

Public Works Design Standards

June 2012



City of Canby
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ATTACHMENT

A CANBY TRANSPORTATION SYSTEM PLAN (DECEMBER 2010) ROADWAY STANDARDS

**CITY OF CANBY
PUBLIC FACILITY IMPROVEMENTS**

DESIGN MANUAL AND STANDARD SPECIFICATIONS

Revised June, 2012

CHAPTER 1 - GENERAL

1.100 REQUIREMENTS FOR PUBLIC INFRASTRUCTURE IMPROVEMENTS

- 1.101 Public infrastructure improvements are conditioned through the development review process, City ordinances and other policies adopted by the City. No public street improvements or utility construction shall commence prior to the City of Canby, Canby Utility or other owning agency (such as ODOT, Clackamas County, etc.) approval of the construction plans. Designs submitted for approval shall be stamped by a Registered Professional Engineer licensed to practice in the State of Oregon.
- 1.102 Submittal requirements consist of design plans, grading plans, erosion control plans and other information as required for street or utility construction, including paving, curbs and sidewalks, sanitary sewer, water system and storm drainage. Other information required may include a transportation study, storm water report, and geotechnical report. Developers shall be responsible for preparation of plans and specifications to comply with all conditions of approval from the City of Canby, and requirements from other owning and regulatory agencies.
- 1.103 Developers shall be responsible to coordinate with City staff and all utility providers prior to preparation of preliminary design drawings. The Developer shall be responsible for amending the design plans such that the review agencies accept the documents.
- 1.104 The current revision of the APWA/ODOT Standard Specifications for Construction and Drawings for Public Works Construction are hereby adopted and incorporated as part of this document by reference except as modified herein.
- 1.105 Prior to any construction activity within a public right-of-way, the Contractor shall apply for a street opening permit which must be approved by the City administrator. Contractors shall post a 100% performance bond or equivalent with the City of Canby for the duration of the work, which shall be released upon satisfactory completion. The Contractor shall be responsible for a 12-month maintenance bond equal to 5% of the construction value for 1 year after acceptance of all work in the public-right-of-way.
- 1.106 These design standards are intended for standard development projects and therefore do not provide for all situations such as pump stations, bridge crossings, railroad crossings, retaining walls, bridges and similar improvements. Deviations to these guidelines may be allowed by the City on a case by case basis if a specific need can be demonstrated.

- 1.107 These design standards are for streets, sanitary sewer and storm drainage. For water system design standards contact Canby Utility.
- 1.108 Where there are discrepancies between the design standards and the standard details, the design standards take precedence. In particular, the standard details have not been updated with regard to the new street right-of-way and pavement widths.
- 1.109 Where sections are referenced from the Canby development code it shall be defined as the referenced section or the updated section/location within the code.

1.200 DESIGN PLAN FORMAT

- 1.201 The plans shall be submitted on 22-inch x 34-inch plan sheets.
- 1.202 Vicinity Maps shall be located on the first sheet of all plans and shall show the location of the project with respect to the nearest major street intersection.
- 1.203 A north arrow shall be shown on each plan view sheet of the plans and adjacent to any other drawing which is not oriented the same as other drawings on the sheet.
- 1.204 Plan scales shall be 1" = 1'V, 1" = 10'H; 1" = 2'V, 1" = 20'H; 1" = 4'V, 1" = 40'H; or 1" = 5'V, 1" = 50'H for all drawings except details.
- 1.205 Letter size shall not be smaller than 0.10 inch high.
- 1.206 The location and elevation of a National Geodetic Survey, United States Geological Survey, State Highway or Clackamas County bench mark shall be shown. No other datum shall be used without permission of the City of Canby or Canby Utility. Temporary bench marks and elevations shall be shown on the plans.
- 1.207 A title block shall appear on each sheet of the plan set and shall be placed in the lower right-hand corner, of the sheet, across the bottom edge of the sheet or across the right-hand edge of the sheet. The title block shall include the names of the project, the engineering firm, the owner, the sheet title and the sheet number.
- 1.208 The seal of the Registered Professional Engineer responsible for preparation of the plans shall appear on the each sheet.
- 1.209 The description and date of all revisions to the plans shall be shown on each sheet affected, and shall be approved and dated by a Registered Professional Engineer as evidenced by signature or initial.

- 1.210 General Sheets shall include the following:
- a. A title sheet with the vicinity map, index of sheets, legend and general construction notes. The general notes should include at least general construction notes, construction execution, material types and testing requirements.
 - b. A site plan showing the entire development including streets, utilities and lots. The boundaries of this map should extend at least 150-feet past the development. This map may be provided at a scale of 1" = 100', or 1" = 200'.
 - c. A grading plan showing the existing and proposed grading. This would also show the location of any retaining walls.
 - d. An erosion control plan and details.
- 1.211 Plan views shall show the following:
- a. Right-of-Way, property, tract, and easement lines.
 - b. Subdivision name, lot numbers, street names and other identifying labels. Developer's name, address and phone number. Subdivision and street names are subject to approval of the City Planning Department.
 - c. Location and stationing of existing and proposed street centerline and faces of curb.
 - d. Horizontal alignment and curve data of street centerline and curb returns including Radius, Delta and Length.
 - e. Existing underground utilities and vegetation in conflict with the construction or operation of the street.
 - f. Match lines with sheet number references.
 - g. Street stationing to be noted at 100 foot intervals.
 - h. Top of curve elevations along curb returns at quarter-deltas.
 - i. Location of the low points of street grades and curb returns.
 - j. Sidewalk ramp locations.
 - k. Crown lines along portions of streets transitioning from one typical section to another.
 - l. Centerline stationing of all intersecting streets.
 - m. Location and description of existing survey monuments, including but not limited to, section corners, quarter corners and donation land claim corners.
 - n. Legend.
 - o. Location of proposed utilities including pipes, manholes, clean-outs, valves, fire hydrants, vaults, water meters and other features. The pipes and manholes shall be stationed, and the manholes shall be numbered.
 - p. Show the location of the water and sanitary sewer service lines. Standard sizes can be established in the construction notes or details. Other than standard size should be noted on the plans.
 - q. The location of driveways and street trees should be shown to determine if there are conflicts with utilities.
- 1.212 Profile views shall show the following:
- a. Stationing, elevations, vertical curve data and slopes for center of streets or top of curbs. For offset or super-elevation cross sections, both curbs shall be profiled. Where curbs are not to be constructed, centerline of street and ditch inverts shall be shown.
 - b. Original ground along the centerline and if necessary at the edges of the right-of-way if grade differences are significant.

- c. Centerline of existing streets for a distance of at least one hundred fifty (150) feet each way at intersections with proposed streets and past the limits of construction.
- d. Vertical alignment of streets.
- e. The top of curve for all cul-de-sacs, eyebrows and curb returns.
- f. For sewer and storm lines show the pipe size, slope and length. Provide the manhole number, station, rim elevation and inverts. Also show the backfill type, and the surface material.
- g. For water lines show the pipe size and location of fittings. Also show the backfill type, and the surface material.
- h. Show all other known underground facilities such as gas lines, power, cable etc.

1.213 Detail sheets shall include the following items:

- a. All details required for the work shall be included on the construction drawings including standard details. These may be modified with notes to cover slight changes required to unique circumstances.
- b. Show unique details that are not covered by standard details.
- c. Show details of manufacturer designed items such as gravity block retaining walls. Also provide the design criteria.

1.300 REVIEW PROCEDURE

- 1.301 Ten (10) sets of complete plans shall be submitted for review by the City of Canby and Canby Utility. This review is to check that all required information has been submitted, that the plans meet the City design standards, that plans are in accordance with City master planning, and that they are reasonable.
- a. The plan submittal should include the construction documents and final reports as required such as storm water, geotechnical and transportation.
 - b. Construction documents must be submitted as a single package to the City.
 - c. The developer is responsible for submitting the plans to other review agencies. The only exception is that the City will coordinate with Canby Utility.
 - d. Before construction documents can be approved a copy of all required permits or approvals from other agencies must be sent to the City. These may be submitted separately, but the construction documents will be reviewed again with regard to the permit requirements.
- 1.302 Upon completion of the detailed review by the City, the City will provide the developer the design review comments. This may be in the form of one (1) set of plans with "Red Line" comments, and/or a design review memo.
- 1.303 After the design engineer has completed all revisions, ten (10) revised plans and the original "Red Line" plans (and/or review memo with reply) shall be returned to the City for review. This process shall continue until the plans are accepted.

1.400 RECORD DRAWINGS

- 1.401 Following completion of construction, the design Engineer shall submit to the City of Canby and Canby Utility Board as applicable, two (2) sets of record drawing blue lines, and one (1) set on electronic media in AutoCAD format.
- 1.402 Record drawings shall be labeled as such on each sheet whether there were changes on that sheet or not.
- 1.403 As-built drawings shall describe any and all revisions to the previously approved construction plans, shall indicate the limits of any surplus material placed as fill on building sites, and shall be accompanied by a certification letter from the design engineer, indicating that the record drawings are accurate.
- 1.404 Final plat signatures or occupancy permits will not be issued prior to receipt of record drawings.

**CITY OF CANBY
PUBLIC FACILITY IMPROVEMENTS**

DESIGN MANUAL AND STANDARD SPECIFICATIONS

Revised June, 2012

CHAPTER 2 – STREETS

2.100 GENERAL

- 2.101 All street designs shall provide for the safe and efficient travel to the public. Streets shall be designed to carry the recommended traffic volumes identified for each street classification. Street classifications are set forth in the Canby Transportation System Plan as updated.
- 2.102 Streets shall be designed to meet or exceed minimum guidelines. These guidelines are set forth in the "AASHTO Policy on Geometric Design of Highways and Streets" (latest edition). Traffic Control Devices shall conform to the "Manual on Uniform Traffic Control Devices for Streets and Highways," Federal Highway Administration, with Oregon Supplements, Oregon Department of Transportation (latest edition).
- 2.103 A transportation impact study (TIS) may be required.
- a. If a transportation impact study was required during land use planning, then it shall be finalized as part of the design. This should take into account any changes to the development, existing conditions or agency requirements since the time the draft report was done.
 - b. If a transportation study was not required during land use planning, it shall be required during design if the proposed development creates more than 1,000 trips per day based upon the ITE Trip Generation Manual, if the development appears to have a significant impact upon local transportation, or if the development will negatively affect an existing traffic concern.
 - c. The scope of the TIS shall be determined by the City as detailed in the Canby development code section 16.08.150 E and F. At a minimum the traffic report shall evaluate nearby intersections as identified by the City and shall determine existing conditions (service level, v/c ratio, cueing) during average day conditions, PM peak and AM peak; projected conditions, identify changes and impacts, and recommend potential solutions. The potential solutions should also be evaluated.
 - d. The scope of the TIS shall also be verified with ODOT or Clackamas County if their facilities may be affected by the development.
 - e. The TIS shall be conducted by a registered traffic or civil engineer in the State of Oregon.

