ENGINEERING DESIGN AND STANDARD DETAILS MANUAL

2023 Edition

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INTRODUCTION

1. PURPOSE

The City of Happy Valley's Engineering Design Manual has been developed to provide a uniform set of standards and procedures to assist the City and private consulting engineers in coordinating, designing, and constructing public improvement projects. These standards apply to all improvements within the existing and proposed public right-of-way and easements, to all improvements intended for maintenance by the City, and to all other improvements for which the City of Happy Valley *Municipal Code* requires the approval of the City Engineer. Standards for site grading, erosion control, pedestrian and bike facilities, parking lots, and driveway construction on private property are also contained in this manual and referenced in the *Municipal Code*. Changes or corrections to the Engineering Design Manual will be made by the City Engineer as needed.

2. ADOPTED STANDARDS AND REFERENCE MANUALS

The City has adopted the APWA/ODOT Oregon Standard Specifications for Construction, latest edition, the AASHTO A Policy on Geometric Design of Highways and Streets, latest edition, and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition for street design and construction standards. The City has also adopted Clackamas County Water Environment Services (WES) Stormwater Management Design Standards and Sanitary Sewer Standards for the design and construction of the stormwater facilities and sanitary sewer systems. These standards will be used in the design and construction of improvements within the City of Happy Valley. The City's Transportation System Plan (TSP), latest edition, shall be used to plan the transportation system development in Happy Valley.

3. SERVICE PROVIDERS

CCSD #5 – Clackamas County Service District #5: Street Lighting service provider.

CFD #1 – Clackamas Fire District #1.

CRW - Clackamas River Water; Drinking Water service provider.

DEQ – Oregon Department of Environmental Quality.

DTD – Clackamas County Department of Transportation & Development; manages Clackamas County Roads

SWA - Sunrise Water Authority; Drinking Water service provider.

WES – Water Environment Services: Sanitary Sewer and Storm Sewer service provider.

4. ABBREVIATIONS

AASHTO – American Association of State Highway Transportation Officials

ACP – Asphaltic Concrete Pavement

APWA – American Public Works Association

BMP – Best Management Practices

CDF – Controlled Density Fill

CTB – Cement Treated Base

DEQ – Department of Environmental Quality

ESC – Erosion and Sediment Control

FEMA – Federal Emergency Management Agency

HCM – Highway Capacity Manual

HDM - Highway Design Manual

HMAC – Hot Mix Asphalt Concrete

HOA – Home Owners Association

HVMC – Happy Valley Municipal Cod

LOC – Level of Service

MUTCD – Manual of Uniform Traffic Control Devices

NCHRP - National Cooperative Highway Research Program

NPDES – National Discharge Elimination System

NPDES 1200-C Permit – Construction Stormwater Permit issued by DEQ for sites that disturb over an acre of land

ODOT – Oregon Department of Transportation

ORS – Oregon Revised Statutes

OSHA – Occupational Safety and Health

OTTCH – Oregon Temporary Traffic Control Handbook

PT/PC – Point of Tangent/Point of Curvature

PUD – Planned Unit Development

PUE – Public Utility Easement

PROWAG – Public Rights of Way Accessibility Guidelines

RAB - Roundabout

ROW – Right of Way

TSP – Transportation System Plan

V/C – Volume to Capacity Ratio

CHAPTER 1
DEVELOPMENT PROCESS

1. GENERAL

Property owners, developers and others proposing to do any work on a site that will alter the site to a significant degree, will be required to obtain all applicable land use approvals and permits. No work may begin on a site prior to the approval of construction plans and issuance of appropriate permits from all agencies involved. Construction plans shall be designed and stamped by a professional engineer, registered in the State of Oregon, herein after referred to as the Design Engineer.

2. PRELIMINARY ENGINEERING

a. Pre-application Conference

At the start of the development process, the developer shall attend a pre-application conference for all development proposals that require land use approvals and for most commercial building improvements. The purpose of the pre-application conference is to help the applicant through the land use and permit process.

b. Providing for Future Development

All improvements shall be designed as a logical part of the development of the surrounding area. Storm sewers and sanitary sewers shall be sized to accommodate the entire drainage basin which they will ultimately serve. Utilities and street improvements will be extended to the boundaries of the development for future extensions to the adjoining areas. The City Engineer may require oversizing of utilities to accommodate future growth of the City.

