170 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 *Beaverton Code* 5.05.230. When a property is in violation of the standards or requirements of this *Engineering Design 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

Unless otherwise governed by specific provision of the *Beaverton Code*, a person aggrieved by any action, decision, or interpretation of the City Engineer may appeal to the City Council in accordance with *Beaverton Code* 9.05.091.

115 SUBMITTAL REQUIREMENTS

115.1 General

- A. Submittal requirements consist of design plans, grading plans, erosion control plans, drainage calculations, and other information as required by each kind of City permit. The applicability of each requirement below to Site Development Permits (SD), Right-of-Way Permits (RW), or Facilities Permits (F) is indicated in the left hand margin beside each paragraph below by a check mark (✓) if the requirements applies and a “Ø” if the requirement does not apply. Letters of transmittals shall accompany all submittals. Notwithstanding the indications of applicability below, 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.

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

Applicability:		
SD	RW	F
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	∅

115.2 Design Plan Format

- A. The plans shall be submitted on 22 x 34-inch or 24 x 36-inch sheets (with 22 x 34-inch preferred because half-size prints can be made on 11 x 17-inch paper), except that Facilities Permit plans may be on 11 x 17-inch paper as the City Engineer deems appropriate for the scope of the project. All plan sheets shall be the same size unless otherwise approved by the City Engineer.
- B. A 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 drawing. Schematics that are not drawn to scale shall be labeled “Not to Scale.”
- 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, and mailing address of developer/owner and engineering firm (including contacts), General Notes, notice to excavators (one call utility locates), sheet legend, index, and space for City approval stamp (5 x 5-inch) in the lower right quadrant. Standard General Notes shall be obtained from the City and shall be faithfully reproduced on the title sheet.

Applicability:			
SD	RW	F	
✓	✓	Ø	2. Composite utility plan including existing public and private utilities, and proposed public improvements.
✓	✓	Ø	3. Sanitary sewer and water plan and profile showing existing and finished contours at 2-foot intervals, and including all backflow assemblies and vaults as required in Chapter VI of this manual. A detail drawing of each backflow assembly and vault shall be included in the detail drawings for the project. The City's Standard Drawings for backflow facilities are provided to ensure that private backflow facilities provide adequate protection of the public water supply in accordance with sections 617 and 618 of this manual, the <i>Beaverton Code</i> section 4.02.160 and section 9.05.045, and OSHA. Detail drawings for backflow facilities may be allowed to deviate from the Standard Drawings by the City Water Division in consultation with the Engineer on a case-by-case basis. A deviation from a Standard Drawing for backflow facilities does not require a Design Modification under subsection 145.1 of this manual if the City Engineer in consultation with the City Attorney determines that the deviation meets any one of criteria A through L in subsection 110.1.
✓	✓	Ø	4. Street and storm sewer plan and profile showing existing and finished contours at 2-foot intervals. Street lighting and signing plans may need to be on an additional sheet to provide clarity.
✓	✓	Ø	5. Grading and erosion control plan with maximum contour intervals of 2 feet. See subsection 115.3 for additional requirements.
✓	✓	Ø	6. Approved preliminary plat (if the proposed development is a land division).
✓	✓	Ø	7. Landscape plan including sidewalks, bikeways, 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).
✓	✓	Ø	8. All City Standard Drawings 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 approval for modifications. Pre-approval is required for modifications to City Standard Drawings per section 145 of this Manual with the exception of the standard drawings for backflow facilities per 115.2.D.3. above.
✓	✓	Ø	E. The scale shall be 1-inch = 2-feet, 3-feet, 4-feet, 5-feet, or 10-feet vertically

Applicability:			
SD	RW	F	
			and shall be 1-inch = 10-feet, 20-feet, 30-feet, 40-feet, or 50-feet horizontally for all drawings except as otherwise specified for traffic signal installations in subsection 430.2 of this manual or as otherwise required or pre-approved by the City Engineer. Metric scales shall not be used without pre-approval by the City Engineer.
✓	✓	✓	F. Alpha-numeric characters and text symbols shall not be smaller than 0.10-inch high.
✓	✓	∅	G. Permanent and temporary survey control points 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 engineering firm, the owner, the sheet title, and the sheet number.
✓	✓	∅	I. The seal of the registered Oregon Professional Engineer (or Architect as permitted by subsection 110.1.3) 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 initial(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
✓	✓	✓	Plan views shall show the following within the site and for a distance of fifty (50) 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

Applicability:		
SD	RW	F
✓	✓	∅
✓	✓	∅
✓	✓	∅
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	∅

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 Development Services Division, 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 plans, 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, existing off-site areas and features that are within a distance of 20 feet outside the site boundary, including but not 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 specified in the Tree Plan regulations of the *Development Code*.

Applicability:			
SD	RW	F	
✓	✓	∅	c. Trees that are three (3) 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 ten (10) feet or less of the site boundary.
✓	✓	✓	d. Other areas and features designated by the City Engineer for evaluation.
✓	✓	∅	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 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 City of Beaverton 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.
✓	✓	∅	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 location or width, and dimensions and street stationing for driveways.
✓	✓	∅	15. Crown lines along portions of streets transitional from one typical section to another.
✓	✓	∅	16. Center line stationing of all intersecting streets.
✓	✓	∅	17. Location and description of existing survey monuments, including but not limited to section corners, quarter corners, donation land claim corners, and City bench marks.

