City of Bend Standards and Specifications Update
Draft: May 7, 2024
Prepared by:

Planning Division

Note:
Text in underlined typeface is proposed to be added
Text in ~~strikethrough~~ typeface is proposed to be deleted.
***Indicates where text from the existing code has been omitted because it will remain unchanged.
Staff comments are ***bold and italicized***

PART II

City of Bend Design Standards

Update BDC 3.2.400, Street Trees to BDC 3.2.400, Street Trees and Planter Strip Landscaping.

Update 12 Landscape Architecture and Irrigation Systems to Landscape ~~Architecture~~ and Irrigation Systems

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2 Design Submittal Requirements

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2.3.7 Landscaping and Irrigation Plans

~~For all City owned public facilities and City owned landscaping, the following items shall be required on all plan submittals.~~

- ~~Existing tree plan showing all existing trees 6-inch diameter at breast height (DBH) and larger. Show all existing trees proposed for removal or relocation~~
- ~~Specify any existing vegetation areas that will remain as is~~
- ~~Proposed protection fencing locations and type of protective measures~~
- ~~Location of all proposed signs, structures, streets, driveways, walkways and other hard surfaces~~
- ~~Identify all proposed plant materials with common name, botanical nomenclature, plant installation size and quantity of each species~~

- ~~Existing and proposed grading and drainage systems~~
- ~~Specify mulch types, applied depth, and location~~
- ~~Specify location of all turf areas and types of proposed turf~~
- ~~Specify hydrozones and landscaping features~~
- ~~Schematic piping layout and size to water source~~
- ~~Location of sleeves under all hard surfaces or construction obstructions~~
- ~~Location, type, and coverage of each irrigation zone~~
- ~~Table of hydraulic calculations showing all zones and their overall usage Site structures and obstacles that interfere with the coverage and performance of the irrigation system~~
- ~~Schedule of heads, numbers of circuits, and sizes of piping~~
- ~~Location of irrigation controller by note (if remote offsite) or symbol~~
- ~~Location of backflow device and 'blowout' for winterization~~
- ~~Location of all points of connection (POC)~~
- ~~Identify limits of City maintained landscaping and privately maintained landscaping~~
- ~~References to applicable standard drawings~~
- ~~Approved design deviations, waivers, or modifications~~

Landscape and irrigation plans are required for any landscaping that is located within City right-of-way (ROW), except for applications reviewed under the Minimum Development Standards Review Process in the Bend Development Code or plans submitted with the current Pre-Approved ROW Templates. Required landscape and/or irrigation plans for work within the public ROW must be stamped and signed by a licensed landscape architect defined by the Oregon Revised Statutes. Minimum general specifications for construction must be set forth in the Oregon Standard Specifications (OSS) for Construction and these City of Bend Standards and Specifications. ***(Relocated from 12)***

1.) **Landscape Plan.** Landscape plans must include the following:

- Identify limits of City maintained landscaping and privately maintained landscaping.
- Existing and proposed structures, streets, driveways, walkways and other hard surfaces.

- Existing and proposed terraces and retaining walls.

- Existing and proposed utilities. Tree and utility separation requirements must comply with City standards.

- Existing Regulated Trees (six inches or larger in diameter measured at four and one-half feet above the ground known as DBH, for "diameter at breast height"). Include tree type and size. Show all existing trees proposed for removal or relocation.

- Existing vegetation areas that will remain as-is including existing turf areas.

- Proposed protection fencing locations and type of protective measures in compliance with Standard Drawing E-3, Tree/Vegetation Protection Fencing.

- Existing and proposed signs to prevent conflict with trees and sign visibility. Signs locations must also comply with the separation requirements per City standards.

- Clear vision areas, intersection sign triangles and sight distance areas. See 12.2.4.5, Street Tree Location and Spacing for clearance requirements.

- Proposed plant and non-plant materials. Include a planting schedule containing the location, size, species, and quantity of proposed plant materials (at time of planting) and include plant installation timeline.

- Existing and proposed grading and drainage systems.

2.) Irrigation Plan. Irrigation plans must include the following:

- Specify hydrozones and landscaping features.

- Schematic piping layout and size to water source.

- Location of sleeves under all hard surfaces or construction obstructions.

- Location, type, and coverage of each irrigation zone.

- Location of irrigation controller, flow sensor and master valve by note (if remote-offsite) or symbol.

- Location of backflow device and 'blowout' for winterization.

- Location of all points of connection (POC) and location of irrigation service and meter.

- Table of hydraulic calculations showing all zones and their overall application rate (in/hr) and flow (GPM). Site structures and obstacles that interfere with the coverage and performance of the irrigation system.

- Schedule of heads and/or drip type, numbers of circuits, and sizes of piping.

- References to applicable standard drawings.

3.) Specify soil specifications at time of planting.

4.) Specify mulch types, applied depth, and location.

5.) Include approved design deviations, waivers, or modifications.