- 2.104 A geotechnical report may be required for the streets or general site grading. The report shall be conducted by a registered engineer in the State of Oregon. The report shall include a site specific investigation including a description of existing conditions based upon existing data and site investigations, slope stability, groundwater location, design criteria and construction recommendations. The report shall be required under certain conditions such as:
- a. If there are suspect ground conditions such as potentially poor soil, unstable ground or slide conditions on the site or nearby,
 - b. If there will be significant cut of fill,
 - c. If there will be structures that are public, or are supporting infrastructure such as retaining walls over 48 inches high or bridges.
- 2.105 Refer to the adopted transportation system plan (TSP) for functional classifications, required upgrades to existing facilities, alternative transportation systems and routes.

2.200 STREET DESIGN

- 2.201 Street Sections
- a. The street sections design standards shall be as outlined in the City of Canby Transportation Systems Plan and any revisions thereof. Please refer to Attachment A for the street sections as shown in the Canby TSP.
 - b. Alternative Requirements – On a case by case basis the City Administrator or designee and Planning Director may allow alternative right-of-way and pavement widths for local streets and neighborhood routes. These may be considered in the following conditions.
 1. In sensitive lands such as wetlands, floodplains or slope hazard areas.
 2. In areas designated as steep slopes (slopes greater than 20%).
 3. Infill development that occurs in otherwise fully developed neighborhoods.
 4. Street improvements in fully developed neighborhoods.
 5. Other exceptional circumstances.

Street Classification	Right-of-Way	Pavement Width	Sidewalk Width
Cases 1, 2 & 5			
Neighborhood Routes	30-50'	20' minimum	5'
Industrial Collector		46'	6'
Industrial Local		32'	6'
Cases 3, 4* & 5			
Local	Match existing, 28' minimum	Match existing, 20' minimum	Match existing

* Where sidewalks are installed they must be a minimum of 4-feet wide. Curb may not be required. The ROW width will be modified based upon the street width, sidewalk and storm drainage requirements.

2.202 Pavement Design

- a. Pavement design shall in no case be less than provided in the design standards. Heavier sections may be required depending upon soil conditions, or the amount of traffic and in particular truck traffic anticipated. Pavement sections for industrial streets, arterials and highways shall be specifically designed.
- b. Perpetual pavement design will be considered in lieu of standard pavement design.
- c. Local and collector streets shall be a minimum of 4 inches of asphalt in two lifts, over 12 inches of base rock. The sub-base shall be proof rolled at the time of construction. The city shall inspect the sub-base as it is proof rolled and determine if the sub-base needs to be improved.
- d. Arterial streets shall be a minimum of 5 inches of asphalt in two lifts, over 12 inches of base rock. The sub-base shall be proof rolled at the time of construction. The city shall inspect the sub-base as it is proof rolled and determine if the sub-base needs to be improved.
- e. Specific designs shall be used for designated truck routes, but in no case shall the section be less than the minimum for arterial streets.

2.203 Horizontal Alignment

- a. Centerline alignment of improvements should be parallel to the centerline of the right-of-way.
- b. Centerline of a proposed street extension shall be aligned with the existing street centerline.
- c. The following are guidelines for minimum centerline horizontal curve radius:

Arterial Streets	-	450 feet
Collector & Neighborhood Streets	-	270 feet
Local Streets	-	165 feet

2.204 Vertical Alignment

- a. Minimum tangent street gradients shall be one-half (0.5) percent along the crown and curb.
- b. Maximum street gradients shall be fifteen (15) percent for collector, and local streets, and ten (10) percent for arterials. Grades in excess of the standards must be approved by the City Administrator or designee on an individual basis based upon the following criteria.
 - 1. There is no practical access to property being developed through adjacent properties.
 - 2. The cut/fill required to maintain the standard slopes may cause destabilization of soils.
- c. Local streets intersecting with a collector or greater functional classification street or streets intended to be posted with a stop sign shall provide a landing averaging two (2) percent or less. Landings are that portion of the street within fifty (50) feet of the edge of the intersecting street at full improvement.

- d. Grade changes of more than one (1) percent shall be accomplished with vertical curves. Vertical curves shall be designed per the "AASHTO Policy on Geometric Design of Highways and Streets". "K" values shall be shown on the plans.
 - 1. Vertical curves may be shortened at intersections where there is a stop sign or a "tee" intersection.
- e. At street intersections, the crown of the major (higher classification) street shall continue through the intersection. The roadway section of the minor street will flatten to match the major street at the quarter panel.
- f. Street grades, intersections and super elevation transitions shall be designed to not allow concentrations of stormwater to flow over the pavement.
- g. The standard street cross-slope shall be to match centerline with top of curb. The minimum cross slope shall be 2%. The maximum cross slope shall be 3.6%.

2.205 Intersections

- a. The interior angle at intersecting streets shall be kept as near to ninety (90) degrees as possible and in no case shall it be less than seventy-five (75) degrees.
- b. Offset intersections shall not be allowed. For intersections where the centerline of the streets does not align, the minimum spacing shall be as follows:

Street Class	Intersection Spacing (Ft.)
Arterial	660 - 1,000*
Collector	250 - 600*
Neighborhood Route	150 - 600
Local/Cul-de-sac	150 - 600

*The City Administrator or designee may permit a minimum spacing of not less than 300 feet (Arterial), 200 feet (Collector), when findings are made to establish that:

- 1. Without the change, there could be no public street access from the parcel(s) to the existing street, or
- 2. The change is necessary to support local pedestrian, bicycle circulation and access, and
- 3. The change is necessary due to topographic constraints, and
- 4. All other provisions of the street design requirements can be met.
- c. The following shall be used as a guideline for curb radii at intersections for the various classifications. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the higher classified street.

Arterial Streets	R = 40 feet
Collector Streets	R = 30 feet
*Local Streets	R = 25 feet

**In accordance with the Oregon Fire Code*

- 2.206 Cul-de-sacs and Eyebrows
- a. Cul-de-sacs shall only be allowed per the Canby Development Code Chapter 16.64.010. Cul-de-sacs and eyebrows shall be allowed only on local streets.
 - b. Cul-de-sacs shall not be more than four hundred (400) feet in length, and shall serve no more than 25 dwellings. The length of a cul-de-sac shall be measured along the centerline of the roadway from the near side right-of-way of the nearest through traffic intersecting street to the farthest point of the cul-de-sac right-of-way.
 - c. The minimum radius for a cul-de-sac bulb right of way shall be 54 feet with a minimum curb radius of 48 feet.
 - d. The minimum curb radius for transitions into cul-de-sac bulbs shall be twenty-eight (28) feet minimum and the right-of-way radius shall be sufficient to maintain the same right-of-way to curb spacing as in the adjacent portion of the road.
 - e. When cul-de-sacs are allowed, provisions for connectivity of other public facilities shall be made. Specifically, pedestrian connections as called for in the Canby Development Code Chapter 16.64.010, and looping of the water distribution system.

- 2.207 Half Street Improvements
- a. Half-street construction is generally not acceptable. Where such a street is justified, the right-of-way and pavement width will be approved by the City Administrator or designee. In no case shall the pavement width required be less than that required to provide two lanes of traffic to pass at a safe distance. For a 32-foot local street, the half-street pavement width will be 20-feet. Half-streets will only be approved when the abutting or opposite frontage property is undeveloped and the full improvement will be provided with development of the abutting or opposite (upon right-of-way dedication) frontage property.
 - b. A development on an unimproved substandard street shall be responsible for constructing a continuous, 20' wide half street to a connection with the nearest publicly owned right-of-way.
 - c. In cases where an existing street is to be improved, the improvement shall be to at least the centerline of the street or 20' wide whichever is more.

- 2.208 Pavement Transitions and Tapers
- a. In the direction of vehicular traffic where the street width transitions from narrower to wider the taper shall be three (3) to one (1).
 - b. In the direction of vehicular traffic where the street width transitions from wider to narrower the length of the transition taper shall be determined as follows:

$$L = S \times W \quad \text{for } S = 45 \text{ mph or greater}$$

$$L = S \times S \times W / 60 \quad \text{for } S \text{ less than } 45 \text{ mph}$$

L – length of taper in feet

S – design speed in mph

W – offset width in feet

- c. Delineator may be required at tapers.

2.209 Sidewalks

- a. Sidewalks shall be a minimum of 4 inches of concrete over 2 inches of base rock.
- b. The maximum cross slope shall be 2-percent.
- c. With regard to obstructions such as mailboxes, sign posts, power poles, etc., the minimum horizontal clearance on a sidewalk shall be 32 inches for a maximum length of 24". Minimum clear width of an accessible route is 36". The vertical clearance shall be a minimum of 7-feet.
- d. Sidewalks are intended to be within the right-of-way. In special circumstances the City may allow them to be outside of the right-of-way, but they then must be within a dedicated easement.
- e. Handrails or fences may be required should there be vertical drops next to the sidewalk of 6-inches or more, or there are steep slopes next to the sidewalk.
- f. One sidewalk ramp meeting Americans with Disabilities Acts (ADA) requirements shall be located at each corner. In areas with greater than 1,000 trips per day, two sidewalk ramps meeting (ADA) standards shall be located at each corner. Mid-block sidewalk ramps may be required where there are pedestrian facilities. Other factors may dictate the location of ramps.

2.210 Curb & Gutter

- a. A standard curb shall be used. It shall be 16-inches deep and have a 6-inch face with a 1-inch radius, 6-inches wide at the top and 9-inches wide at the bottom.
- b. Mountable curbs will not be used unless approved by the City Administrator or designee in special circumstances such as developments with townhouses where 90% of the frontage is driveway.
- c. Monolithic curb and gutters are not required, but may be used.

2.211 Driveways

- a. Access to private property shall be permitted with the use of driveway curb cuts. The access points with the street shall be the minimum necessary to provide access while not inhibiting the safe circulation and carrying capacity of the street. Driveways shall meet all applicable guidelines of the Americans with Disabilities Act (ADA).
- b. Driveways shall be limited to one per property except for certain uses which include large commercial uses such as large box stores, large public uses such as schools and parks, drive through facilities, property with a frontage of over 250-feet and similar uses.
- c. Double frontage lots and corner lots may be limited to access from a single street, usually the lower classification street. Single family residential shall not have access onto arterials, and shall have access onto collectors only if there is no other option.
- d. If additional driveways are approved by the City Administrator or designee, a finding shall be made that no eminent traffic hazard would result and impacts on through traffic would be minimal. Restrictions may be imposed on additional driveways, such as limited turn movements, shared access between uses, closure of existing driveways, or other access management actions.

- e. Within commercial, industrial, and multi-family areas, shared driveways and internal access between similar uses are encouraged to reduce the access points to the higher classified roadways, to improve internal site circulation, and to reduce local trips or movements on the street system. Shared driveways or internal access between uses will be established by means of common access easements at the time of development.
- f. Driveway widths shall be as shown on the following table.

Driveway Widths (Minimum/Maximum, Ft.)

Street Classification	Res.	Comm.	Ind.
Arterial:	NA (1)	12/36	12/36
Industrial:	NA (1)	12/36	12/36
Collector:	12/24 (2)	12/36	12/36
Neighborhood Route:	12/24 (2)	12/36	12/36
Local:	12/24 (2)	12/36	12/36
Cul-de-sac:	12/24 (2)	12/36	12/36
Public Alley	12/24 (2)	NA	NA

Res. = Residential Zone
 Comm. = Commercial Zone
 Ind. = Industrial Zone

Notes: (1) Special conditions may warrant access.
 (2) 28' maximum with 3-car garage.