Applicability:		
SD	RW	F
✓	✓	Ø
✓	✓	Ø
✓	✓	Ø
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	Ø
✓	✓	Ø
✓	✓	Ø
✓	✓	Ø
✓	✓	Ø
✓	✓	Ø

18. Location of proposed street intersection monument boxes and other required surveying monuments shown on the plat.
19. FEMA designated 100-year flood plains and flood ways, or areas of flooding during a 100-year storm event.
20. Existing and proposed wetland areas, wetland mitigation areas, and storm water quality undisturbed corridors (buffer strips), drainage ways and swales.
21. Legend.
22. Developer's/Applicant's name, address, and phone number.
23. Any additional information that the City deems 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, center line of street and ditch inverts shall be shown.
2. Original ground along the center line and if necessary at the edges of the right-of-way if grade differences are significant.
3. Center line, top of curb, and gutter flow lines of existing streets for a distance of at least three hundred (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.

Applicability:			
SD	RW	F	
✓	✓	∅	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). In addition, base flood elevations shall be shown on the profile.
✓	✓	∅	8. Profiles for ditch and creek flowlines shall extend a minimum of two hundred (200) feet beyond the project, both upstream and downstream. Typical cross sections at fifty- (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.
✓	✓	∅	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
✓	✓	∅	1. The <i>Beaverton Code</i> requires a site grading plan as part of the application for any development that involves the excavation or fill of greater than fifty (50) cubic yards of material. Grading contours, existing and proposed, shall be at no more than two (2)-foot intervals, and shall extend off-site a minimum of 50 feet. If the site topography warrants, one (1)-foot contours may be required by the City. 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.
✓	✓	∅	2. All soil-disturbing construction activity must adhere to the requirements of OAR 340-41-455 and Clean Water Services' <i>Erosion Prevention and Sediment Control Planning and Design Manual</i> . A detailed erosion control plan shall be shown in conjunction with the site grading plan.

Applicability:			
SD	RW	F	
✓	✓	Ø	3. The beginning of an excavation or the toe of a filled slope shall be located one-half its vertical height but not less than ten (10) 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 evidence in the form of a written opinion of a soils engineer or engineering geologist to support justification for the waiver.
✓	✓	Ø	4. On grading and erosion control plans, the contours shall extend off-site a minimum of 50 feet. Grading and erosion control plans shall note the source of the topographic information, date of fieldwork, and location of original document. Grading and erosion control plans shall show the limits of construction, the on-site topography, any required tree preservation fencing, and the adjacent off-site topography within 50 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 section 115.2.1.7. that are within a distance of 50 feet outside the site boundary.
✓	✓	Ø	5. All grading plans for those areas where the grading will be within ten (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 two (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.
✓	✓	Ø	6. The erosion control plan shall show both the construction erosion control plan and also the post-construction erosion control plan. Where possible, the grading and erosion control plans shall each be entirely on separate sheets.
✓	✓	Ø	7. Unless inconsistent with the other provisions of this Manual or the <i>Beaverton Code</i> , sections 3312 through 3315 and Figure A-33-a, "Setback Dimensions," of Chapter 33 of the <i>Uniform Building Code Appendix</i> (1997 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.

Applicability:			
SD	RW	F	
✓	∅	∅	<p>115.4 Drainage Calculations</p> <p>Drainage calculations shall be presented in a clear, concise, and complete manner. These calculations shall address all runoff into the drainage system; areas contributing flow to each inlet must be computed separately and each inlet with contributing area shall be designated and shown on an accompanying contour map work sheet.</p>
✓	∅	∅	Initial time of concentration calculation with assumptions listed and charts or nomographs used shall be included with drainage calculations.
✓	∅	∅	For more information on storm drainage calculations, see Chapter III Storm Drainage.
			<p>115.5 Other Requirements</p>
✓	✓	✓	Other information to be shown on the construction drawings or the other submittals include:
✓	✓	∅	A. The design assumptions for each street (e.g., traffic coefficient, R-value).
✓	✓	∅	<p>B. The design elements such as:</p> <ol style="list-style-type: none"> 1. Street classification 2. Design speed 3. Superelevation. 4. Average Daily Traffic (ADT) or Design Hourly Volume (DHV).
✓	✓	∅	C. 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, UBC, and ACI codes, specifications, and guidelines incorporated into this Manual by reference.
✓	✓	✓	D. Any additional information that the City Engineer deems necessary to review the plans and assure compliance with design standards.
			<p>E. Other Submittals</p> <p>Final Plat (if the proposed development is a land division.) For any proposed subdivision and any land division with public improvements, if the Final Plat is designed/drawn on a CAD system, and the digital file is readily available as an</p>