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2.3.9 Grading and Erosion Control

The following items ~~shall~~ must be shown on all plans, as applicable.

1. Construction entrance(s) / Wheel washes
2. Storm Inlet protection
3. Tree protection in compliance with Standard Drawing E-3, Tree/Vegetation Protection Fencing / removal
4. 1 foot contours for existing and proposed grades. Where steep terrain exists, existing grade contours can be shown at 2-foot intervals. Contours must be labeled to provide clear understanding of slope direction and grade.
5. Slope mitigation (during construction and post construction)
6. Concrete washout
7. Stock pile areas
8. Stream / Waterway protection
9. Sediment control
10. Indicate whether land is a cut or a fill.

11. Show site plan and identify all drainage basins within the area.

12. Show erosion control methods.

13. Provide cross-sections or profile plans to show existing and final grading where terrain is steep and incurring large cuts and fills.

14. References to applicable standard drawings

15. Approved design deviations, waivers, or modifications

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12 Landscape ~~Architecture~~ and Irrigation Systems

The purpose of these ~~guidelines~~ standards is to promote community health, safety and welfare by protecting ~~natural~~ native vegetation and Regulated Trees (six inches or larger in diameter measured at four and one-half feet above the ground known as DBH, for "diameter at breast height"), ~~set~~ requiring ~~development standards for~~ landscaping and street trees in the right-of-way, and reduc~~i~~ng water consumption through the use of appropriate site design, plant materials, and irrigation technologies.

These standards are in addition to ~~and complement~~ the Bend Development Code Chapter 3.2, Landscaping, Street Trees, Fences and Walls.

12.1 Applicability

~~The City shall require submittal of Landscape and Irrigation plans for any system that is located within City right-of-way (ROW) and/or will become owned, operated and maintained by the City of Bend and when required by the Bend Development Code. All landscape and/or irrigation plans for work within all public ROW shall be stamped and signed by a licensed landscape architect defined by the Oregon Revised Statutes. Minimum general specifications for construction shall be set forth in the Oregon Standard Specifications (OSS) for Construction and these City of Bend Standards and Specifications. *(Relocated this paragraph to submittal requirement in 2.3.7, Landscape and Irrigation Plans)*~~

The standards in this Chapter apply to all landscaping and irrigation in the public right-of-way.

The ~~design~~ standards include ~~tree and existing plant habitat protection, removal of trees and landscaping materials, plant selection, tree spacing, as well as the safety of the public and City maintenance staff~~ design parameters, tree preservation requirements, street tree and plant requirements, standard materials and requirements and irrigation plan submittals.

12.2 Landscape Plan Submittals

~~A l~~Landscape and irrigation plans ~~is~~ are required ~~to include the following submittals per Bend Development Code Chapter 4.2.300:~~ in compliance with 2.3.7, Landscape and Irrigation Plans and this Chapter 12.

~~a. A planting schedule containing the location, size, and species of the existing and proposed plant materials (at time of planting)~~

~~b. Existing and proposed building and pavement outlines~~

~~c. Irrigation plans, written soil specifications at time of planting, and anticipated plant installation time line~~

~~d. The location of existing and proposed terraces, retaining walls, decks, patios, shelters, and play areas~~

~~e. Existing and proposed abutting street right-of-way landscaping~~

~~f. Other information as deemed appropriate by the Development Services Director City Engineer or designee. An arborist's report may be required for sites with mature trees that are protected under Bend Development Code Chapter 3.2.~~

~~g. Also include the location of existing and proposed signs to prevent conflict with trees and sign visibility~~

12.2.1 Design Parameters

The design ~~criteria~~ for the public ROW ~~projects shall~~ must conform to the current City of Bend Standards and S~~s~~pecifications, codes and ordinances of the City of Bend. The following are the minimum design standards for the City of Bend. These standards apply to all public ROW ~~projects~~ unless a ~~variance~~ deviation to the City of Bend Standards and Specifications is approved ~~in writing~~ from the City of Bend.

12.2.1.1 Stormwater Source Control Principles

The landscape plan ~~shall~~ must adhere to current stormwater quality source control principles for low impact development including but not limited to identifying the development/building envelope, designing with the natural topography, minimizing impervious areas, working to minimize the volume and velocity of stormwater runoff through features such as canopy coverage and infiltration, where appropriate, and incorporating treatment through soils.

12.2.1.2 Water Efficient Landscaping Principles

The landscape plan ~~shall~~ must adhere to current water conservation principles for water efficient landscape design, including, but not limited to, addressing microclimatic conditions in the site design process, grading, plant selection,

soil amendments, irrigation design, and other material selection.

12.2.1.3 Hydrozoning

The landscape design ~~shall~~ must select and group plants by implementing principles of "matched hydrozones" that is, grouping and watering plants based on their water needs.