- g. Driveway spacing shall be as shown in the following table.

Minimum Driveway Spacing

Street Classification	Intersection	Driveway
Arterial (2)	330' (1)	330' (1)
Industrial Streets (2)	100' (1)	100' (1)
Collector (2)	100' (1)	100' (1)
Neighborhood Route	50' (1)	10'
Local (all)	50' (1)	10'
Cul-de-sac	50' (1)	10'
Public Alley	50' (1)	

Notes: (1) Minimum distance or no closer than 60% of parcel frontage unless this prohibits access to the site, in which case City Administrator or designee may approve a deviation.
 (2) Direct access to this street will not be allowed if an alternative exists or is planned.

* Driveways shall not be constructed within the curb return of a street intersection.

- h. Curb cuts shall be a minimum of five feet from the property line, unless a shared driveway is installed. Deviation may be approved by the City Administrator or designee.
- i. For roads with a classification of Collector and above, driveways adjacent to street intersections shall be located beyond the required queue length for traffic movements at the intersection. If this requirement prohibits access to the site, a driveway with restricted turn movements may be permitted.

- j. Multi-family access driveways will be required to meet the same access requirements as commercial driveways if the multi-family site generated 100 or more trips per day.

2.212 Bikeways

- a. General - The City has adopted a Transportation System Plan, which includes a Bicycle/Pedestrian Plan. This plan summarizes the City's policy and implementation strategies for bikeways within the City. The City will use both AASHTO and ODOT standards and criteria as the minimum guidelines for bikeway design, construction, and control.

The guidelines for bikeways consist of the following:

1. AASHTO, "Guide to Development of Bicycle Facilities," latest edition.
 2. ODOT, "Oregon Bicycle & Pedestrian Plan", latest edition.
 3. Manual on Uniform Traffic Control Devices with Oregon supplements by Oregon Transportation Commission, latest edition.
- b. Location - Bikeway location and widths for on-street bike lanes are shown on the street section table in paragraph 2.201 of these standards. Bikeways that are outside of street sections will be considered two-way. See paragraph 2.201 for the width. These shall have a minimum of 2-foot wide gravel shoulders on both sides.
 - c. Design Criteria – Design shall meet the criteria per AASHTO and ODOT, but shall also meet the following criteria:
 1. All bikeways shall have a minimum cross-slope of two percent (2%) and a maximum cross-slope of five percent (5%).
 2. Bikeway curvature will be based on a minimum design speed of 20 MPH.
 3. Bikeway grades shall be limited to a maximum of five percent (5%). Where topography dictates, grades over five percent (5%) are acceptable when a higher design speed is used and additional width is provided.
 4. Off-street bikeways shall be constructed for limited maintenance vehicle use. Subgrade preparation will require removal of existing organic material and compaction.

Bikeway Thickness

Use	Asphalt	Aggregate
Limited	3"	6"

5. When drainage such as side ditches is required parallel with the bikeway, the ditch centerline shall be at least five feet (5') from the edge of the pavement. Ditch side slope adjacent to the bikeway shall be no steeper than 2:1 when measuring the horizontal distance to the vertical distance.
6. When culverts cross bikeways, the ends of the pipe shall be no closer than five feet (5') from the edge of the bikeway.

2.213 Parking

- a. Location – On street parking location and widths are shown on the street section table in paragraph 2.201 of these standards.
 - 1. On street parking is considered optional on one way arterials and collector streets. Both parallel and diagonal parking are options for the one way arterials. The requirements for on street parking in these locations are at the City's discretion.
 - 2. Neighborhood routes and local street shall have parallel parking. Parking may be deleted in special circumstances such as conserving major trees, streets are located in sensitive lands, or hazardous conditions at the City's discretion.
 - 3. On street parking is not allowed on two way arterials and industrial streets (local and collector).

2.214 Street Signs & Stripping

- a. A street signing and stripping plan shall be included in plan submittals for new streets. Street stripping and signing shall be in accordance with ODOT standards and guidelines.

2.215 Street Lighting

- a. A street lighting plan shall be included in plan submittals for new streets. Street lighting shall be for the safety of pedestrians as well as traffic safety.

- 2.216 Traffic Calming
- a. Traffic calming measures are encouraged and are supported as shown in the following table.

Allowed Traffic Calming Measures by Roadway Functional Classification

Traffic Calming Measure	Is Measure Supported? (per Roadway Classification) ^a		
	<i>Arterial</i>	<i>Collector</i>	<i>Neighborhood Route/ Local Street</i>
Curb Extensions	Supported	Supported	Calming measures are supported on roads that have connectivity (more than two accesses) and are accepted and field tested by the Canby Fire District.
Roundabouts	Supported	Supported	
Medians and Pedestrian Islands	Supported	Supported	
Pavement Texture	Supported	Supported	
Speed Hump	Not Supported	Not Supported	
Raised Crosswalk	Not Supported	Not Supported	
Speed Cushion (provides emergency pass-through with no vertical deflection)	Not Supported	Not Supported	
Choker	Not Supported	Not Supported	
Traffic Circle	Not Supported	Not Supported	
Diverter (with emergency vehicle pass through)	Not Supported	Supported	
Chicanes	Not Supported	Not Supported	

NOTES:

- a. Traffic calming measures are supported with the qualification that they meet Canby Fire District guidelines including minimum street width, emergency vehicle turning radius, and accessibility/connectivity.

2.217 Temporary Dead end Streets

- a. Temporary dead end streets more than 150-feet long shall have a temporary turn-around that meets the requirements of the Canby Fire District.
- b. Appropriate easements shall be provided for the temporary turn-around

2.300 MOBILITY STANDARD

2.301 The mobility standard for City of Canby streets is measure as the level of service (LOS) and is as follows:

- a. Signalized intersections or four-way stops: LOS D.
- b. Two way stop controlled: LOS E.

2.302 The mobility standard for Clackamas County and ODOT shall be per their respective standards.

**CITY OF CANBY
PUBLIC FACILITY IMPROVEMENTS**

DESIGN MANUAL AND STANDARD SPECIFICATIONS

Revised June, 2012

CHAPTER 3 – SANITARY SEWER DESIGN

3.100 GENERAL

- 3.101 Sanitary sewer design shall comply with all requirements of the Oregon Department of Environmental Quality design guidelines and be approved by DEQ prior to beginning any construction, as well as comply with the City of Canby's master planning requirements.
- 3.102 Sanitary sewer systems shall, in general, be designed to provide gravity service to all areas of development. Approval by the City Administrator or designee shall be obtained prior to design of any sewer which cannot provide gravity service.
- 3.103 Sanitary sewer system capacity shall be designed for ultimate development density of the tributary area. The system shall allow for future system extension and for future development based on current or proposed land use designations.
- 3.104 Sanitary sewers shall be designed to remove the domestic sewage and industrial wastes from basements of houses, where practical, commercial or industrial buildings, and all public and private establishments where possible.
- 3.105 Storm water, including street, roof, or footing drainage, shall not be discharged into the sanitary sewer system but shall be removed by a system of storm drains or by some other method separate from the sanitary sewer system.
- 3.106 All public sewer pipelines shall be located within the public right-of-way whenever possible. These lines are placed in the public streets and right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to provide required replacement and/or repair. Under special topographical conditions the placing of public sewers outside of public right-of-way may be approved by the City Administrator or designee.
- 3.107 Sanitary sewer lines shall be extended to the edge of the property being developed to facilitate future extension of the collection system.
- 3.108 Refer to the adopted wastewater master plan and facility plan for required upgrades to existing facilities.

3.200 DESIGN CALCULATIONS –

- 3.201 All pipeline design submittals shall include the following capacity and general information:
- a. Flow based upon an average design flow at 100 gallons per capita per day (gpcd), with three (3) persons per household average.
 - b. Design peak hourly contributions of three (3) times average flow.
 - c. Pumping head and flow calculations for pumping stations. Pump station shall be designed for peak flows.
 - d. Off-site contribution for future connections from within the UGB.
 - e. Receiving pipeline capacity review.

3.300 DESIGN GUIDELINES

- 3.301. Pipe Size - Minimum pipeline size shall be 8" diameter on mainlines and 6" diameter on public portion of service laterals;
- 3.302 Pipe Cover - Depth shall be sufficient to serve adjacent areas with considerations of receiving pipeline grades, future extensions, and potential of basement construction. Depths shall be at a minimum the following:
- a. Sewer Mainline - Six feet (6') at Right-of-Way for level or upward sloping lots
 - b. Trunk and Collector Sewer – Eight feet (8') in roadways and easements
 - c. Ductile iron pipe shall be used when cover is less than three feet from subgrade and approved by the City Administrator or designee.
 - d. Deviation from the above standards will be considered on a case-by-case basis when one of the following circumstances exist:
 1. Underlying rock strata - required: A request in writing to the City Administrator or designee, together with submittal of a soils report, with a plan and profile certifying that bed rock exists three feet (3') or less below the undisturbed ground surface at all investigated alignments.
 2. A ditch or stream must be crossed - required: A plan and profile; horizontal scale 1" = 20', vertical scale 1" = 2'.
 3. Connecting to an existing sanitary sewer that does not meet the depth requirements.
- 3.303 Velocity –
- a. The slopes on pipes shall be set to maintain a minimum velocity when the pipe is flowing 2/3 full at 2 feet per second.
 - b. Minimum pipeline slope shall be according to the following table to maintain minimum resuspension and transport velocities:

<u>DIAMETER</u>	<u>MINIMUM SLOPE</u>
8"	0.0040 ft/ft
10"	0.0028 ft/ft
12"	0.0022 ft/ft
15"	0.0015 ft/ft
18"	0.0012 ft/ft

- c. All pipelines shall be laid at uniform slope between manholes.

3.304 Manholes

- a. Manholes shall conform to ASTM C-478. They shall be concrete and shall include a sloped shelf, channel, access rungs, manhole rim and cover, grade rings as required, kor-n-seal boots or similar pipe connection, and shall be water tight.
- b. Manholes shall be placed at all locations where the pipeline changes grade, size or horizontal alignment.
- c. They shall have a maximum spacing of 500-feet, and shall also be placed at the end of pipe lines where there is the potential for future development.
- d. The minimum angle between an incoming and outgoing pipe shall be 90-degrees.
- e. The elevation drop through a manhole when the pipe goes straight through is 0.1-feet. The elevation drop through a manhole when the pipe changes directions through the manhole is 0.2-feet. Where the algebraic grade change between an incoming and outgoing pipe is greater than 10, the grade through the manhole shall be the average of the two pipe grades.
- f. Pipes of unequal diameters must be aligned at the 0.8 depth elevation in accordance with DEQ standards.
- g. Manholes shall be a minimum of 4-feet in diameter for pipe up to 27-inches in diameter. Pipe from 30 to 36-inch shall require a minimum of 6-foot diameter manhole. Larger pipe shall require larger manholes.
- h. Manholes shallower than 6-feet shall require a flat top.
- i. Manholes located in right-of-ways shall be level with the grade. Manholes located outside of right-of-ways shall extend 1-foot above grade and shall be tamperproof covers.
- j. Beaver slides may be used in manholes up to an elevation change of 2-feet. Drop connections are discouraged, and may only be used with approval by the City Administrator or designee.
- h. All manhole covers shall be watertight at or below the 100-year flood elevation.