Applicability:			
SD	RW	F	
			<p>AutoCAD DWG file, the applicant is encouraged to submit to the City, in addition to the Mylar copy of the Final Plat, a digital file for the Final Plat or a “partial” Final Plat showing only the interior and exterior lot lines, right-of-way lines, and street centerlines, as a DWG file provided on a CD or by email or on the Design Engineer’s ftp site. (While not mandatory, submittal of this DWG file may expedite the city’s acceptance of the completed development’s public improvements.</p>
✓	✓	∅	<p>115.6 Detail Sheet(s)</p> <p>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 Drawings and special details necessary for the project.</p>
✓	✓	∅	<p>All City Standard Drawings shall be full size, 75 percent, or 66 percent of original size. Any modifications to a City Standard Drawing or detail must be clearly marked and initialed by the Engineer along with the date of approval for the modification. Pre-approval for modifications to City Standard Drawings and details is required; see section 145 of this manual.</p>
✓	✓	✓	<p>115.7 Review Procedure</p> <p>Seven (7) hardcopy sets of complete plans for the development, meeting the requirements of sections 115.1 through 115.6, or as directed by the City Engineer, shall be submitted for review. In addition to the hardcopy sets of the complete plans submitted for review, the design engineer shall submit to the City digital copies of each of the files listed below and in the format prescribed below. (It is understood that these files shall be provided exclusively for the City’s internal uses as described below.)</p> <ol style="list-style-type: none"> 1. The digital files for the plans submitted for review, on CD-RW (to be used by the City primarily for interim updating of its road and utility system maps until the complete plans are approved by the City), and 2. A digital file for the Plat of the development, on CD-RW (also to be used by the City primarily for interim updating of its GIS maps of the City until the plat is approved by the City.) 3. Format. <ol style="list-style-type: none"> a. If the plans or plat were prepared using AutoCAD Land Desktop software, the digital file shall be submitted in AutoCAD DWG format. b. If the plans or plat were prepared in software other than AutoCAD Land Desktop, they shall be converted to DWG format, except that design engineers not equipped to make such conversions in-house shall, as an

Applicability:		
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✓	✓	Ø
✓	✓	✓
✓	✓	✓

alternative, submit their plans or plat in hardcopy form to the City for scanning.

- c. If the plans or plat were hand-drawn, the design engineer shall submit a hardcopy set of the plans and plat to the City for scanning.
- d. Plans submitted in hardcopy format shall be full-sized copies.
- e. Digital copies of plans and plats initially submitted pursuant to these requirements shall be marked “PRELIMINARY – NOT FOR CONSTRUCTION” and, at the discretion of the design engineer, shall display a disclaimer as to completeness, accuracy or other characteristics as deemed appropriate by the design engineer.

Once the complete plans have been approved by the City, the design engineer shall submit to the City digital copies of the drawing files for the approved plans (for use by the City in permanently updating the City’s road and utility system maps and GIS maps.) The format for these plans shall be as prescribed for the initial plan submittal in paragraphs 1 and 3 above.

Supporting information and documentation, such as drainage and water system calculations, fire flow tests and worksheets, structural calculations, and a geotechnical/soils report shall be submitted, as the City Engineer deems necessary.

Upon completion of the detailed review by the City, the City will return one (1) 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 set. After the design engineer has completed all revisions, seven (7) sets of final revised plans shall be submitted to the City for signoff.

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 one (1) year from the date of plan review fee payment. If a site development permit is not issued within the one-year timeframe 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 two years from the date of the issuance of the site development permit. Extensions to the permit can be made by requesting a one-year extension using a City-provided form. Contact the City Senior Engineer in the Community Development Department for a copy of the form. If a site development permit is obtained, plan approval is valid for two years from the date of the issuance of the site development permit. Approval of a permit extension may require a new plan review if conditions have changed since the plans were approved.

Applicability:			
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✓	✓	✓	Plan approval means that the plans have been reviewed for reasonableness and compliance with minimum City specifications and standards. This approval does not supersede those standards and specifications unless expressly varied by the City. Plan approval does not relieve the Engineer from responsibility for errors, omissions, or deficiencies in the plans.
✓	✓	Ø	115.8 As-Built Drawings Following completion of construction and prior to final inspection of a completed project, the Engineer shall submit one (1) complete set of as-built (record) drawings. Each sheet included in the construction plan set shall be as-built.
✓	✓	✓	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 and shall include any detail drawings, shop drawings, and clarification drawings issued after the original approved plans.
✓	✓	Ø	As-built drawings shall be accompanied by a completion certification letter from the Engineer. The completion certification letter shall accompany the as-built plans 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 fill 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.
✓	✓	Ø	Advisory Note: Certificates of occupancy will not be issued until the as-built drawings have been submitted to the City and approved with or without conditions, except that the City may waive this requirement for the first three (3) buildings constructed in residential development. However, in no case shall the City allow the as-built drawings to be submitted more than seven (7) days after issuance of the certificates of occupancy for the first three (3) buildings constructed in a residential development. Failure of the developer/applicant to submit as-built drawings acceptable to the City within seven (7) days after said issuance will be cause of the City to suspend said certificates of occupancy until acceptable as-builts have been submitted.
✓	✓	✓	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 relating to their specialty.
✓	✓	✓	As a condition of the City's acceptance of the As-Built drawings, the site must either have all vegetation/landscaping established or all erosion control measures as needed based on the <i>Erosion Prevention and Sediment Control Planning and</i>