The City of Bend recognizes ~~four~~ the following three hydrozone classifications~~ as outlined in the Oregon State University Extension Service publication Water-wise Gardening in Central Oregon. The four hydrozones are:~~

1) Very Low - Most natives / may require supplemental water for plant establishment during drought post establishment

2) Low - Perennials and some shrubs / some supplemental water required during the growing season (Apr - Oct)

3) Moderate - Fruit trees, ornamental trees, and shrubs / regular amounts of supplemental water required during the growing season (Apr - Oct)

~~4) High - Turfgrass and vegetable gardens / regular amounts of supplemental water required during the growing season (Apr - Oct)~~ ***(Delete since we don't want high water use plants in the ROW.)***

In addition, the following site-specific situations ~~shall~~ must be considered for separating zones:

- Separate zones for planting areas that have soil types that are significantly different as a result of being amended or disturbed
- Separate zones for plants in raised planters, containers, tree wells, tree pits, or other limited spaces because those spaces dry out faster
- Separate zones for plants on slopes, because they may require several short irrigation cycles to prevent runoff
- Separate zones for landscape areas separated by physical barriers such as walls, fences, roads, sidewalks and driveways
- Street trees in a planter strip must be irrigated on a separate irrigation zone to allow for proper water allocation to trees and the remainder of the landscape plant species.

12.2.2 ~~Landscape Conservation~~ Tree Preservation *(Update both Table of Contents to reflect the new title)*

~~Landscape conservation prevents the indiscriminate removal of significant trees and other vegetation, including vegetation and features associated with streams, riparian areas, wetlands and other protected natural resource areas. Landscape conservation standards apply to all development sites that contain significant vegetation, as defined in the Bend Development Code.~~ The following are the requirements for preserving Regulated Trees (six inches or larger in diameter measured at DBH) in the public right-of-way.

12.2.2.1 Tree Protection Plan

~~A Tree Protection Plan is required per Bend Development Code Chapter 3.2.200. Significant trees shall be inventoried during the site design process and protected during construction unless otherwise approved for removal through the site plan review process. Significant trees are defined as individual trees with a specific trunk diameter as measured four feet above the ground (known as DBH, "diameter at breast height"). Deciduous trees measuring 6 inches or greater and coniferous trees measuring 10 inches or greater shall be considered significant.~~ ***(2.3.7 Landscaping and Irrigation Plans requires a tree plan and 12.2.2.2 addresses tree removal.)***

~~Significant~~ Trees in the public ROW ~~shall~~ must be retained unless approved by the City to be removed ~~for development~~ in compliance with 12.2.2.2, Tree Removal and Relocation. ~~Preservation will be considered impracticable when it would prevent development of public streets, public utilities, needed housing, or land uses permitted by the applicable land use district.~~

~~A protection area shall be defined around the edge of all branches of each tree (drip line) or strand of trees. Drip lines may overlap between trees.~~ **Root Zone Protection Requirements.** Trees to be preserved must be protected according to the following standards. Tree protection methods and specifications must be consistent with ISA best management practices.

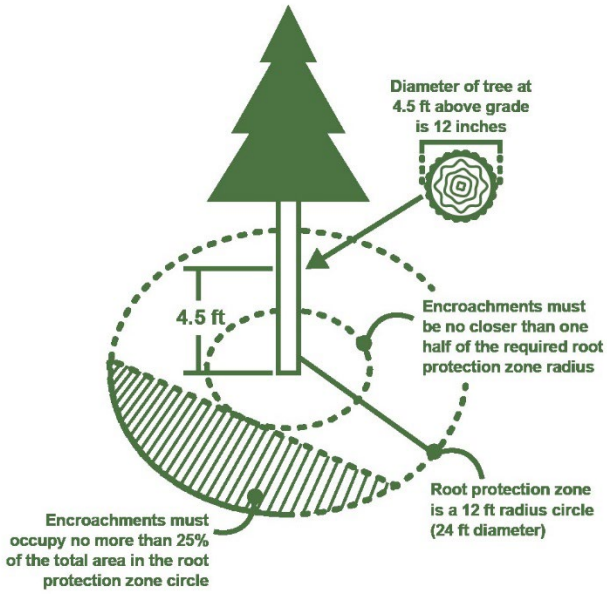
1. **Establish a root protection zone.** Root protection zone means a circular area measured from the outside trunk of the tree equal to one foot in radius for every inch of tree at diameter at breast height. For offsite trees with root protection zones that extend into the site, the root protection zone may be estimated but no less than the extent of the dripline.
2. **Encroachments.**
   a. **Existing Encroachment**s. Existing encroachments into the root protection zone may remain.

   b. **New Encroachments for Structures, Impervious Surfaces and Utilities.**

      i. New encroachments into the root protection zone are allowed provided the area of all new encroachments is less than 25 percent of the remaining root protection zone area when existing encroachments are subtracted; and

      ii. New encroachments are no closer than one half of the required root protection zone radius.