3.305 Cleanouts on main lines may only be used on dead end lines that will never be extended which are shorter than 250-feet and serve less than 8 homes (or the equivalent of 8 homes). A 4" cleanout shall be installed within the public utility easement as shown.

3.306 Service Lines

- a. There shall be a single service line for each lot served.
- b. The service line shall be at 90-degrees to the mainline except in cul-de-sacs.
- c. Service lines shall not connect at manholes except in cul-de-sacs.
- d. Service lines shall be constructed at a minimum of a 2-percent grade. In special circumstances the grade may be lowered with sufficient justification and a variance from the regulatory agency. The maximum grade is 45-percent.
- e. Tees for service lines shall be angled up at 45-degrees from the main line. Connecting to existing pipe may be done with inserta-tees.
- f. Service lines shall be extended to the right-of-way line, or if there is a utility easement it shall be extended past the easement.
- g. The end of the service line shall be plugged and marked with a 2"x4" wood marker that extends 12-inches above ground. The marker shall be painted white and be marked with the depth of the service line.

- h. The curb shall be stamped with an "S" on the face or top where the service line crosses.
- i. There shall be a 4-inch clean out located at the right-of-way line on service lines.
- j. In special cases where a lot may not be able to be served by gravity, individual pumping facilities may be used. These may only be used with the approval of the City Administrator or designee. The pumping facility will be considered private, and it should be noted on the design plans.

3.307 Toning Wire

- a. Where non-metallic pipe is used both for the main lines and services lines there shall be a toning wire. It shall be laid along the pipe and shall be extended into the manholes and clean outs.

3.308 Materials

- a. Sanitary sewer pipelines and services shall be PVC SDR 35, complying with the requirements of ASTM D-3034.
- b. Where additional pipe strength is required two pipe materials are acceptable. Pressure rated ductile iron (DI) may be used, or PVC C-900.
- c. Stream crossing shall be made with DI pipe. If approved by the City Administrator or designee fusion butt-welded HDPE pipe may be used for stream crossings.
- d. Toning wire shall be a minimum of 18 gauge copper wire with green insulation.

3.400 CONNECTION TO EXISTING SEWERS

- 3.401 Connections to, and extensions of, existing sewers may occur to facilitate new development.

- 3.402 Connections to existing manholes is the preferable method for extending main lines.

- a. Connection to an existing stub out is preferred.
- b. Where there is no stub out, the existing manhole may be core drilled at the top of the shelf. A core-n-seal boot or similar water tight connection method shall be used. The shelf shall be rechanneled as needed to accommodate the new pipe.
- c. Where there is insufficient depth to connect to an existing manhole at the top of the shelf, the connection may be made lower. This will require reconstruction of the channel and shelf. Note that the crown elevation of the new pipe must be no lower than the crown of the outgoing pipe. The base of the manhole may need to be rebuilt.
- d. Drop connection may only be made in special circumstances such as intervening structures that prevent the appropriate slope. Depth of sewer alone does not warrant a drop connection.

3.403 Connection to Main Line

- a. When there is not an existing manhole for a main line to connect to, a new manhole may be constructed over an existing pipe. The manhole base may be poured around the existing pipe, and the top cut out of the existing pipe. The shelf will be formed around the existing pipe, and the new pipe shall enter the manhole no lower than where the existing pipe is cut.
- b. The manhole should be tested prior to cutting the existing pipe.

3.404 Connection to Clean Outs

- a. When sewers are extended from cleanouts, the entire cleanout assembly, including the wye, shall be removed. The new pipe shall be installed at the same grade as the existing pipe.
- b. The new pipe will need to be tested prior to connection to the existing pipe.

3.405 Service Connections

- a. New building service laterals will be made at existing tees where possible.
- b. When tees do not exist on the Public Sanitary Sewer System, the new lateral sewer will enter the collection system through a "cored" opening with an approved connector such as inserta tee.

3.500 EASEMENTS

3.501 Public Easements

- a. Easements for public sewers less than or equal to 12-inches in diameter shall be a minimum of 15-feet wide. Easements for public sewers greater than 12-inches in diameter shall be a minimum of 20-feet wide.
- b. Easements for sewer greater than 24-inches in diameter or more than 8-feet deep shall require wider easements in increments of 5-feet.

3.502 Private Easements

- a. Private easements for service lines are the responsibility of the private owners. However, if the design plans for a development require a service line to cross another property the private easements shall be shown on the plans and must be included in the plat.
- b. Private easements shall not be permitted within the public right-of-way.

3.600 SEPARATION FROM WATER LINES

3.601 Water mains shall be installed a minimum clear distance as defined in OAR Chapter 333, Public Water Systems. However, in no case shall the distance be less than five feet (5') horizontally from sanitary sewers.

3.602 Water lines shall be installed to go over the top of such sewers with a minimum of 18 inches of vertical clearance at the intersections of these pipes.

3.603 Exceptions shall first be approved by the City Administrator or designee. In all instances the distances shall be measured surface to surface.

3.700 RELATION TO WATERCOURSES

3.701 Generally, the top of all sanitary sewers entering, crossing or adjacent to streams shall be at a sufficient depth below the natural bottom of the streambed to protect the sewer line. One foot (1') of cover is required where the sewer is in solid rock; three feet (3') of cover is required in other materials. In paved channels, the top of the sewer line shall be placed at least six inches (6") below finish grade of the bottom of the channel, except as provided above.

- 3.702 Sewers located along or parallel to streams shall be located outside of the streambed and sufficiently removed there from to provide for future, possible stream channel widening.
- 3.703 Sewers crossing streams or drainage channels shall be designed to cross the stream as nearly perpendicular to the stream channel as possible, and shall be free from change of grade.
- 3.704 The pipe material shall be ductile iron with an 18-foot length of pipe centered on the stream or drainage channel centerline or continuous High Density Polyethylene. The ductile iron or High Density Polyethylene pipe shall extend to a point where a one-to-one slope begins at the top of the bank and slopes down from the bank away from the channel centerline and intersects the top of the pipe.
- 3.705 Concrete encasement will be required when the above cover requirements cannot be met. Each deviation from the above requirements will be reviewed and approved by the City Administrator or designee on a case-by-case basis.

3.800 TESTING

3.801 Pipe Lines

- a. All pipelines shall be tested for leakage per the criteria identified in the current APWA Standards. This shall include low pressure air testing.
- b. Flexible pipe shall be deflection tested per APWA standards with a mandrel sized at 95% of the pipe diameter.
- c. Following acceptable testing, the Contractor shall flush the lines and provide complete pipeline TV inspection to verify grade and condition.

3.802 Manholes

- a. Manholes shall be vacuum tested in accordance with the National Association of Sewer Service Companies (NASSCO) standards.

3.900 SPECIAL FACILITIES

- a. Special facilities shall be approved on a case by case basis by the City Administrator or designee. This includes facilities such as pump stations and force mains, bridge crossings, river crossings, inverted siphons and similar facilities.

3.901 Pump Stations

- a. Pump station designs shall include a design report that includes the following items at a minimum: full service area size, calculation of peak flows for the existing development and the for the full service area, pump sizing and design criteria such as pump type/capacity/HP/number, overflow location, control elevations and equipment, wet well sizing, alarm type, transfer switch type, force main size, hydrogen sulfide control, discharge manhole protection, downstream capacity analysis.
- b. In general pump station shall be designed to meet peak design flows with full pumping redundancy, and the wet wells shall have a minimum of four (4) hours storage above the alarm elevation.

- c. Features that are required in a pump station design include: pumps (a minimum of two), wet well, valves, valve vault, associated piping, level control, electrical, control panel and weatherproof enclosure, instrumentation, pressure gages, alarms, telemetry, access road, parking, fencing, landscaping, potable water supply, lighting, power outlets, and standby power.
- d. The following features may be required on a case by case basis: odor control, downstream discharge point hydrogen sulfide, air relief valves on the force main.
- e. Standby power with an automatic transfer switch will be required and approved by the City Administrator or designee.
- f. Additional requirements include an operation and maintenance manual, a minimum of two hours of training, and spare parts for parts such as gaskets, bearings and mechanical seals.
- g. Pump stations shall utilize submersible pumping systems unless approved by the City Administrator or designee.

**CITY OF CANBY
PUBLIC FACILITY IMPROVEMENTS**

DESIGN MANUAL AND STANDARD SPECIFICATIONS

Revised June, 2012

CHAPTER 4 – STORM DRAINAGE DESIGN

4.100 GENERAL

- 4.101 Performance Standards - Storm drainage design within a development area must include provisions to adequately control run-off from all public streets and limited private property runoff from areas identified in the City Stormwater Master Plan. The design must ensure future extension of the drainage system to the entire drainage basin in conformance with the adopted Stormwater Master Plan and these Design Standards.
- 4.102 Discharge Location: Surface or subsurface drainage, caused or affected by changing the natural grade of the existing ground or removal of natural ground cover or placement of impervious surfaces, shall not be allowed to flow over adjacent public or private property in a volume or location materially different from that which existed before development occurred, but shall be collected and conveyed, in an approved manner, to an approved point of disposal.
- 4.103 Discharge Location: Surface water entering the subject property shall be received at the naturally occurring locations and surface water exiting the subject property shall be discharged at the natural locations with adequate energy dissipaters within the subject property to minimize downstream damage and with no diversion at any of these points.
- 4.104 Discharge Location: The approved point of disposal for all storm water may be a storm drain, existing open channel, creek, subsurface, detention or retention pond or facility approved by the City Administrator or designee. Acceptance of suggested systems will depend upon the prevailing site conditions, capacity of existing downstream facilities, and feasibility of the alternate design.
- 4.105 Underground Injection Control: New Underground Injection Control (UIC) devices shall not be approved for public storm water facilities unless there is no other method for discharging storm water. New UIC's may only be used as a source of stormwater discharge if they are Registered and Rule Authorized by DEQ.
- 4.106 Low Impact Development (LID): The City encourages the use of LID methods for storm water. For specific design criteria and design standards for LID the City refers to the latest LID manual developed by Clean Water Services. [Low Impact Development Approaches Handbook, July 2009]
- 4.107 Private Drainage: Design for private storm drainage, where permitted by the Stormwater Master Plan, shall meet the same requirements as the public facilities. The design of these facilities shall be included in the public improvement plans including facilities for individual lots.