Applicability:			
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			<i>Design Manual</i> , and all erosion control measures must be installed and in good working order.
✓	✓	✓	Each sheet of the as-constructed drawings shall be stamped "As-Built" and dated.
✓	✓	Ø	Each as-built drawing shall be signed by the Engineer. This signature constitutes a certification that the public improvements, grading, and other elements of the engineered drawings have been completed in accordance with the City approved plans and to the standards of the City.
✓	✓	✓	<p>As-builts submitted in hardcopy form shall be black India ink on originals or reverse reading, fixed-line, photographically reproduced (Silver Halide process) on 4-mil polyester film (e.g. Mylar), 22 x 34-inches or 24 x 36-inches in size except that Facilities Permit as-builts may be 11 x 17-inches, as the City Engineer deems appropriate for the scope of the project. Sepia mylars or vellums will not be accepted.</p> <p>Below is a list of combinations of plotted ink on polyester film media that in 1999 were tested and found to be acceptable by members of the Oregon Association of County Engineers and Surveyors (O.A.C.E.S.) The City has approved these combinations of plotted ink on polyester film media as acceptable forms of hard copies of as-built plans.</p> <ol style="list-style-type: none"> 1. HP Cartridge #51640A, #51645A, # 51629 or #1892A (UV) on Continental Imaging # JPC4M1 or JPC4M2 polyester film. 2. HP Cartridge # 51645A on JPD-4E 3. HP Cartridge # 51645A on OCE # 868342 4. HP Cartridge # 51645A on AZON 13-0444 - 4 mil double matte 5. HP Cartridge # 51645A on Comstock 130444 - 4 mil double matte (added 1/25/2002) 6. HP Cartridge # 51645A on Bullfrog BF7804IJ 7. HP Cartridge # C4871A on HP #51642B Mylar (HP plotter DJ1055CM) 8. Graphic Utilities # 81581 (pigmented ink refill for HP51626A cart.) on JPC4M1 or JPC4M2 polyester film 9. Graphic Utilities # 618101 (pigmented ink refill for HP51640A cart.) on JPC4M1 or JPC4M2 polyester film 10. Graphic Utilities # 611781 (pigmented ink refill for HP51645A cart.) on JPC4M1 or JPC4M2 polyester film

Applicability:			
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			<p>11. HP Cartridge # 4844A on Continental Imaging # JPC4M1 or JPC4M2 polyester film. (new series HP 500 & 800 plotters)</p> <p>12. HP Cartridge #C4871A on Continental Imaging # JPC4M1 or JPC4M2 polyester film.</p> <p>(Note: The City’s publication of the above list does not constitute an endorsement by the City or the OACES of any of the products on the list. In addition, the City assumes no responsibility for failure of as-builts prepared using any of the combinations listed above to pass the City’s inspection of said as-builts for durability and ink permanency. For more up-to-date information, please contact the City Site Development staff.</p> <p>In addition, the following requirements apply:</p>
✓	✓	✓	A. All public utility easements must be shown on the as-built.
✓	✓	✓	B. Distance between main lines in shared easements-must be shown.
✓	✓	✓	C. Type of main line, size, and material must be shown.
✓	✓	✓	D. All laterals must be shown with descriptions of their lengths, plan stationings, sizes, materials, and depths.
✓	✓	✓	E. If one or more sidewalks are constructed, the appropriate City Standard Drawing for each type of public sidewalk must be included.
✓	✓	✓	F. If the project was designed on a CAD system, the City must also be provided electronic file copies of the as-built drawings and all related drawings (including but not limited to revised construction drawings and additional construction drawings issued after the City’s approval of the original construction plan set, clarification drawings, shop drawings, survey record drawings and plat revisions), documents and data files (including but not limited to survey point files). Electronic copies shall be AutoCAD files in .dxf or .dwg format on CD ROM disk(s) and organized in folders for ease of identification and retrieval. A-builts submitted in hard copy form shall be 22 x 34-inches or 24 x 36-inches in size, except that as-builts for work performed under a Right-of-way Permit or a Facilities Permit may be 11 x 17-inches, as the City Engineer deems appropriate for the scope of the project. Hard copies of as-built plans and related drawings shall be to exact engineering scale matching the scale of the approved construction plans (including the original construction plan set and any subsequent plan sheets). If the electronic copies of the as-built drawings are unsatisfactory, they must be corrected to the City’s satisfaction and resubmitted to the City.

Applicability:		
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✓	✓	Ø
✓	✓	✓

G. Permanent and temporary survey control points and related data must be shown in accordance with subsection 135.5.

H. As-built plans and related information shall show at least the same level of detail as the plans in the original approved construction plan set and all subsequent construction drawings and related information. The City may review the as-built plans and related as-built information for any construction work within the City to ensure that they conform to the requirements of the *Manual*, State archival law and all other applicable local, regional, state, federal and national standards in all respects, including but not limited to format, organization, completeness, accuracy, coherency, legibility, consistency, durability and compatibility with the City’s computer software and hardware. If any as-built drawing or related as-built information submitted to the City is found by the City to be unsatisfactory, it must be corrected to the City’s satisfaction and re-submitted to the City for approval.