Figure 12.2.2.1 – Example of Permissible Encroachments



3. Prohibited in Root Protection Zone. The following are prohibited within the root protection zone of each tree:

a. Clearing, grading and construction activity including vehicle or equipment access (but excluding access on existing streets or driveways), storage of equipment or materials including soil, temporary or permanent stockpiling, excavation or fill, compaction, trenching or other work activities.

i. Exception: Demolition of existing structures or other encroachments is permitted in the root protection zone. Trees damaged or destroyed during demolition must be replaced in compliance with BDC 3.200(E), Mitigation Options.

b. New structures, impervious surfaces and utilities unless approved to encroachment in compliance with subsection (2)(b) of this section.

4. Protection fencing:

a. Required protection fencing must be installed before any construction activities start; and may only be removed upon completion of final inspection.

b. Protection fencing must be installed at the edge of the root protection zone and permissible encroachment area in accordance with the City of Bend Standards and Specifications (See Standard Drawing E-3, Tree/Vegetation Protection Fencing). Existing structures and/or existing secured fencing at least 3.5 feet tall can serve as the required protective fencing.

c. When a root protection zone extends beyond the development site, protection fencing is not required to extend beyond the development site.

d. Signage designating the protection zone and penalties for violations must be secured in a prominent location on each protection fence.

5. Landscaping and Irrigation. Any landscaping or irrigation approved within the root protection zone may be installed before or after the removal of the protection fence and must not disturb existing trees including roots within the root protection zone.

~~The tree protection plan shall include the following:~~

~~a. Inventory of Significant Vegetation. Depict all significant vegetation by DBH and species, showing property lines, two-foot contours and rock outcroppings.~~

~~b. Building Envelopes. The developer shall depict the buildable area of a lot that is consistent with the lot coverage area of the zone.~~

~~c. Barriers. The developer shall depict protection barriers on the site plan and locate and mark with flagging and/or signs for all construction roads, parking places for workers, and areas for the storage of building materials, gravel and soil; stake out the exact locations of all utility trenches; erect physical barriers around all trees to be retained or groups of trees around the work site. Barriers that extend beyond the drip line of the tree are preferred.~~

~~d. Soil Compaction. The Tree Protection Plan shall depict typical details of methods for protecting the critical root zone. If barriers are not feasible to keep away vehicles and foot traffic, use six to eight inches of wood chips spread over the root zone or bridge root area overlaid by plates of steel or other suitable material.~~

~~e. Grade Changes. If a grade change is unavoidable, retaining walls shall be used to protect the root system.~~

~~f. Severing Roots. Avoid cutting anchoring roots if possible. Tunneling for smaller household utility lines may be an option for tree preservation. When root cuts are unavoidable, the cuts shall be made with a pruning saw.~~

~~g. Above-Ground Injuries to Trees. Do not use trees for posting signs, electrical wires and pulleys. Keep trees free of nails, screws, and other fastening devices. Prevent trunk injuries by surrounding trunk with one-inch by four-inch wooden slats and securing in place with gauge wire around slats.~~

~~h. Soil Contamination. Altering the soil chemistry can result in weakened trees, making them more susceptible to insects and disease. Prevent adverse effects on soil chemistry by spreading heavy plastic tarping where~~

~~concrete is to be mixed or sheet rock cut; do not clean paintbrushes and tools over tree roots; dispose of chemical wastes properly and do not drain onto soil.~~

~~i. Altering the Natural Drainage Course. When the natural drainage of a site is altered, watering for existing trees must be augmented by an irrigation system. Prior to site grading, prepare a site drainage plan. Sometimes surface water containment can sustain existing stands of trees without artificial irrigation.~~

Landscape plans or specifications ~~shall~~ must note a requirement for the City to be notified within 24 hours of any damage to existing trees within the project area that were not approved for removal or relocation. If damage occurs during construction, the contractor ~~shall~~ must employ ~~a~~ an International Society of Arboriculture (ISA) ~~c~~Certified ~~a~~Arborist to determine whether the damage may be repaired or the tree must be replaced according to City ~~standard~~ mitigation procedures in BDC 1.3.300.C, Removal of Landscaping and Regulated Trees.

12.2.2.2 Tree Removal and Relocation

Trees ~~shall~~ must not be removed or relocated within the public ROW without approval from the City Engineer. The applicant ~~shall~~ must submit a Tree Removal and Planting Permit application to the City of Bend that identifies number and type of trees to be removed, location of trees to be removed, reason for removal, and proposed planting mitigations. Approval for removal/relocation of the tree ~~shall~~ requires approval from the City Engineer based on the following criteria:

1) The site cannot feasibly be developed or accessed, either by alternative site design or construction methods without removing or relocating existing trees in the right-of-way

2) Trees left in their present location will be so undermined by construction that their viability is threatened to the extent they become a danger in the future

3) The existing location is determined to interfere with the clear vision standards, intersection sight triangles, and intersection sight distances (for traffic, bicycles, and/or pedestrians and causes a safety concern that may not be resolved by appropriate pruning or thinning).