- 4.108 Peak Discharge Rate: Unless adequate capacity is available, the peak discharge from the subject property, for all applicable design storms, may not be increased from conditions existing prior to the proposed development. Detention and/or retention will be required to obtain this result. Where it can be satisfactorily demonstrated by the applicant that there is already detention and there are no adverse impacts to the downstream system, additional detention/retention may not be required.
- 4.109 Treatment: Stormwater quality facilities or Best Management Practices may be required to control the discharge of pollutants from development and redevelopment, to the municipal storm drainage system, UIC's or natural watercourse. Where required by DEQ or the City Administrator, the City will encourage the use of LID standards. Please refer to the Clean Water Services Low Impact Development Approaches Handbook July 2009.
- 4.110 Flow Through Capacity: All storm drain system designs shall make adequate provisions for collecting all storm water run-off. The system shall accommodate all run-off from upstream tributary areas whether or not such areas are within the proposed development. The amount of run-off to be accommodated shall be based upon ultimate development of all upstream tributary areas.
- 4.111 Downstream Capacity: Proposed storm drain systems shall not discharge flows into inadequate downstream systems unless approved by the City Administrator or designee.
- 4.112 System Location: Public storm lines shall be located within the public right-of-way if feasible. These lines are placed in the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to provide required replacement and/or repair. Any storm lines not placed in the public right-of-way shall be located in a public utility easement.
- 4.113 Only public right-of-ways runoff shall, by design, be collected and disposed of within the public storm drainage system. Upon development, runoff from private properties shall not be permitted to discharge to public storm sewer facilities except as identified in the City Stormwater Master Plan.
- 4.200 STORM DRAINAGE REPORT
- a. If a storm drainage report was required during land use planning, then it shall be finalized as part of the design. This should take into account any changes to the development, existing conditions or agency requirements since the time the draft report was done.
 - b. If a storm drainage report was not required during land use planning, it shall be required during design.
 - c. A storm drainage report shall include the following items.
- 4.201 Existing Drainage Plan - Provide a topographical contour map defining existing conditions to include the following minimum information:
- a. Two-foot (2') contour intervals; slopes over 10% may use 5-foot (5') intervals; very flat sites may need contour interval of one-foot (1') or even one-half foot(1/2'); extend contours a minimum of 100 feet beyond property.

- b. All structures, buildings, parking lots, and utilities on the property.
 - c. Location of all existing drainage facilities and water courses, including wetlands and floodplain areas.
 - d. Locations of all subsurface water outlets (e.g., springs).
 - e. Show arrows to indicate direction of flow for all drainage information.
- 4.202 Proposed Drainage Plan - Show proposed site grading and drainage facilities on a topographical contour map. Unless the detail for proposed improvements will obscure the conditions shown on the existing drainage plan, proposed site grading and drainage may be shown on the existing drainage plan. The following minimum information shall also be shown:
- a. Finished contours of the property, after development, at two-foot (2') or five-foot (5') intervals as required.
 - b. Percent grade for graded slopes; elevations, dimensions and locations for all graded slopes.
 - c. Cut/fill areas; structural fill placement areas; erosion/sedimentation control methods; reseeding areas.
 - d. All proposed drainage facilities - public and private systems; paved areas, curbs, sidewalks; drainage ditches, culverts.
- 4.203 Drainage Calculations - The storm drainage report shall provide the following information at a minimum.
- a. Pre and post development conditions with regard to basin boundary maps, pervious and impervious area, flow routing, discharge rates for design storms, discharge velocity, and time of concentration calculation. They shall also include a general description of the proposed facilities, soils identification, curve number (CN) (and calculation of composite CN's), design storms, detention sizing, treatment sizing, downstream analysis, and infiltration rate with supporting data. Provide references for soils type, and CN. Use ODOT Zone 8 Rainfall Intensity-Duration Frequency curve.
 - b. The discharge rates to be evaluated include the 2, 5, 10 and 25 year storm events. The conveyance system shall be designed to pass the 10 year storm events without surcharge, and a 25 year event with surcharge but keeping the hydraulic grade line below the manhole lids.
- 4.204 Geotechnical Report -
- a. If subsurface disposal of the storm water is proposed as the discharge method, then a site specific geotechnical investigation is required to define the infiltration rate of the existing soil. All tests shall be done during periods when the groundwater table is expected to be at its maximum. This investigation shall include background data from existing soils mapping, but it shall also include a field test of the infiltration rate at the site in question. Nearby field tests on other properties are not acceptable.
 1. For the test an excavation shall be made to the bottom elevation of the proposed infiltration system. The maximum infiltration rate shall be determined using either the EPA falling head percolation test procedure (Design Manual – Onsite Wastewater Treatment and Disposal Systems, EPA, 1980) or the double ring infiltrometer test (ASTM D3385).
 2. The test hole or apparatus shall be filled with water and maintained at depths above the test elevation for a period of not less than 4 hours. This represents the saturation period.

3. Following the saturation period, the infiltration rate shall be determined in accordance with one of the test procedures specified above, with a head of 6 inches of water.
4. The Engineer shall perform at least 1 test per contributing acre to determine a representative infiltration rate for the site.
5. A factor of safety of 2 shall be applied to the field measured infiltration rate.
6. The test shall be witnessed by a representative of the City.
 - a) The infiltration rate of the medium used for various LID technologies such as infiltration swales shall also be documented.
 - b) The maximum groundwater table shall also be identified.

4.205. Downstream Analysis Report

- a. The downstream analysis will show what impacts, if any, a project will have on the hydraulic conveyance system(s) downstream of the project site. The analysis is to be divided into three parts that are followed sequentially. The three parts include: review of resources, inspection of the affected area, and analysis of downstream effects.
 1. During the review of resources, the designer will review any existing data concerning drainage of the project area. This data will commonly include area maps, floodplain maps, wetland inventories, stream surveys, habitat surveys, engineering reports concerning the entire drainage basin, inventories of known drainage problems, and previously completed downstream analyses. The City may be able to provide some of this information. Other sources of information include, Oregon Department of Environmental Quality, Oregon Division of State Lands, Department of Fish and Wildlife, and other local agencies.
 2. The Designer will physically inspect the drainage system at the project site and downstream of the site. During the inspection, the designer should investigate any problems or areas of concern that were noted during the review of resources. The designer should also identify any existing or potential capacity problems in the drainage system, any existing or potential areas where flooding may occur, any existing or potential areas of channel destruction (including erosion and sedimentation), and existing or potential areas of significant destruction of aquatic habitat.
 3. The information that has been gathered is analyzed to determine if construction of the project will create any drainage problems downstream or will make any existing problems worse. Often, if the other minimum requirements are met, the project will not negatively impact the downstream drainage system. There are however some situations that, although minimum requirements have been met, will still have negative impacts. Whenever a situation is encountered where it has been determined that there will be negative impacts resulting from the project, mitigation measures must be included in the project to correct for the impacts.

- 4.206. Stormwater Flows - Several methods are available to design engineers for estimating peak runoff rates. Three of these are the "Rational Method", the SCS "Curve Number" method, and the Santa Barbara Urban Hydrograph (SBUH) method. These methods will be acceptable for estimating the peak runoff rates to be used in sizing storm drainage conveyance improvements in those areas for which there are no specific Master Plan recommendations.
- 4.207. Detention/Retention Volumes - Several methods are available for the calculation of run-off rate volumes for the purpose of calculating detention/retention storage volume requirements. Detention volume estimates shall be based on hydrographs developed for the storm duration specified by the City for the applicable return frequencies. A method shall be used which routes the design hydrograph through the proposed detention system. Unless specified otherwise, noted the standard design storm duration shall be 24 hours. For development of the appropriate hydrograph(s) the SCS Type 1A 24-hour rainfall distribution is, currently, being accepted for all development submittals.

4.300 MINIMUM DESIGN STANDARDS

4.301 Minimum Design Criteria

- a. Storm Frequency - All public storm drain systems shall be designed for the design storm recurrence interval in the following table:

DRAINAGE SYSTEM DESIGN CAPACITY

Drainage System Element	Description	Design Storm Recurrence Interval, Years
Minor:	Streets, curbs, gutters, inlets, catch basin and connector drains	10
Major:	Laterals (collectors) <250 tributary acres	10
	Trunk >250 tributary acres	25*
	Arterial Streets and the Drainage System in or under Arterial Streets	10*
Watercourses:	Without designated floodplain	25
	Within designated floodplain	100
Bridges:		100
Detention Facilities:	Storage volume (on site)	25
	Discharge rate	Function of downstream capacity ^(a)
Retention Facilities:	Infiltration capacity	25
	Detention capacity	25
Infiltration Facilities	UIC, LID elements	10

NOTES

(a) Typically this will mean designing for the 2,5,10 and 25-year storm events.

* Surcharged conditions for pipe systems and culverts and bank full conditions for open ditches and channels are acceptable only for demonstrating the adequacy of the conveyance system to convey the peak run-off for the 25 year design storm (as required), provided that:

- a. run-off is contained within defined conveyance system elements; AND
- b. the hydraulic grade line does not exceed the elevation of the roadway subgrade; AND
- c. no portions of a building will be flooded.

- b. Velocity and Slope - All storm drains shall be on a grade which produces a mean velocity, when flowing full, of at least three (3') feet per second.
- c. Velocity in Natural Channels - Control of discharge from developed areas to natural channels shall be such that the average velocity resulting from all design storms less than or equal to the 25-year event remains below the erosive velocity of the channel.
- d. Manning Equations - When calculating minimum pipe slopes and velocities, the design engineer shall use the Manning pipe friction formula.
- e. Pipe Coefficient - The storm-drain pipe roughness coefficient to be used in the Manning formula shall be not less than 0.013.
- f. Slope - All pipelines shall be laid at uniform slope between manholes.

4.302 Pipe Materials and Size

- a. All public storm drains shall be constructed with either ribbed PVC or HDPE smooth interior, corrugated exterior pipe (Hancor ADS N-12, PVC C-900, or –equal). Where required, for added strength, Class 50 Ductile Iron pipe will be used.
- b. Corrugated aluminum pipe or concrete pipe may be used for culvert applications only, if the material is specified as having a 75-year design life. Submittal of the manufacturer's specifications, testing results and warranty will be required for City review prior to approval.
- c. Private storm-drain pipe shall meet the appropriate sections of applicable building and plumbing codes.
- d. All public storm-drain main lines shall be a minimum of twelve inches (12") in diameter, and lateral lines to catch basins and other inlet structures shall be a minimum of ten inches (10") in diameter.
- e. Drywells (UIC's) shall be constructed of perforated concrete pipe conforming to ASTM-478. The upper portion of the drywell shall be constructed meeting the requirements of a standard manhole with rim and lid.
- f. Catch basins shall be cast-in-place or precast concrete conforming to the City of Canby standard drawing or ODOT Type G2 inlet with minimum 18 inch sump.
- g. Manholes shall be concrete and shall conform to ASTM C-478. They shall be concrete and shall include a sloped shelf, channel, access rungs, manhole rim and cover, grade rings as required, kor-n-seal boots or similar pipe connection, and shall be water tight.

4.303 Minimum Cover

- a. Minimum cover shall be thirty inches (30") above the top of the pipe in paved areas and thirty-six inches (36") at all other locations. Catch basin leader lines shall have a minimum of 18" cover if feasible. Lines with less than 18" cover shall be constructed of ductile iron or PVC C-900.
- b. If minimum cover cannot be attained due to uncontrollable circumstances, such as elevation of the existing system, then alternatives may be approved by the City Administrator or designee. These alternatives include use of ductile iron pipe, or use of control density fill.
- c. In areas of relatively flat terrain, the design engineer must show that sufficient depth is provided at the boundary of the development to properly drain the remainder of the upstream basin area tributary to the site.