120 EASEMENTS

A. The minimum public utility and drainage easements for residential subdivisions shall be as follows:

1. A six-foot (6) wide public utility easement along all front lot lines, as shown on the local street section standards, except that in R5, R7, and R10 residential subdivisions, the public utility easements along all front lot lines shall be eight (8) feet wide.
2. A three-foot (3) wide utility and drainage easement along all side and rear lot lines.

B. Public water, sanitary sewer, and storm drainage lines on private property shall be centered within a permanent easement granted to the City, with a minimum width of fifteen feet (15) 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. Under no circumstances shall a private utility facility or structure be placed within the pipe zone, regardless of whether City 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 to maintain City utilities. Such easements,

when directed by the City, shall be accompanied by temporary easements granted to the City of adequate width to allow construction and maintenance of water, sewer, and storm drainage facilities. The Engineer or developer's surveyor shall provide the City with documents necessary to record the easements. The width of combination easements is evaluated at the site development permit stage on a case-by-case basis. It is within the authority of the City Engineer to refuse to approve or sign any land partition, partition plat, or subdivision plat for a development that has not installed or completed the construction of the necessary public infrastructure to serve the proposed and affected existing lots. Such approval may be withheld until it can be verified that the location and width of proposed rights of way and easements are adequate for the completed infrastructure.

- 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 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.

130 ACCURACY OF CITY MAPS AND PLANS NOT GUARANTEED

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

135 SURVEYING

135.1 General

This document, the *Oregon Standard Specifications* for Construction, section 00170.82(C), and ORS 209.140-150 define the requirements for protection of existing survey monuments during any construction and setting new survey monuments following construction of new streets, sewers, water and related works.

The City Engineer may not approve or sign any land partition, partition plat, or subdivision plat until the necessary public infrastructure to serve the proposed and affected existing lots has been installed and has been guaranteed by a security acceptable to the City Attorney. It is within the authority of the City Engineer to refuse to approve or sign any land partition, partition plat, or subdivision plat for a development that has not installed or completed the construction of the necessary public infrastructure to serve the proposed and affected existing lots. Such approval may be withheld until it can be verified that the location and width of proposed rights of way and easements are adequate for the completed infrastructure.

135.2 Existing Survey Monuments

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

As per ORS 209.150, no person shall willfully or negligently remove, destroy, or deface any existing survey monument. If damage cannot be avoided, the monument shall be referenced and replaced, under the direction of a registered Professional Land Surveyor, according to state law. A copy of the field notes referencing such monuments shall be provided to the City Engineer. Failure to comply with this provision is subject to penalty according to ORS 209.990.

135.3 New Survey Monuments

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 drawing in Chapter VIII shall be installed in new streets as required by Oregon Revised Statutes. Public street intersections or private street/public street intersections shall be monumented in a City Standard monument box.

The monuments shall be set by an Oregon registered Professional Land Surveyor. When monuments are set by a registered Professional Land Surveyor, a record of survey shall be filed complying with ORS 209.250 and any additional requirements set forth by the City.

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

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.

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

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

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.

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

Horizontal control shall be Oregon State Plane Coordinates, Oregon North Zone, NAD 83(91), expressed in International (SI) Feet. Vertical control shall be NGVD 29, expressed in U.S. Survey Feet.

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 Drawing number 130. Masonry nails (such as “PK or MAG” nails, with or without washers or shiners) shall not be considered durable and permanent.

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.

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

The purpose of the following requirements is to promote a method by which 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 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.

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: Horizontal control shall be Oregon State Plane Coordinates, Oregon North Zone, NAD 83(91), expressed in International (SI) Feet. Vertical control shall be NGVD 29, expressed in U.S. Survey Feet. Project control may be established using traditional surveying methods and/or Global Positioning System (GPS) techniques. City of Beaverton 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, GC-3, GC-42 or other geodetic surveys recorded by the City. Preferred control shall include all City of Beaverton GPS base stations. Additional control can be found in the City's Horizontal and Vertical Control Index. All digital maps and data files shall be on the same coordinate system.

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:

- A. 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
- B. 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
- C. The project's site, 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.

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

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).

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(91), North Zone, multiply the LDP

coordinate by an average combined grid factor of 0.00000000”. 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 NAD83(91) coordinates.

140 STRUCTURES

140.1 General

Structures in public rights-of-way and easements shall be designed, constructed, inspected and tested in accordance with the requirements of the ODOT, Clean Water Services (CWS), and ACI, as applicable, and the additional or exclusionary requirements contained in this manual. In cases of conflict or disagreement, the most stringent 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 latest editions of *Uniform Building Code (UBC)*, the “ACI Manual of Concrete Practice,” “ACI Manual of Concrete Inspection,” and the “ACI Guide for Concrete Inspection,” or other 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

Major roadway, roadside, and drainage structures shall conform to the design criteria in this section and section 210.13 of this manual. The project construction drawings and Special Provisions for bridges and other major roadway, roadside, and drainage structures shall state the ODOT requirements and design criteria that apply to the project.