Recommendations for removal, pruning or thinning must be made by a licensed landscape architect or certified arborist. Under no circumstances may a tree be “topped”.

Existing trees approved for removal or relocation ~~shall~~ must be clearly identified on the landscape plan. The City ~~shall~~ must be notified 48 hours in advance of any approved tree removal activity.

12.2.3 Street Trees and Plants

Street trees ~~shall~~ and planter strip landscaping must be ~~required to be located and~~ planted ~~with all public ROW projects~~ consistent with BDC 3.2.400 Street Trees and Landscaping in Planter Strips. ~~They may be located per 12.2.3.5 - Street Tree Location and Spacing and the requirements of Bend Development Code Chapter 3.2.400. Deviation from this standard shall require approval from the City Engineer.~~

~~Trees and plant species selected for use in non-paved public ROW projects shall be selected for their durability, drought tolerance, proportionality to site circumstances, low maintenance, and clearance standards for pedestrian, bicycle, and vehicular traffic safety. The use of native plantings should be prioritized over non-native plantings.~~

~~The publication titled "Water-wise Gardening in Central Oregon" by the Oregon State University Extension Service is recommended as a guidebook for plant selection. Copies of the publication are available at the City of Bend Utility Department and OSU Extension Service.~~ ***(Relocated to 12.2.3.1 below)***

All trees and plants considered ~~shall~~ must be hardy to USDA Zone 3 – 5 or 6b.

12.2.3.1 Approved Street Tree List and Plant List ***(Update title in the Table of Contents and if referenced elsewhere in the S&S.)***

Proposed plants must be selected from the City of Bend Approved Plant List (see Appendix E of the City of Bend Standards and Specifications) and/or the moderate to very low water need plants listed in the publication titled "Water-wise Gardening in Central Oregon" by the Oregon State University Extension Service. Copies are available at the City of Bend Utility Department and OSU Extension Service.

Proposed street trees ~~shall~~ must be selected from ~~Bend Development Code Chapter 3.2.400, unless otherwise approved by the Planning Director~~ the City of Bend Approved Street Tree List (See Appendix D of the City of Bend Standards and Specifications).

12.2.3.2 Non-approved Street Trees and Plants

~~Turf and artificial turf is prohibited in public ROW projects, but will be assessed by the City of Bend on a case-by-case basis.~~

The following species are prohibited from installation in the ROW:

- All species of warm and cool season turfgrass (grass lawn)
- Populus sp.
- Salix sp.

- Alianthus sp.
- Robinia sp.

Synthetic turf is prohibited in the ROW.

12.2.3.3 Height Standards for Street Trees and Plants

~~On public ROW landscape projects without existing sidewalks, trees shall be located to accommodate future sidewalk locations with consideration for existing and future utility corridors.~~ ***(Relocated on 12.2.3.5 Street Tree Location and Spacing)***

Plants that will attain a mature height of two feet or more in height ~~should~~ must not be planted in Clear Vision Areas, Intersection Sight Triangles, ~~no~~r Sight Distance Areas. Refer to Standard Drawing R-2 and 3.3.4.3 - Intersection Sight Distance vs. Clear Vision Area. The height of the plant ~~shall~~ must include the ~~adjacent~~ abutting curb height and any earthwork or grading within the plant bed.

~~Street trees are not permitted to be planted within the Clear Vision Area, or within Intersection Sight Triangles, nor Sight Distance Areas.~~ Existing trees ~~shall~~ must be limbed to a minimum of 8 feet above the adjacent curb. This applies to center medians as well as roadside areas. ***(Repetitive with 12.2.3.5 Street Tree Location and Spacing)***

Only trees, 25 feet high or less, at maturity, ~~shall~~ can be considered for planting ~~under~~ beneath or within 10 lateral feet of any overhead ~~utility~~ power lines. See the city's currently approved street tree list for planting beneath powerlines.

12.2.3.4 Size of Street Trees and Plants

~~Minimum plant and tree sizes are to be determined by the Bend Development Code Chapter 3.2.300.~~

Shrubs, Ornamental Grasses and Perennials and Groundcover Plants. ~~Shrubs shall be planted from two-gallon containers or larger.~~ Shrubs and ornamental grasses must be a minimum of one gallon containers, and perennials and groundcover plants must be a minimum of four-inch pots.

Deciduous Trees. The minimum caliper size of street trees at planting ~~shall~~ must be two inches ~~DBH (diameter at breast height, or four feet above ground), based on the American Association of Nurserymen Standards~~ measured at six inches above the soil or root ball for bare root trees. ~~If the required caliper is not available, the Planning Director/Review Authority may accept replacement trees with an extended maintenance guarantee of two additional years depending on substituted size.~~ If the required caliper is not available as demonstrated by letters submitted by three different local nurseries, the Planning Director/Review Authority may accept a smaller caliper tree no less than one and one-half inches.