4.304 Manholes

- a. Manholes shall be located at all changes in slope, alignment, pipe size, and at all pipe junctions with present or future storm drains.
- b. Manhole spacing shall not be greater than 500 feet.
- c. Manholes are required at all pipe junctions, except where private service laterals are "t'ed" in to a municipal main storm line in areas defined in the City Stormwater Master plan.
- d. Flat-top manholes shall be used when rim to crown of pipe elevations are less than six feet (6').
- e. When the downstream pipe size increases, the crown of all upstream pipes shall not be lower than the crown of the larger downstream pipe.
- f. Inside drops on manholes shall not exceed four (4) feet. Drops of less than two (2) feet shall have beaver slides.
- g. Manholes shall not have open grate lids except in special circumstances approved by the City Administrator or designee.
- h. Manhole rims shall be level with the ground surface where the ground is covered by improved surfaces (asphalt, concrete, crushed rock). In unimproved areas the manhole rim shall be one foot above finished grade.
- i. Manholes shall have sixteen (16) hole lids. Tamper proof lids are required outside of vehicle or pedestrian travel ways.
- j. Pollution control (PC) manholes shall be located just prior to storm water detention/retention and treatment facilities. A pollution control manhole shall have a sump for sedimentation to occur, and shall be located such that there is access by a vactor truck.

4.305 Catch Basins

- a. Catch basins shall be located in streets at the curb line to receive storm water run-off and convey it to the main storm drain or treatment facility.
- b. Catch basins shall be located at the following locations, but in no case be spaced further than 400 feet. Any single catch basin shall not receive storm water from more than 400 feet of street.
 1. At curb returns on the upstream side of an intersection.
 2. Where geometry dictates the need for a catch basin, such as large curves in the street.
 3. When street slopes are less than one percent (1%), maximum catch basin spacing should be decreased to 300 feet.
 4. When street slopes are greater than six percent (6%), maximum catch basin spacing should be decreased to 300 feet. When street slopes are greater than fifteen percent (15%), maximum catch basin spacing should be decreased to 200 feet.
 5. At the ends of all dead-end streets with a descending grade.
 6. At intermediate locations so that storm flows at the curblines do not exceed three feet (3') in width (measured from the curb face) or three inches (3") in depth (measured at the curb face), whichever is less.
 7. At the downstream end of the street improvements which abut unimproved roads or undeveloped property.
 8. At the upstream end of the street improvements which abut unimproved roads or undeveloped property.
 9. Additional inlet capacity is required at sag vertical curves. This may be accomplished in one of three ways:
 10. A single unit double catch basin at low point of the sag vertical curves.
 11. A single catch basin with the standard inlet plus a curb inlet.

12. Three catch basins may be used: one at the bottom and one to either side part way up the sag curve.
13. This requirement may be waived by the City Administrator or designee where the drainage area is small or the vertical curve is minimal.
14. Catch basins shall be capable of intercepting completely the design storm flow at the curb.

4.306 Culverts

- a. Culverts at road crossings in natural, perennial channels shall be designed to pass the peak discharge for the 50 year design storm such that the headwater water surface elevation:
 1. Does not exceed 1.5 times the culvert diameter; OR
 2. Remains at least 1 foot below the roadway subgrade, whichever is less.
- b. In waters federally designated as critical habitat, tribute to, or have endangered or threatened listed fish species, water-crossing structures shall be constructed and maintained so as to not impede or eliminate a listed species' access to habitat or ability to migrate.
- c. Proposed culvert crossings, regardless of Tributary size, intermittent or perennial, shall address Oregon Department of Fish & Wildlife and National Marine Fisheries Service's regulations and stream crossing guidelines.

4.307 Bridges

- a. New and replacement bridges over natural, perennial channels shall be designed to pass the 100 year peak discharge from the tributary area assuming full development. Vertical clearance between the design water surface and the bottom of any part of the bridge shall be a minimum of two feet, or 25% of the mean channel width between ordinary high water marks at the crossing, whichever is greater.

4.308 Site Grading

- a. Site grading shall be done such that it does not redirect surface drainage onto neighboring properties.
- b. Site grading shall be done such that it does not impede surface water drainage on neighboring properties causing ponding.
- c. Where it appears that off site impacts cannot be avoided, private drainage systems shall be designed and constructed to mitigate the affect. The design shall be submitted as part of the development design plans. This shall include appropriate private easements.

- 4.309 Low Impact Development
- a. The City encourages low impact development approaches (LIDA) to reduce impervious area, reduce run-off, provide detention, provide treatment and provide alternative discharge options. Refer to CWS LIDA Handbook, July 2009 for options and design criteria.
 - b. The options identified include:
 1. Porous pavement – this may not be used in driving lanes on streets, but may be used as approved by the City Administrator or designee for certain on-street parking applications. Other uses as identified in the LIDA handbook are acceptable.
 2. Green Roofs
 3. Infiltration Planters/Rain Gardens
 4. Flow through Planters
 5. Swales
 6. Vegetated Filter Strips
 7. Vegetated Swales
 8. Extended dry basins
 9. Wetlands

4.310 Water Quality Facilities

Where water quality facilities are required by DEQ/EPA, the City Administrator or his designee, the following standards will apply:

- a. In lieu of constructing new facilities, the City Administrator or designee may permit a development to upgrade an existing public treatment facility if the affect of the improvement will improve the overall storm water treatment to the same extent as a new facility.
- b. Treatment processes that are accepted include:
 1. Vegetated Swale
 2. Extended Dry Pond
 3. Wetlands
 4. LIDA treatment facilities
 5. Proprietary treatment devices as approved by the City Administrator or designee.
- c. It is presumed that water quality requirements will be met if the water quality processes listed are used and designed using the appropriate criteria. The design criteria for the water quality facilities are found in the Clean Water Services (CWS) Design Manual under Chapter 4, paragraph 4.06. The design criteria for the LIDA treatment facilities are found in the CWS LIDA Handbook, July 2009.
- d. Special water quality requirements may be added based upon stormwater permits that the City may have in the future.

4.311 Detention/Retention

Where Detention/Retention facilities are required by DEQ/EPA, the City Administrator or his designee, the following standards will apply:

- a. When detention is required or downstream facilities are inadequate, the volume to be detained may be up to the volume necessary to limit the developed site peak discharge to pre-developed rates for all storm events with a recurrence interval less than or equal to 25 year.

- b. An emergency overflow is required for storm events from a 25 year to 100 year 24-hour storm event such that the facility does not over-top or exceed the capacity of the overflow.
- c. Sufficient armoring will be required to prevent failure of the facility from erosion.
- d. Detention methods, in order of preference, are the following:
 - Surface storage - off channel
 - Surface storage – on channel
 - Subsurface storage – may only be used if no other method is possible and with approval of the City Administrator or designee.
- e. Control Manholes
 - 1. A flow control manhole shall be located at the discharge location of all detention facilities. The flow control manhole shall be located such that it is accessible by a vactor truck.
 - 2. A water quality manhole shall be located upstream of all detention/retention facilities. The water quality manhole shall be located such that it is accessible by a vactor truck.
- f. The design criteria for the detention/retention facilities are found in the CWS Design Manual under Chapter 4, paragraph 4.04.

4.312 Infiltration facilities

- a. Infiltration facilities are an acceptable discharge method. Acceptable methods include the options as outlined in the CWS LIDA Handbook, July 2009 and correctly constructed UIC's. Alternative infiltration methods should be evaluated prior to using UIC's.
- b. All UIC devices must be preceded by a water quality manhole or catch basins with snouts.
- c. Dry wells are considered underground injection control (UIC) devices. They must be constructed to meet the EPA regulations as administered by the Oregon DEQ. They must also be registered and Rule Authorized.
 - 1. Dry wells (UIC's) shall be preceded by a City approved treatment devices or facilities. This includes treatment methods such as G2 type catch basins, swales, vegetated swales, wetlands, extended dry ponds and DEQ approved proprietary devices.
 - 2. When there is sufficient depth to groundwater per the UIC regulations, UIC design shall be a minimum of 26 feet deep, with the bottom 10' perforated. Site specific designs will be allowed with adequate analysis submitted by a registered Engineer demonstrating adequate capacity;
 - 3. Drywells (UIC's) shall be located to collect up to a maximum of one half acre of runoff. Gutter flow shall be limited to 400-500 lineal feet, provided the flow does not exceed 3" in height against the curb line. Any variation from this guideline shall be based on field infiltration tests.

4.400 EASEMENTS

- a. Easements for storm drain lines from 12-inches to 24-inches shall be 15-foot wide, and then up to thirty-six inches (36") shall have a minimum width of twenty feet (20'). The easement width shall be on a case by case method for pipelines greater than thirty-six inches (36"), where the pipe is excessively deep pipe or where there are impediments such as location of structures to the easement. Easement increments shall be 5-foot intervals.
- b. Open channels shall have easements sufficient in width to cover the 100-year Floodplain Line when a 100-year design storm is required, or fifteen feet (15') from the waterway centerline, or ten feet (10') from the top of the recognized bank, whichever is greater.
- c. Easement locations for public storm drains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance.
- d. When private property must be crossed in order to reach an approved point of disposal, it shall be the developer's responsibility to acquire a recorded drainage easement. Drainage facilities crossing private property must be engineered to contain the storm water without causing erosion or other adverse effects to the private property.
- e. All easements must be furnished to the City Administrator or designee for review and approval prior to recording.

4.500 RELATION TO WATERCOURSES

- a. Storm drain lines shall enter a creek or drainage channel at 90° or less to the direction of flow.
- b. The outlet shall have a head wall and scour pad or riprap to prevent erosion of the existing bank or channel bottom. An energy dissipation structure may be required depending upon the velocity of the storm flow in the pipe. The size of pipe or channel being entered will govern which protective measures are required.
- c. Where rip-rap is used it shall meet the requirements of ODOT/APWA specifications. It shall be a minimum of 12-inches thick, a minimum width of 3 times the pipe diameter, and length as needed but no less than 6-feet. The minimum size will be class 100, but larger may be needed. There should also be a filter blanket beneath the rip-rap.
- d. Discharges on slopes greater than 15% or greater than 20-feet tall require special consideration with regard to erosion. Energy dissipation will be required, and additional slopes stabilization may be needed. In severe cases the pipe may need to be extended to the bottom of the slope.