Where existing utility lines do not adjoin the proposed development, the developer will be required to extend the lines to the development as necessary. Where existing roadway improvements do not extend to the proposed development, the developer will be required to improve the roadway to and through the development as necessary.

c. Pavement Moratorium

There is a moratorium on any city street that has been recently paved. No street cuts will be allowed in an arterial or collector street that has been paved or resurfaced within the previous five (5) years, or any other street that has been paved or resurfaced within the previous three (3) years. Exceptions may be made by the City Engineer on a case-by-case basis. Exceptions will require additional pavement restoration limits, and/or grinding and repaving of the entire street section.

d. Utilities

All utility improvements associated with the development, including telephone, internet, electrical power and lighting, gas, and cable TV, shall be installed underground in a public utility easement, and shall meet the current standards of the appropriate agency as well as City standards. (See *Chapter 2, Section 10,* for additional information)

3. CONSTRUCTION PLAN REVIEW

Once all required Land Use Approvals are obtained, submit electronic construction plans in PDF format to the Engineering Division. Completed permit forms/information and supporting documentation shall accompany all plan submittals. Supporting documentation may include the engineer's construction estimate, geotechnical engineering report, wall designs, sight distance exhibits, and other required exhibits. Plan review priority will be given to plans submitted for subsequent review over plans submitted for initial review. A plan review deposit is required with the first plan submittal. (See *Chapter 2, Section 13,* for additional information on specific permit applications to accompany the plan submittal.)

Upon completion of the detailed review by the City, a set of electronic "redline" plans and / or a list of itemized plan review comments will be returned to the Design Engineer. More than one review may be required. A response letter addressing all the City's previous review comments shall be included with each subsequent construction plan submittal. After the Design Engineer has completed all revisions and obtained the necessary approvals from affected service providers (Water Environment Services and Sunrise Water Authority for example), electronic files of the final approved and signed drawings (in PDF), along with one half-size paper set, shall be submitted to the City prior to any permit issuance or commencing of construction.

The final plan review approval is valid for one (1) year from the date of plan review fee payment and issuance of the Site Development Permit. Larger projects that will be under construction for more than one year will be valid for two (2) years with City approval. Extensions to the permit can be made by requesting a one-year extension. Approval of the permit extension may require a new plan review if conditions have changed since the plans were approved. (See *Chapter 2, Section 13,* for more information about the permits that must be obtained prior to beginning construction.)

In some instances, the City Engineer may approve an Early Grading Permit release ahead of full site development permit approval. Any project requesting early grading shall first meet the requirements of the City's Early Grading Policy (latest edition may be found on the website). The purpose of allowing early grading on a development project is to facilitate earth movement during the dry season and minimize erosion and sediment issues on site. Early Grading Permit issuance will only be considered during the months of May through September, or under special exception.

4. CONSTRUCTION PLAN REVIEW AND INSPECTION FEES

Construction plan review and inspection fees are based upon the construction value of the project. A plan review deposit must be submitted at the time of the first plan review submittal. Plan reviews that require more than four (4) reviews are subject to additional plan review fees based upon the hourly rate of the staff person, or staff persons, reviewing the plans. The most recent fee schedule is available on the City's website at *www.happyvalleyor.gov*.

5. PERFORMANCE AND MAINTENANCE GUARANTEES

Prior to construction plan approval, the developer shall submit a financial guarantee for the improvements as required in *Section 16.50.080* of the City's *Land Development Code*. Upon satisfactory completion of the required public improvements, a two-year 25% maintenance guarantee shall be submitted.

6. PRE-CONSTRUCTION MEETING

The construction plans will be approved by the City and Water Environment Services, and engineering permits issued, after the project pre-construction meeting. The developer's Design Engineer is responsible for arranging the pre-construction meeting between principal representatives of the engineer, contractor, developer, City, Water Environment Services, and any other applicable attendees (DTD or ODOT for example). Meetings may be held virtually or in person at City Hall.