Conifer Trees. Conifer trees must be a minimum of six feet in height measured from the soil to the top of the tree.

12.2.3.5 Street Tree Location and Spacing

~~Street trees must be planted within existing and proposed planting strips or in City-approved sidewalk tree wells on streets without planting strips. Street trees planted within sidewalk tree wells shall be installed with a City-approved tree grate.~~

~~Where the landscape strip and/or sidewalk is not wide enough to accommodate street trees, the Planning Director may allow the street trees to be planted within five feet from the back of the sidewalk.~~

~~Where practical, small stature trees must be planted no closer to the curb or sidewalk than three feet, medium trees – three feet and large trees – four feet. Root barriers may be required with street tree planting to protect the City's curb and sidewalk.~~

~~Street tree spacing must be based upon the type of tree(s) selected and the canopy size at maturity. Small canopy trees and columnar shaped trees must be planted no further than 25 feet apart; medium and large canopy trees must be planted no further than 35 feet apart, except where planting a tree would conflict with existing trees, retaining walls, utilities and similar physical barriers. A random spacing of street trees may be approved for the equivalent number of trees required for the length of the frontage.~~

Location.

Street trees must be planted within existing or proposed planting strips or in City-approved sidewalk tree wells on streets without planting strips. Street trees planted within sidewalk tree wells must be installed with a City-approved tree grate.

Where the planter strip is less than four feet wide (excluding curb dimensions), the street trees may be planted within five feet from the back of the sidewalk. Root barriers are required with street tree planting to protect the City's curb and sidewalk. Existing trees located in the proposed planting strip, tree well, or within five feet from back of sidewalk can count towards this requirement.

For public ROW landscape without existing sidewalks, trees must be located to accommodate future sidewalk locations with consideration for existing and future utility corridors. ***(Relocated from 12.2.3.3 Height Standards for Street Trees and Plants.)***

Spacing.

The required spacing distance is based on the species of tree and described in the city's currently approved street tree list except where planting a tree would conflict with existing trees, driveways, retaining walls, utilities and similar physical

barriers. A random spacing of trees may be approved for the equivalent number of trees required for the length of the frontage.

Trees should be spaced no less than the following distances from existing or planned infrastructure:

- Stop signs: 35 feet
- Street lights: 25 feet
- Non-street light utility poles: 5 feet
- Property lines: 2 feet
- Fire hydrants: 10 feet
- Water meters or sampling manholes: 5 feet
- Driveways~~, sidewalks, curbs,~~ or alleys: ~~3 feet for small and medium trees, 4 feet for large trees~~ 5 feet
- Traffic signs: 20'
- Bus benches and shelters: 5'

Trees shall not be planted within the following areas:

- Clear vision areas except street trees may be planted a minimum of five feet from a driveway or an alley
- Intersection sign triangles
- Sight distance areas
- City water or sewer easements, unless approved by the City Engineer
- Public utility easements~~, unless written approval is obtained from the applicable agency(ies)~~ . All street trees must be placed outside utility easements unless the utilities can be placed in a conduit for maintenance (this may require additional easements) or when approved by the utility provider. If the existing planter strip contains such easements and is not wide enough to also accommodate street trees, the street tree location requirements may be adjusted as approved by the Planning Manager.
- Medians and planter strips less than 4 feet wide (excluding curb dimensions)

12.2.3.6 Exemptions

Exceptions and/or exemptions to tree and plant location standards will be considered on a case-by-case basis, as approved by the City Engineer and/or Planning ~~Director~~ Manager.

12.2.4 Standard Materials and Equipment

Designs ~~shall~~ must incorporate materials and equipment that comply with the City of Bend Standards and Specifications. Alternative materials ~~shall~~ must only be used when an approved Deviation from Standards and Specifications request has been submitted and approved.

12.2.4.1 Tree Wells

Street trees planted within sidewalk tree wells ~~shall~~ must be installed within a pedestrian rated tree grate or surrounded by permeable pavers or pavement appropriate for pedestrian circulation. The minimum tree pit dimensions ~~shall~~ must be a minimum of 108 cubic feet 4 ft. x 9 ft., minimum 3 feet deep, and a minimum surface dimension of 4 feet.

12.2.4.2 Soil Amendments

The City of Bend requires the use of organic soil amendments to improve soil structure and increase aeration, water penetration, and water retention for plant hydration when appropriate for the selected plant species. ~~An agricultural soil analysis shall be required for all public works projects. Soil analysis shall include pH, N-P-K, SAR, ECe, boron levels, percolation rates and soil particle evaluation. The report shall include recommendations for amendments, fertilizers, application rates, and procedures for conditioning the soil. Soil amendments shall be tilled to an appropriate depth for the planting in order to prevent a layering of soil types. Existing native shrub zones shall not be disturbed by soil amendment processes.~~ Soil amendment must be tilled into native topsoil to a depth of 6 inches across entire area for seeding or spot amended at individual planting holes at a ratio of 1/3 amendment to 2/3 native excavated soil. Topsoil with aggregate material in excess of 5 percent of composition is not acceptable amendment. Prior to amending soil, planting area must be cleared of construction debris, base rock and other to a depth of 12 inches for shrubs and groundcover and 24 inches at tree pits.