**CITY OF CANBY
PUBLIC FACILITY IMPROVEMENTS**

DESIGN MANUAL AND STANDARD SPECIFICATIONS

Revised June, 2012

CHAPTER 5 – CONSTRUCTION OBSERVATION AND SPECIFICATIONS

5.100 CONSTRUCTION OBSERVATION

- 5.101 All public improvement shall be inspected by an Oregon Registered Engineer or a qualified individual under the supervision of an Oregon Registered Engineer. The City will not authorize work to begin on public improvements without designation of an engineer's inspector by the owner or developer. All inspection costs including required testing shall be paid by the owner or developer.
- 5.102 An Engineer whose firm, or any member of the firm, has an interest in the development for which the improvements are required cannot be designated engineer's inspector unless full disclosure and prior approvals are granted. The engineer's inspector's relationship to the project must be solely that of a professional service nature.
- 5.103 Construction services provided by the City shall be limited to:
- a. Liaison between the inspecting engineer and the City.
 - b. General monitoring of work progress.
 - c. Observation of all performance testing.
 - d. Participate in final inspection for acceptance of improvements.
- 5.104 The following minimum activities are required of the designated inspector:
- a. Maintain a project log book which contains at least the following information:
 1. Job number and name of engineer and designers;
 2. Date and time of site visits;
 3. Weather conditions, including temperature;
 4. A description of construction activities;
 5. Statements of directions to change plans, specifications, stop work, reject materials or other work quality actions;
 6. Public agency contacts which result in plan changes or other significant actions;
 7. Perceived problems and action taken;
 8. General remarks;
 9. Final and staged inspections;
 10. Record all material, soil and compaction tests.
 - b. The inspecting engineer shall obtain and use a copy of City-approved construction plans and specifications;
 - c. Review and approve all pipe, aggregate, concrete, A.C. and other materials to ensure their compliance with City standards;
 - d. Approve all plan or specification changes in writing and obtain City approval;

- e. Monitor and concur in construction activities to ensure that end products meet City specifications;
- f. Perform or have performed material composition and other tests required to ensure that City specifications are met; and,
- g. For pavement construction, perform the following stage inspections and record date of each:
 - 1. Curbs are built to line and grade;
 - 2. Subgrade meets grade and compaction specifications;
 - 3. Base rock meets grade and compaction specifications;
 - 4. Wearing course meets grade and compaction specifications. The City shall be given twenty-four (24) hour notice of impending stage inspections.
- h. 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 the Oregon Occupational Safety and Health Administration (OSHA).

5.105 The City Inspector's role is not one of supervision or safety management, but is one of watchful care only. Nothing contained in this section or elsewhere in this book shall be interpreted to obligate the City to act in any situation, nor shift the owner's responsibility for safety compliance to the City. No responsibility for the safety of the work or for construction means, methods, techniques, sequences or procedures shall attach to the City by virtue of its action or inaction under this section.

5.200 SPECIFICATIONS

- 5.201 Specifications shall per the ODOT/APWA Oregon Standard Specifications for Construction, latest edition except as modified here.
- a. The maximum density of compacted materials will be determined by AASHTO T 180. The density of compacted materials in place will be determined by AASHTO T 238, or other approved methods.
 - b. For the one-year period between placement of the base lift and top lift of asphalt, temporary ramps shall be placed at all grade changes. Manhole lids and valve boxes shall be set flush to the base lift and raised only at the time of placing the top lift. 1 ½" steel riser rings shall be used to adjust manhole lid elevations. Valve boxes shall be raised to finish grade.
 - c. Weep holes will not be allowed.

Canby Transportation System Plan

Roadway Standards

This section discusses the various roadway standards that are important to managing the transportation system. These standards include the following:

- Roadway Cross-Sections
- Industrial Area Roadway Cross-Sections
- Access Management
- Traffic Signal Spacing

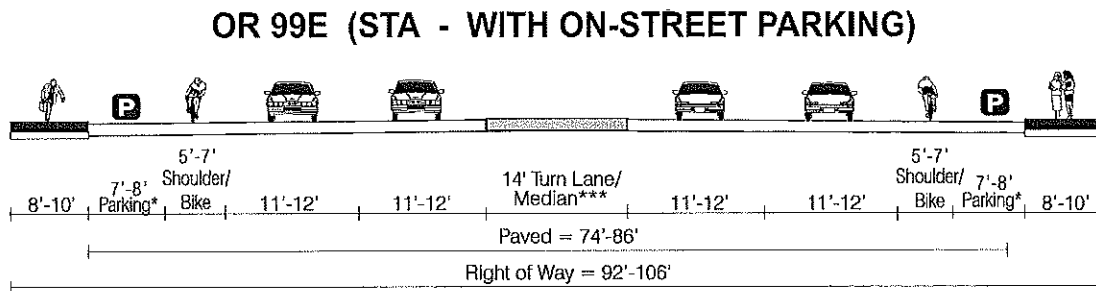
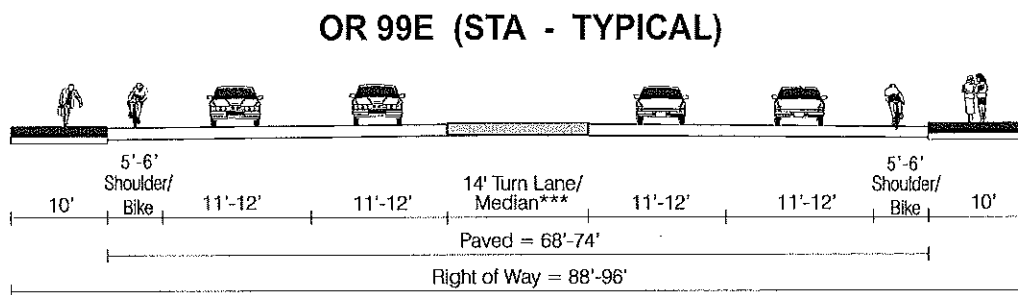
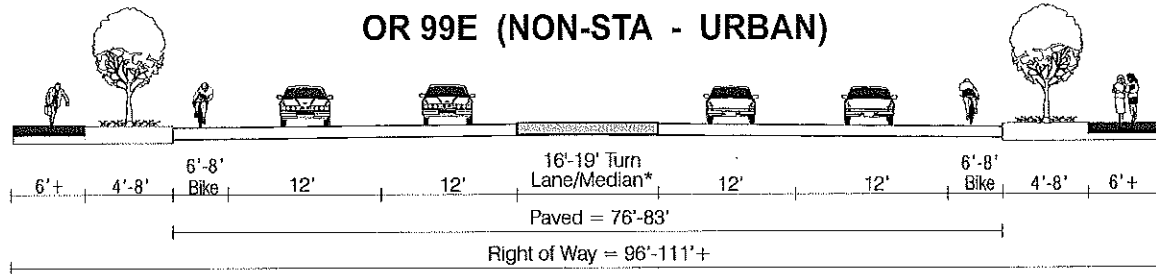
Roadway Cross-Section Standards

Street cross-section standards consist of minimum, maximum, and/or typical cross-sections that are required for City roadways based on their functional classification. The purposes of the cross-section standards are to ensure that the City roadways can meet the multi-modal function and demand associated with their functional classification and to provide consistency throughout the City.

Because the actual design of a roadway can vary from segment to segment due to adjacent land uses and other factors (e.g., truck routes, bike routes, pedestrian corridors, etc.), flexibility has been built in to the standards; this is why ranges of required components are provided for each functional class. In addition, because physical limitations exist for some roadways due to prior construction, “low impact” standards were also developed and may be used at the City’s discretion when an existing roadway with physical limitations is being improved. Specific right-of-way needs will also need to be monitored continuously through the development review process to reflect current needs and conditions; specifically, more specific details may become evident during development review, thereby requiring improvements other than these outlined in this TSP.

Additional design considerations are required for OR 99E. The state highway design considerations are defined in the *Oregon Highway Plan (OHP)* and in the *Highway Design Manual (HDM)*. Any deviation from these standards requires approval of a design exception. Design and future improvements to OR 99E must also address ORS 366.215 (Reduction in Vehicle Carrying Capacity) on this national freight network facility. The City also intends to conduct a future OR 99E corridor plan that will refine the cross-sections, roadway features, and cost estimates for highway improvements in Canby.

The cross-section standards are provided in Figure 7-3 for OR 99E, Figure 7-4 for arterial streets, Figure 7-5 for collector streets, and Figure 7-6 for neighborhood routes and local streets. To ensure suitability for roadway improvements, final cross-section designs must be coordinated with City of Canby staff and are subject to City Staff approval; cross-sections of state highways are also subject to ODOT approval.



Notes:

- * On-Street Parking may be provided on one or both sides
- ** Turn lane/median is to be provided except under Molalla Forest Road Multi-Use bridge and at adjacent Oregon Pacific Railroad crossing
- *** Turn Lane/Median section may consist of one of the following:
 - A. 14' Left-Turn Lane or Two-Way Left-Turn Lane with No Raised Median
 - B. 12' Raised, Landscaped Median with 1' Shy Distance on Either Side
 - C. 12' Pedestrian Refuge (Level with Roadway) with 1' Shy Distance on Either Side

The OR 99E Cross-Sections are shown to be consistent with ODOT Standards. Specific roadway designs will be developed through a refinement plan or project development process. Design and future improvements to OR 99E must also address ORS 366.215 (Reduction in Vehicle Carrying Capacity) on this national freight network facility.

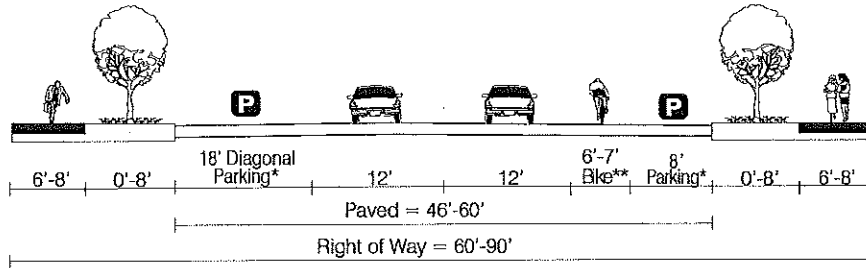
LEGEND

- On-street Parking Lane (except at intersections)

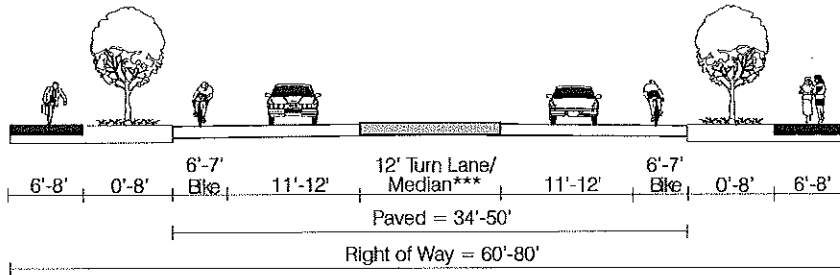
Figure 7-3

OR 99E: STANDARD CROSS-SECTIONS

ARTERIAL (ONE-WAY TRAFFIC)



ARTERIAL (TWO-WAY TRAFFIC)



Notes:

- * On-Street Parking is only allowed on arterial roadways within downtown commercial district. Diagonal or parallel parking may be provided on one or both sides interchangeably.
- ** When on-street parking is provided, bike lanes should only be provided adjacent to parallel parking (not head-in diagonal parking). If diagonal parking is provided on both sides and speeds are 25 miles per hour or less, then bike lanes are not required.
- *** Turn Lane/Median section is optional and may consist of one of the following:
 - A. 12' Left-Turn Lane or Two-Way Left-Turn Lane with No Raised Median
 - B. 10' Raised, Landscaped Median with 1' Shy Distance on Either Side
 - C. 10' Pedestrian Refuge (Level with Roadway) with 1' Shy Distance on Either Side