The detailed design criteria for major roadway, roadside, and drainage structures contained in the ODOT/APWA *Oregon Standard Specifications for Construction*, ODOT's *Bridge Design Manual and Accompanying Standard Drawings*, AASHTO's *Roadside Design Guide*, AASHTO's *Load and Resistance Factor Design (LRFD) Bridge Specifications*, and ODOT's *Manual of Field Test Procedures*, are hereby incorporated herein by reference.

Unless otherwise provided herein, major concrete and steel structures shall conform to the ODOT/APWA Oregon Standard Drawings. Major concrete structures not addressed by these standards, and the characteristics of major concrete structures not fully addressed by these standards, shall conform to the design criteria in the latest editions of the *International Building Code (IBC)*, the "ACI Manual of Concrete Practice," "ACI Manual of Concrete Inspection," and the "ACI Guide for Concrete Inspection," or other ACI codes, standards, specifications, and guidelines, at the discretion of the City Engineer.

For purposes of this manual, the following structures are not considered major structures: curb, curb and gutter, sidewalks, driveways, catch basins, street inlets and other drainage inlets connected to storm drain pipes 15-inches in diameter or smaller. These structures shall conform to this *Manual*, the City's Standard Drawings, and the ODOT/APWA *Oregon Standard Specifications for Construction*, but not to ODOT's or CWS's standard drawings unless said standard drawings are explicitly referenced. For drainage structures, in cases of conflict or disagreement between the City's standards and CWS's standards, the City's standards shall govern, unless directed otherwise by the City Engineer.

Concrete for major roadway, roadside, and drainage structures shall be Class 5000 - $\frac{3}{4}$ concrete unless otherwise specified in the ODOT/APWA *Oregon Standard Specifications for Construction* or approved by the City Engineer. Reinforcing steel for all structures shall be as specified in the ODOT/APWA *Oregon Standard Specifications for Construction*. Concrete for poured-in-place curb, curb and gutter, sidewalks, driveways, catch basins, street inlets, and other drainage inlets shall be Class 4000 - $\frac{3}{4}$ concrete. Concrete for pre-cast catch basins, street inlets, and other pre-cast drainage inlets shall be Class 4000 - $\frac{3}{4}$ unless otherwise specified or approved. The concrete for poured-in-place underground utility structures shall be Class 3000 - $\frac{3}{4}$ concrete. The concrete for pre-cast underground utility structures shall conform to the applicable ASTM standard(s).

140.3 Retaining Walls

- A. 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 ten (10) feet or less of the tie-backs shall be encased in approved steel pipe casings.
- B. Retaining walls in 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.

- C. A building permit may be required by the UBC depending upon the height of the wall.
- D. Retaining walls requiring a building permit under the UBC shall be designed by a professional civil or structural engineer in accordance with the UBC design criteria.
- E. Retaining walls 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.

140.4 Testing of PCC Concrete for Structures

PCC concrete for structures shall be tested and evaluated as specified in subsections 210.2.4.5, 210.2.4.6, and 210.2.4.7 of this Manual.

145 DESIGN MODIFICATIONS

145.1 Modification Process for Specific Projects

The City Engineer may make project-specific revisions to City standard drawings 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. An applicant or 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 the 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.
- B. The written request shall be in a form approved by the City and shall include, at a minimum, the following:
 - 1. A completed "Request for Design Modification" form.
 - 2. An accompanying letter or narrative providing the following:
 - a. The information required in 145.1.1.A for the requested Design Modification(s) organized in a manner that addresses each requested Design Modification separately;

- b. A statement for each requested Design Modification describing how it is justified in terms of one or more of the criteria in subsection 145.1.5 that the applicant believes to be applicable to the development and explaining the applicant's rationale for selecting each of the criteria that the applicant submits as a basis for approval of the requested Design Modification(s);
 - c. A description of existing and future conditions that are relevant to each requested Design Modification, and;
 - d. The causative relationship between said conditions and the requested Design Modification(s).
- C. The written request shall be accompanied by three (3) copies of a development plan or set of development plan(s), depending on the scope and complexity of the development, for evaluation by the City Engineer. Such plan or plans shall depict the entire proposed development and all of the proposed public improvements to be included in the development and other information required by sections 115.1 through 115.4 of this manual, all at the level of detail required by the City Engineer.
- D. If land use approval is required for the proposed development, the applicant shall submit the written request, supporting information, and three (3) copies of the development plan(s) to the City Engineer prior to or concurrent with submittal of the land use application.
- E. If land use approval is not required, the applicant is encouraged to submit the written request, supporting information, and three (3) copies of the engineering plan(s) at the conceptual or schematic stage of plan preparation for the development that would ordinarily be required by the City for a land use application submittal.
- In such cases, the applicant should submit the written request and the required supporting information and plan(s) to the City Engineer no later than when the application for a Site Development Permit is submitted. Failure to do so may result in delay of the permit process.
- F. Any request for modification of a City standard for a specific project should be supported with reference to pertinent nationally accepted specifications or standards.