12.2.4.3 Mulches

~~Organic mulch such as shredded bark or composted bark shall be applied to all planting areas for moisture retention, weed control, and moderation of soil temperatures.~~ Finished landscapes must include organic shredded bark or rock mulch to a depth of three inches. Mulch must be pulled back at a 4”- 6” radius from the tree and shrub root flare.

~~Impermeable weed barriers made of plastic are prohibited under any mulches. Geotextile products are allowed under gravel or rock mulches.~~ Weed barriers and impermeable plastic are prohibited under any mulches.

The landscape plan ~~shall~~ must identify the proposed type and recommended depth of installation for all proposed

mulch materials.

12.4.4 Fertilizers

The landscape plan or specifications ~~shall~~ must specify any additional fertilization requirements that may be necessary for the establishment of new plant material.

The landscape plan ~~shall~~ must specify type and recommended application rate for each proposed use of any fertilizer recommendation that deviates from Specification Section 01030 - Seeding, and Specification Section 01040 - Planting, for approval by the City.

12.3 Irrigation Plan Submittals

Irrigation systems shall be designed to be efficient and to uniformly distribute water.

Specific criteria that ~~shall~~ must be considered in designs include soil type, slope, root depth, plant materials, hydrozones, microclimate conditions, water source, peak precipitation rate demand, and watering windows. To conserve and protect water resources, designs ~~shall~~ must utilize appropriate equipment and components that meet the City of Bend Codes, Standards and Specifications. Irrigation ~~designs should strive to design projects that are aesthetically pleasing,~~ must be designed to operate at a level that conserves water resources~~,~~ and reduce required maintenance by City staff.

For capital improvement and development projects, the following design requirements ~~shall~~ must be implemented in all design deliverables and submittals presented to the City of Bend for review.

An irrigation plan ~~shall~~ must accompany the site/landscape plan and identify the location, type, and coverage of sprinklers, as well as drip lines, valves, zones, point(s) of connection and other equipment required to provide water as prescribed by the City of Bend as part of the submittal to the City for review and approval prior to installation. An irrigation plan is required for any public development where landscaping within the City of Bend right-of-way is part of the improvements, either new or existing. Irrigation plans ~~shall~~ must be in compliance with these standards and those set forth in OSS and in other Bend Codes, Standards, and Specifications.

See 2 - Design Submittal Requirements for plan submittal requirements and City of Bend CAD Standards.

12.3.1 Design Parameters

Irrigation systems ~~shall~~ must be designed to fully irrigate plant materials shown or specified on the site plan. System design should consider plant size and spacing at maturity to ensure long term effectiveness.

The minimum supply water pressure ~~shall~~ must be based on information supplied by the water utility, field-verified

and noted on the drawings, and be incorporated in the irrigation design to ensure proper system performance.

Irrigation systems ~~shall~~ must be designed to maximize efficient water usage based on existing and proposed site~~–~~specific topography, soils, site orientation, prevailing wind conditions, and micro-climates to eliminate the possibility of run-off and overspray, minimize evaporation, and increase the rate of infiltration. In dimensions >8 feet ~~O~~overhead irrigation sprinklers ~~shall~~ must be inset ~~3 to 5~~ 12 inches from abutting hardscape, curbs and sidewalks to prevent irrigation overspray and runoff onto adjacent surfaces. Ensure the irrigation system adheres to Bend Code Chapter 14.20 and does not result in irrigation overspray or runoff onto adjacent hard surfaces.

Irrigation designs ~~shall~~ must not mix sprinkler types, i.e., rotary, ~~fixed spray,~~ bubblers, ~~micro-sprays~~, drip, or subsurface irrigation ~~methods~~ on the same zone.

Provide separate irrigation zones for trees, shrubs ~~&~~ and groundcovers~~, and turf~~. Tree irrigation must be RWS-Root watering system or similar, per Standard Drawing L-18 Tree Root Watering System Detail with cans installed on each side of tree root ball and flush with finish grade. Bubblers placed at root flare of tree are not acceptable.

Where overhead irrigation is approved in widths >8 feet, high efficiency nozzles must be used and result in a net precipitation rate of 1 in/hr or less. Overhead spray nozzles are prohibited in the ROW. ~~Fixed spray or rotary head~~ ~~i~~Irrigation utilizing high efficiency nozzles may be used for “temporary irrigation zones”. Temporary irrigation is required to establish areas being revegetated with drought-tolerant and native plant species. Temporary irrigation systems ~~shall~~ must be reviewed on a case-by-case basis and removed after the vegetation is established. Irrigation designs shall identify location, number of zones, and irrigation types proposed for any areas determined to be temporary irrigation zones.