Low Impact Street Design Characteristics

Characteristic	Arterials (One-Way)	Arterials (Two-Way)
Vehicle Lane Widths	11 ft.	11 ft.
On-Street Parking	8 ft. - Only in downtown	8 ft. - Only in downtown
Bicycle Lanes (minimum)	5-6 ft. - Right side or road	5-6 ft.
Sidewalks (minimum)	6-8 ft.	6 ft.
Buffer/Planter Strip	0-8 ft.	0-8 ft.
Turn Lane/Median	12 ft. - Optional	12 ft. - Optional
Neighborhood Traffic Management (NTM)	Under Special Conditions	Under Special Conditions
Transit	As appropriate	As appropriate
Turn Lanes	When Warranted	When Warranted

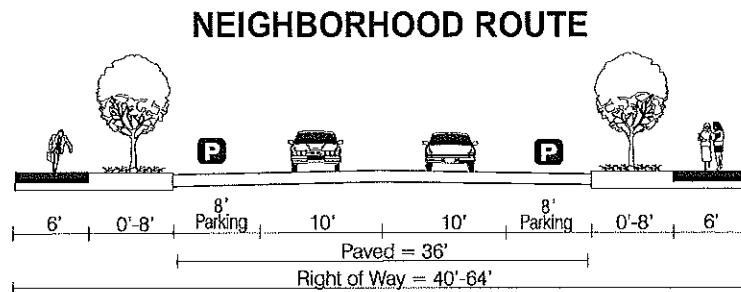
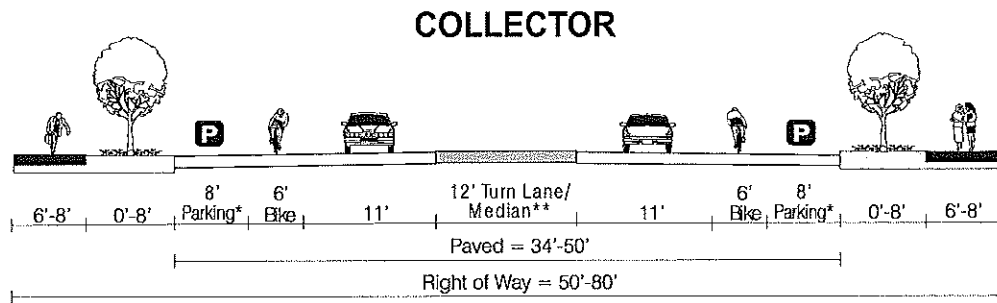
"Low Impact" standards require demonstration of hardship or other exceptional circumstances resulting from conditions of the adjacent properties and must be approved by City Staff.

LEGEND

P - On-street Parking Lane
(except at intersections)

Figure 7-4

ARTERIAL: STANDARD CROSS-SECTIONS



Notes:

- * On-Street Parking may be provided on neither, one, or both sides. Where turn lanes are provided, on-street parking should not be allowed.
- ** Turn Lane/Median section is optional and may consist of one of the following:
 - A. 12' Left-Turn Lane or Two-Way Left-Turn Lanes with No Raised Median
 - B. 10' Raised, Landscaped Median with 1' Shy Distance on Either Side
 - C. 10' Pedestrian Refuge (Level with Roadway) with 1' Shy Distance on Either Side

Low Impact Street Design Characteristics

Characteristic	Collectors	Neighborhood Routes
Vehicle Lane Widths	10-11 ft.	10 ft.
On-Street Parking	8 ft.-Optional	8 ft.- At least one side
Bicycle Lanes (minimum)	5-6 ft.	None
Sidewalks (minimum)	6-8 ft.	6 ft.
Buffer/Planter Strip	0-8 ft	0-8 ft
Turn Lane/Median	12 ft.-Optional	None
Neighborhood Traffic Management (NTM)	Under Special Conditions	Under Special Conditions
Transit	As appropriate	As appropriate
Turn Lanes	When Warranted	When Warranted

"Low Impact" standards require demonstration of hardship or other exceptional circumstances resulting from conditions of the adjacent properties and must be approved by City Staff.

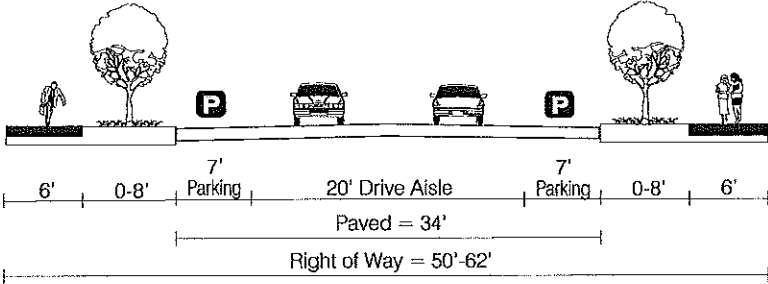
LEGEND

- On-street Parking Lane
(except at intersections)

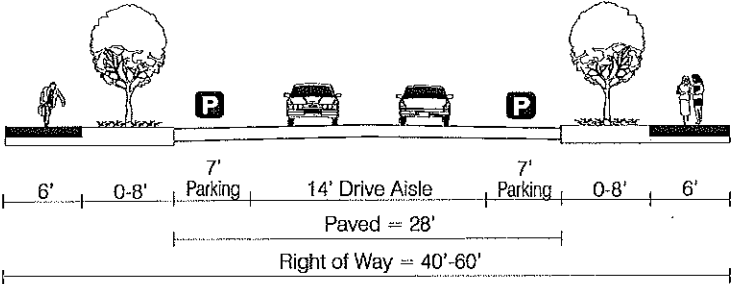
Figure 7-5

COLLECTOR/NEIGHBORHOOD ROUTE: STANDARD CROSS-SECTIONS

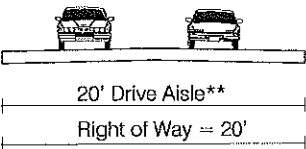
STANDARD LOCAL STREET



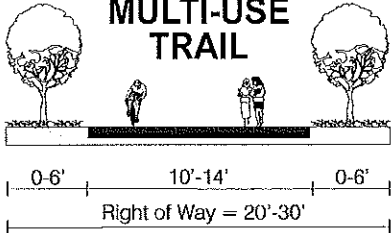
LOW-VOLUME LOCAL STREET (<500 Vehicles Per Day)



ALLEY



MULTI-USE TRAIL



Notes:
 ** On-Street Parking prohibited.

Low Impact Street Design Characteristics

Characteristic	Local
<i>Drive Aisle</i>	14 ft.
<i>On-Street Parking</i>	7 ft.- Both sides required
<i>Bicycle Lanes (minimum)</i>	None
<i>Sidewalks (minimum)</i>	6 ft.
<i>Buffer/Planter Strip</i>	0-8 ft
<i>Turn Lane/Median</i>	None
<i>Neighborhood Traffic Management (NTM)</i>	Under Special Conditions
<i>Transit</i>	Should not be used
<i>Turn Lanes</i>	None

"Low Impact" standards require demonstration of hardship, other exceptional circumstances resulting from conditions of the adjacent properties and must be approved by City Staff.

LEGEND

- On-street Parking Lane (except at Intersections)

Figure 7-6

**LOCAL STREET/ALLEY:
 STANDARD CROSS-SECTIONS**

Industrial Area Roadway Cross-Sections

In Canby, industrial uses currently play an important economic role and are expected to play an even greater role as development occurs in the Canby Pioneer Industrial Area. Having industrial area roadway cross-section standards will help the City ensure that new and improved roadways in the industrial areas are built to accommodate efficient freight movement.

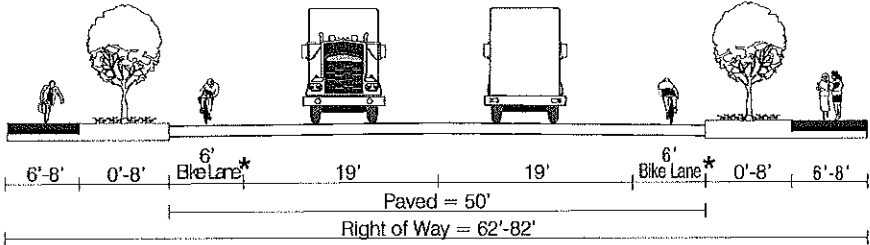
The industrial area roadway cross-section standards for Canby are shown in Figure 7-7 and were determined from geometric analysis documented in the Industrial Area Cross-Section Analysis Memorandum included as Appendix I. The identified cross-sections will allow two trucks to simultaneously make opposing turn maneuvers through intersections and not have overlapping paths. This objective for large trucks is often not applied to the general road system because a balance is desired between accommodations for all transportation modes (particularly pedestrians). However, in major industrial areas, truck movements become a higher priority and wider streets and intersections are more important.

A key component considered in the cross-section standards is the balance of street width with the required curb return radii to facilitate truck movements. Narrower roadways require larger curb returns, while wider roadways mean that smaller curb returns are needed. For Canby, narrower roadways were sought compared to smaller curb return radii to minimize the overall right-of-way and impervious area footprint of the roadways. This strategy can be compatible with the pedestrian environment by separating the sidewalks from the roadway by landscaping/swale areas, which would minimize issues with curb ramp design.

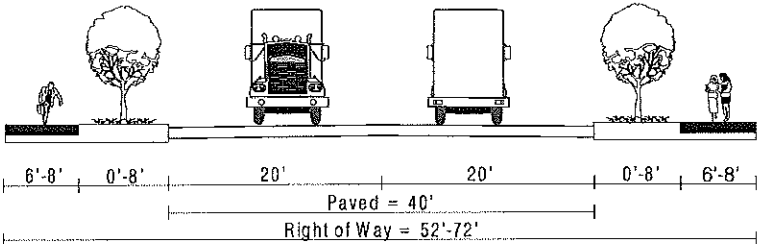
As shown in Figure 7-7, bike lanes are to be provided on collector roadways. It is expected that trucks may use the portion of the bicycle lanes adjacent to intersections when making turn maneuvers. Therefore, to make it clear to truck drivers and cyclists that there are likely to be conflicts in the turning area, bike lane stripes should be dotted instead of solid within the turning maneuver area of the trucks.

The analysis to determine street widths was focused on collector and local streets. This can be translated to required private access curb-cuts in the industrial area by applying the local street design.

COLLECTOR



LOCAL



Note:

* Adjacent to intersections, bike lane stripes should be dotted instead of solid within the turning maneuver area of the trucks.

Low Impact Street Design Characteristics

Characteristic	Collector	Local
Paved Width	46 ft.	32 ft.
On-Street Parking	None	None
Bicycle Lane	5 ft.	None
Sidewalks	6 ft.	6 ft.
Buffer/Planter Strip	0-8 ft	0-8 ft
Turn Lane/Median	12 ft.	None
Neighborhood Traffic Management (NTM)	None	None

"Low Impact" standards require demonstration of hardship or other exceptional circumstances resulting from conditions of the adjacent properties and must be approved by City Staff.

Figure 7-7

**INDUSTRIAL AREA ROADWAY:
 STANDARD CROSS-SECTIONS**