The construction plan review and inspection fees, financial guarantee, all required permits and a certificate of insurance, naming the City as additional insured, shall be submitted **prior to** requesting the pre-construction meeting.

7. PROJECT ACCEPTANCE

a. Submittals

Following completion of construction, and prior to final inspection of a completed project, the Design Engineer shall submit a complete set of electronic as-built (record) drawings for review, including franchise utilities, along with a signed certificate of compliance and completion. Submit electronic as-built construction plans in PDF format to the Engineering Division via email at plans-engineering@happyvalleyor.gov. As-built drawings shall contain and reflect all design modifications incorporated into the completed project and all revisions to the previously approved construction plans. The as-built plans shall include all easements shown on the final recorded plat. The submittal of as-built plans and certificate of completion by the Design Engineer will begin the closeout phase of the project and signal to the City that a final inspection may be scheduled.

Once the as-built plans have been reviewed and accepted by the City and WES, the Design Engineer shall submit final electronic as-built construction plans in PDF, DWG, and GIS shape file format to the Engineering Division via email at plans-engineering@happyvalleyor.gov. Each sheet of the as-built drawings shall be stamped "As-Built", and shall be dated and signed by the Design Engineer.

If specialists were required in the design of the project (geotechnical engineer, structural engineer, surveyor, arborist, wetland scientist, etc.) then a certificate of completion or compliance letter from those individuals shall be required relating to their specialty.

Individual lot as-built drawings shall also be submitted electronically at project closeout. Each individual lot as-built shall include the following:

- The entire lot shall be shown on the as-built.

- All easement restrictions shall be shown on the lot.
- A note indicating if the fire sprinklers are required.
- Sanitary sewer lateral location with pipe size, two ties to the end of the lateral, pipe depth and length
- Storm sewer lateral location with two ties to the end of the lateral, pipe depth and length
- A note indicating required on-site stormwater facilities, such as detention or infiltration, if applicable.

b. Project Punchlist

A punchlist will be prepared for the project outlining the items that need to be completed prior to project acceptance and submittal of building permits. The punchlist will include field items, as-built plan review items, bonding requirements, and approvals from the project's service providers, such as WES and DTD.

c. Building Permit Release Letter

There are two ways a Building Permit Release Letter may be signed off by Engineering. The first, is the standard method of project completion and acceptance. The second is an alternative method using the HB2306 checklist for substantial completion and providing a financial surety. The HB2306 checklist may be found on the City's website under the Supplemental Documents for the Engineering Design Manual. Both methods are outlined below:

- The standard method of Engineering sign off on a Building Permit Release Letter is to have the public improvements for a development completed, including items on the project punchlist, the plat recorded, the as-builts approved, required warranty sureties received, and the project accepted by the City.
- The alternate method of Engineering sign off on a Building Permit Release Letter is to achieve substantial completion by completing items on the HB2306 checklist and by providing an accepted financial surety for all outstanding work per LDC 16.50.080.

Builders can submit for building permits once the Building Permit Release Letter has been signed by City Planning and Engineering, WES, and DTD (project specific).

CHAPTER 2
GENERAL DESIGN INFORMATION

1. GENERAL

Review of the public and/or private site improvement plans is initiated by the submittal of construction plans that are at least 95% complete. Improvement plans shall be designed and stamped by a professional engineer, registered in the State of Oregon, herein after referred to as the Design Engineer. See *Chapter 1, Section 3*, for plan review and submittal requirements.