Separate zones are required for permanent and temporary irrigation lines.

12.3.1.1 Safety

Run-off and/or over-spray from sprinkler heads ~~shall~~ must be eliminated from streets and sidewalks by use of proper design principles and installation practices. Refer to Bend Code Chapter 14.20.030 for additional information about water waste.

To conserve and protect water quality, all landscapes and irrigation installations ~~shall~~ must consider the conservation of resources, and protect native habitats and watersheds.

Irrigation designs shall utilize products that require the least amount of service, repair, and replacement. Buried vaults and valves should be located near areas with low pedestrian and vehicular traffic.

12.3.1.2 Hydrozones

The irrigation plan, in conjunction with the landscape plan, ~~shall~~ must prevent over-watering and under-watering by implementing principles of "matched hydrozones." Refer to 12.2.1.3 - Hydrozoning for additional detail.

12.3.1.3 Hydraulic Calculations

Irrigation designs ~~shall~~ must supply complete calculations for all irrigation zones (drip zones and spray zones separately). Supply a table showing the total water required for each zone to ensure that the design has not exceeded the maximum for the meter, proposed pipe size, and zone watering times.

12.3.2 Drip Irrigation Design

~~Use drip irrigation when practical and where potential for irrigation overspray and/or runoff is likely to occur.~~ Drip irrigation systems ~~shall~~ must be designed according to standards and engineering practices specified by the American Society of Agricultural and Biological Engineers or Irrigation Association. Systems should be designed to meet the changing water requirements of the landscape as it matures.

Drip irrigation/pressure compensating bubblers ~~is~~ are required where dimensions are less than ~~six~~ eight feet in any direction. ~~Overhead irrigation in areas greater than six eight feet in dimension shall must utilize low precipitation rate, high efficiency sprinkler nozzles and have a precipitation rate of less than 1.0 inch per hour. Fixed spray and VAN nozzles are prohibited from use in the ROW.~~

Subsurface ~~D~~drip irrigation systems ~~shall~~ must be buried to a depth of two inches and include all required devices for successful long term maintenance and monitoring including, but no limited to, air relief valves, auto flush valves and drip zone indicators at each end of the drip header per zone. See Standard Drawing L-16 Dripline 2" Below Grade Potable System.

Pressure compensating stream bubblers on a PRS pop up, hard piped to a swing joint and set in no less than 12 inches from sidewalk and curb inside edge may be installed in widths <8 feet requiring drip irrigation. ~~designed so that the drip emitters have an 'Emission Uniformity' (relative flow rate between like emitters) of at least 80 percent at time of installation~~.

12.3.3 Standard Materials and Equipment

Designs ~~shall~~ must incorporate materials and equipment that comply with Specification Section 01120. Alternative materials ~~shall~~ must only be used when an approved Deviation from Standards and Specifications request has been submitted and approved. Materials shall be designated by trade name as per City of Bend Special Provisions or an approved equal, as verified from information in the manufacturer's catalogue and shown to contain comparable components.

12.3.3.1 Irrigation Controllers

The City of Bend uses the current technology for programming and monitoring irrigation systems for landscape areas within the city to ensure the most efficient delivery of water to the public ROW. Irrigation controllers ~~shall~~ must be EPA WaterSense labeled smart irrigation controllers, programmed to ~~that~~ automatically adjust irrigation run times in response to environmental conditions. Some models may require an external weather sensor or accompanying module to access the weather data, freeze/rain clicks do not qualify.

At a minimum, a station list with plant type and area description must be left in the controller. A pre and post grow in schedule must be calculated and left in the controller. If power is not available, a solar powered controller may be utilized with approval. Battery powered controllers may not be used in new construction.

12.3.3.2 Automatic Control Valves

Automatic electric solenoid remote control valves ~~shall~~ must be slow acting diaphragm-type, as per Specification Section 01120.17 (h)(2) Automatic Control Valves.

12.3.3.3 Sprinkler Heads

Sprinkler heads ~~shall~~ must provide coverage as specified in the manufacturer's design literature. Where overhead type sprinklers are allowed, dimensions >8 feet, ~~T~~the use of high efficiency sprinklers or nozzles ~~is encouraged wherever practicable~~ required in the ROW, zones must have a net precipitation rate of less than 1.0 inch per hour. Acceptable types of high efficiency nozzles include (Mp Rotators, R-Van, Precision) models. Fixed spray and VAN nozzles are prohibited from use in the ROW.

12.3.3.4 Pipe

ROW projects ~~shall~~ must be entirely furnished with one pipe class or schedule type as per the Bend Standards and Specifications, and conforming to all other natironal and local standards.

12.3.3.5 Blowouts

A blowout connection point ~~shall~~ must be installed to facilitate winterization by use of compressed air. Locate blowout connection immediately downstream from backflow device.