145.1.2. Review of Requested Modification

The City Engineer shall review a design engineer's request to modify a City standard relating to, and only for, a specific project. The City Engineer shall:

- Approve the request as proposed,
- Approve the request with conditions, or
- Deny the request.

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

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.

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

Pursuant to *Beaverton Code* sections 9.05.016 and 9.05.091, 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

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. 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 capital improvement project. 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.

Pursuant to *Beaverton Code* sections 9.05.016 and 9.05.091, 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

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 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.L. of this Manual.
5. For utility facilities, exemption criteria are listed in section 210.18.R.

145.2 Metric Standards

City standards are presented in English units. The City Engineer may approve equivalent standards in metric units. In calculating the metric equivalents, the City Engineer may round the figures to a level of accuracy equivalent to that of the original standard; provided, rounding of the metric units shall not cause a deviation greater than three (3) percent between the English and metric values.

150 CONSTRUCTION

150.1 Work Hours

The work hours for all items covered by the site development permit shall be from 7:00 A.M. to 6:00 P.M. Monday through Friday. The City Engineer may allow longer or require shorter work hours depending on site-specific conditions. (The City shall observe the following holidays; New Years Day, Martin Luther King Day, President's 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 Mayor due to inclement weather, natural disaster, or national security, those days shall also be considered as Sundays or other legal holidays.)

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 Engineer'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 Inspector. Requests made with less than two days notice may not be approved if the City Engineer is not available.

150.2 Inspections

All public improvements shall be inspected by an Oregon registered Professional Engineer or a qualified individual under the supervision of an Oregon registered Professional Engineer (exceptions to this are as noted in subsection 110.1.3). 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.

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.

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:

- A. City Inspection Services: It is the policy of the City of Beaverton to provide only "spot check" (oversight) inspection services, which are listed in subsection 150.2.1 below.
- B. 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.
- C. 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.

150.2.1 City Inspector's Activities

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. Maintaining a completion file containing the following:
 - a. The original of the project completion certification;
 - b. A complete copy of the log book initialed by the engineer's inspector;
 - c. The results of material tests, compaction tests, and soil analysis as detailed in the log book.
6. Inform the City Development Services 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's Project Inspector as to whether the revision is significant enough to warrant review by the City Site Development Division. If so, the Engineer of Record shall submit five (5) full-size copies of the proposed plan revision(s); no work affected by the revision shall be done until approval by the City Development Services Engineer.

150.2.2 Inspecting Engineer's Activities

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

1. Maintain a project log book of daily inspection reports which contain the following information:
 - a. Job number and name of Engineer and designees.
 - b. 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.

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

- 2. Obtain and use a copy of City-approved construction plans, specifications, and a copy of this manual.
- 3. Review and approve all pipe, aggregate, portland cement concrete, asphaltic concrete, and other materials to ensure their compliance with City standards.
- 4. Approve all plan or specification changes in writing and obtain City approval (see City Inspector's 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.
- 5. Monitor construction activities to ensure end products meet City specifications.
- 6. Perform (or have performed) material, composition, and other tests required to ensure City specifications are met.

7. For pavement construction, perform the following stage inspections and record date of each:
 - a. Curbs, 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, grade, and compaction specifications.
 - d. Leveling course meets depth/thickness, grade, and compaction specifications.
 - e. Wearing course meets depth/thickness, grade, and compaction specifications.
 - f. Provide the City with 24-hour notice of impending stage inspections.

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 plan. 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 and recording of all public utility easements).

150.3 Substitution of Products; “Approved Equal” Designation

It is not the intent of this manual to exclude other equipment, materials, or products 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. 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.

150.4 Safety Requirements

The contractor is responsible for observing the safety of the work and of all persons and property coming into contact with the work. The contractor shall conduct his work in such a manner as to comply with all the requirements prescribed by OSHA. Traffic control in work zones shall conform to the *MUTCD*. For short-term projects, the “Oregon Temporary Traffic Control Handbook for Operations of 3 Days or Less,” published by ODOT, is used by the City as a guideline. In general, lane closures will not be approved on arterial or collector streets for the period between Thanksgiving and New Years Day. The City Traffic Engineer may restrict the hours when lane closures are allowed, where necessary to maintain traffic capacity. At the City’s discretion, a traffic control plan shall be submitted and approved prior to construction.

The City Project Inspector's role is not one of supervision, 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.

150.5 Scheduling

A. Sequence of Operations.

The Contractor shall plan construction work and execute his operations with a minimum of interference with the operation of the existing public facilities. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions, and it shall be the obligation of the Contractor to do this work at such times. This scheduling, however, is subject to the City's approval and does not relieve the contractor from making work available for inspection.

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

B. Progress of Construction.

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

In the case of a pipe-laying job for sanitary sewer, storm drainage, and water improvements the trenching equipment at no time shall be greater than 300 feet ahead of the pipe-laying crew, unless given permission by the City Engineer. The trench shall be backfilled so that no section of the trench or pipe is left open longer than 24 hours. 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:
 - Existing drainage patterns and features;
 - Existing vegetation, shrubs, trees, and landscaping;
 - Public property, improvements, operations, and services;
 - Private property and improvements;
 - Access to public and private property and the enjoyment of same;
 - Private utility facilities and services; and,
 - 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 property access shall be restored as soon as possible but in no case shall such a disturbance be left unrestored for more than one (1) hour, unless an extension is granted by the City.
3. Disruptions of utility services shall be restored as soon as possible but in no case shall a disruption last for more than four (4) hours, 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 two (2) hours after the disruption first occurs, until the service is fully restored, unless an extension is granted by the City.
4. An unauthorized disturbance of any other feature or amenity listed in 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 eight (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 150.6.A. 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.

C. 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. Stockpiling of construction materials shall not be allowed on existing sidewalks or the driving surface of existing streets.

D. Restoration.

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 Contractor's 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 prior to final acceptance of the work by the City.

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 150.6.A.

E. 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. 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 the CWS erosion control procedures.

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.

F. Dust Prevention.

During all phases of the work, the Contractor shall take precautions to abate any dust nuisance by cleaning up, sweeping, sprinkling with water, or other means as necessary to accomplish results satisfactory to the City. Dust prevention measures shall be continuous until final acceptance by the City. Obtaining water from a hydrant will require specific authorization from the applicable water jurisdiction.

G. Stream and Creek Crossings.

The Contractor shall comply with all provisions of the permits required by the Oregon Division of State Lands and the U.S. Army Corps of Engineers. Before any work may be performed in any stream, the method of operation and the schedule of such work shall be approved in writing by the Engineer. Work within major streams shall be scheduled to take place as specified in the applicable permits for such work, and once started, shall be completed without interruption of the work. Mechanized equipment shall enter streams only when necessary and only within the immediate work area.

150.7 Interferences and Obstructions

A. General.

Various obstructions may be encountered during the course of the work. Although maps and information regarding underground utilities should be obtained from the utility owning and operating such utilities, the location of such utilities is not guaranteed. A

minimum of 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 150.6.A.

B. Protection.

The Contractor shall exercise all due care in protecting property along the route of the improvement. This protection shall include, but not be limited to, trees, yards, fences, drainage lines, 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. General.

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. Permits or Easements.

Crossing agreements, permits, and/or easements for such crossings will be obtained by the applicant and all the terms of such permits or easements shall be met by the Owner and Contractor.

150.9 Materials

A. General.

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 otherwise specified by the City Engineer. No re-built, reconditioned, refurbished or used materials or components will be allowed, except as provided in paragraph 150.9.C for re-used manhole components.

B. Products Altered During Installation, After Installation or During Disassembly.

When a product, including but not limited to, a pre-cast manhole section or other manhole component, street inlet grate or frame, pipe, valve, or any 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. When a pipe or fitting has been installed and then disconnected, the joint gasket(s) or connection gasket(s), gripper band, connection O-ring, or other flexible joint-sealing component(s) shall be discarded and replaced with all new manufactured identical product to avoid re-installation of a contaminated or otherwise altered component.

C. City Engineer's Approval of Re-use.

With the City Engineers' 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 since manufacture may be re-used.

155 ENVIRONMENTAL PROTECTION DURING CONSTRUCTION

155.1 General Policy and Requirements

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

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

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

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

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

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 the Department of Environmental Quality and the Tualatin Valley Fire and Rescue Fire Marshal's Office.
3. 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.

4. 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.
5. 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.
6. 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

Besides the City's own ordinances and resolutions, the non-conflicting provisions of ordinances and resolutions of Clean Water Services apply within the City. All design and construction must meet or exceed the applicable standards of the City and Clean Water Services. The following are the City's erosion control standards that apply to design and construction in addition to the erosion control standards of Clean Water Services:

- A. Measures to prevent erosion at construction sites shall be incorporated into the construction drawings and specifications.
- B. 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.
- C. The concentration of runoff on or across slopes shall be prevented.
- D. 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.
- E. 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. Forging 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.
- F. 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 kept to a minimum.
- B. Pollutants such as sawcut slurries, concrete slurries, excavated and quarried materials, fuels, lubricants, bitumens, raw sewage, and other harmful materials shall not be discharged into or near rivers, streams, or impoundments. Sterilizing water from water line construction activities shall not be directly discharged into the public storm drainage system. Activities and construction practices must comply with all Oregon 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 impoundment shall not result in altering the temperature or turbidity of any water body enough to harm fish habitat or affect other aquatic life.

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

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

- A. Noise control shall comply with ORS 467, OAR 340-035, 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 Engineer.

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 (Part 204 CFR), the City Code and ODOT/APWA Standards.
 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 Engineer.
 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.
- B. 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 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)

C. 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.

- D. 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 marked 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 CWS Design and Construction Standards, landscape requirements.

155.8 Historical and Archaeological Areas

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.

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

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

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

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 five (5) copies of the 24 by 36-inch revised pages (with the revisions clearly identified), along with a copy of any revised calculations. Applicants are cautioned that revisions must be reviewed for coordination with the entire plan set and that such reviews will be conducted in the order that the revisions are received, on a first come, first served basis.