2. CONSTRUCTION DRAWING REQUIREMENTS

a. Drawing Format

- Plans shall be submitted electronically and scaled on 22" x 34" (ANSI D) or 24" x 36" sheets (ARCH D).
- A vicinity map is to 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.
- A north arrow shall be shown on each plan view sheet and adjacent to any other drawing which is not oriented the same as other drawings on the sheet. The orientation of the north arrow shall be up or to the right on the plan sheet, with stationing from left to right.
- The scale shall be 1"= 2', 4', 5' or 10' vertically and 1"= 10', 20', 30', 40' or 50' horizontally for all drawings except structural drawings. The scale of corresponding sheets shall be the same.
- Letter size shall not be smaller than 0.10 inches high.
- All detail drawings, including standard drawings, shall be included in the plan set. The City's standard General Notes shall be included in the Construction Notes for each project. See the supplemental documents for General Notes.
- A note about the required Construction Hours Notice Sign shall be included in the Construction Notes for each project. See the *City's Standard Drawing 350* for more information.
- The location and elevation of a National Geodetic Survey, United States Geological Survey, Clackamas County or City of Happy Valley benchmark shall be noted on the Title Sheet. Temporary benchmarks shall be shown or referenced on the plans.
- A title block shall appear on each sheet of the plan set and shall be placed across the bottom edge of the sheet, or across the right-hand edge of the sheet. The title block shall include the name of the project, the City land use file number, the Developer/Applicant's name, the engineering firm, the sheet title and number.
- The seal of the Registered Professional Engineer responsible for preparation of the plans shall appear on each sheet.

- The seal of the Registered Landscape Architect responsible for the preparation of the landscape plans shall appear on each applicable sheet.

b. Plan Organization

Plan Sheets to be Included in Construction Drawings:

- **Title Sheet**

  Include the project name and Land Use file number in large letters across the top of the sheet, vicinity map, General Notes, notice to excavators for One Call Utility Locates, sheet legend/index, and space for the City approval stamp (3”x5) in the lower right quadrant. The final approved plans shall include the Site Development Permit number.

- **Existing Conditions Plan**

  Include two-foot contours, utilities, structures, existing easements, natural resource sensitive areas and all other affected features.

- **Composite Utility Plan**

  Include existing public and private utilities, proposed public and private utilities, and proposed public improvements.

- **Sanitary Sewer, Storm Sewer and Water Plan and Profile**

  Show existing and proposed finished contours, and include all piping, structures and appurtenances as required by Water Environment Services, Sunrise Water Authority and Clackamas River Water District.

- **Street Plan and Profile**

  Provide a stand-alone street plan and profile, not combined with any other utility. Show existing and proposed finished contours. Street lighting and signing and striping plans shall be on a separate sheet to provide clarity.

- **Grading and Erosion Control Plan**

  Use minimum 2-foot contour intervals. See *Section 0* of this chapter for additional requirements.

- **Tree Removal Plan**

  Include all plan elements required by the Tree Removal Permit application.

- **Landscape Plan**

  A street tree and planter strip landscape plan shall be included in the construction plan set in accordance with *Municipal Code Section 16.42.040*. All landscape plans shall include public utility easements, other easements, sight vision zones, sidewalks, bike and/or pedestrian pathways, entry monuments or signage, retaining walls, irrigation, underground utilities, street signs and streetlights along all existing and proposed street frontages.

- **Signage and Striping Plan**

  Provide a signage and striping plan for review, prepared by a professional engineer registered in the State of Oregon.

- **Street Lighting Plan**

  Provide a street lighting plan for review by the City, Clackamas County Service District #5 (CCSD#5) and PGE.

- **City Standard Drawings**

  Shall be included in the construction plans and be full size.

- **Fire and Life Safety Plan**

  Provide a fire and life safety plan that includes street widths, street slopes, turning radii and dimensions at emergency vehicle routes, emergency access locations, No Parking areas and fire sprinkler requirements for lots.

c. Plan View

Plan views shall show the following within the site and for a minimum of 200 feet around the perimeter of the site unless specified otherwise:

- Right-of-way, property, tract, and easement lines (existing and proposed) and their respective identifiers, and existing and proposed utility lines within them, all on the same drawing.
- Subdivision name, lot numbers, street names, and other identifying labels. Subdivision and street names are subject to the approval of the City Planning Division, Fire Marshal's Office, and the County Surveyor.
- Location and stationing of existing and proposed street center lines and curb faces.
- Horizontal alignment and curve data of proposed street center lines and curb returns.
- Existing aboveground and underground utility facilities and vegetation within the construction limits. For additional information required on Site Grading Plan, see *Chapter 2, Section 4*.
- Location of existing buildings, wells, septic tanks, drain fields, fuel tanks, and any other buried structures. An ALTA survey shall be required for at least 100 feet surrounding any of the above items to remain. Historical buildings shall be identified as such on the drawings.
- All other affected, adjacent, and existing off-site areas and features that are within a distance of 200 feet outside the site boundary, including but not limited to:
    - Off-site features that, in the Design Engineer's best judgment, will be within the zone where the construction activities have the potential to impact or potentially compromise the off-site feature. Such construction activities include, but are not limited to; grading, excavation, fill construction, trenching, stockpiling, pile driving, blasting (blasting requires a special permit), ground shaking from construction

vehicles or equipment, and structural loading. Off-site features include, but are not limited to, vegetation, landscaping and trees, buildings, fences, decks, walls, slabs and pavements.

  - Trees of any type that are 6-inches diameter at breast height (DBH) or more, and whose root zones extend into the site using the trees' canopy as the delineator of the root zone or are within 10 or less of the site boundary.
  - Natural Resource Sensitive areas.
  - Other features or areas designated by the City Engineer for evaluation.
  - Tax lot information for subject site and adjacent properties including tax lot number, lot area, and Township, Range and Section Numbers.

- Location, stationing and size of all proposed mains and service lines for storm drainage, sanitary sewer, and water. Stationing shall be in relationship to the street stationing at all manholes or other key locations.
- Match lines with stationing and sheet number references.
- Street centerline stationing to be noted at a minimum of 100-foot intervals and "tic" marks at 50-foot intervals.
- Top of curb elevations along curb returns at quarter-deltas, and at 100-foot stations.
- Location of the low points of street grades and curb returns, and the locations of catch basins and street inlets.
- Sidewalk dimensions and locations and sidewalk ramp dimensions and elevations. This shall include spot elevation at breaks in grade on ramps, locations by street stationing of transitions in locations or width, and dimensions and street stationing for driveways.
- Crown lines along portions of streets, transitioning from one typical section to another.
- Center line stationing of all intersecting streets.
- Location and description of existing survey monuments, including but not limited to section corners, quarter section corners, donation land claims corners, and Clackamas County benchmarks.
- Location of proposed street intersection monument boxes and other required surveying monuments shown on the plat.
- FEMA designated 100-year flood plains and flood ways, or areas of flooding during a 100-year storm event, wetland buffers and natural resource areas.
- Existing and proposed wetland areas, wetland mitigation areas, and storm water quality undisturbed corridors (buffer strips), drainage ways and swales.
- Legend showing line types and symbols used.
- Any additional information that the City, Water Environment Services (WES), Clackamas County Department of Transportation and Development (DTD), Clackamas County

Service District #5 (Street Lighting), Clackamas County Fire District #1, Sunrise Water Authority, or Clackamas River Water deem necessary.

d. Profile View

Profile views shall show the following:

- Orient the profile view in the same direction as the plan view. The profile shall be on the same plan sheet as the plan view and shall be located directly below the associated plan view.
- Stationing, elevations, vertical curve data (including curve k factors), and slopes for center of streets or gutterline. 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.
- Original ground along the centerline, and if necessary, at the edges of the right-of-way if grade differences are significant.
- Centerline, top of curb, and gutter flow lines of existing streets for a distance of at least 200-feet each way at intersections with proposed streets. For stub streets that may be extended in the future, the vertical alignment shall be designed for at least 200-feet beyond the scope of the proposed construction. At the discretion of the City Engineer, additional design information concerning the vertical and horizontal alignment of future street extensions may be required.
- The gutterline for all cul-de-sacs, eyebrows and reflecting quarter deltas, low and high points, vertical curve data, and extending 50-feet beyond the PC and PT.
- All proposed drainage facilities, all invert and top elevations, slopes, materials, bedding, and backfill.
- Existing drainage facilities, including off-site facilities, upstream and downstream that affect the design (i.e., downstream restrictions that back water on to project site). Base flood elevations shall be shown on the profile, if applicable.
- Profiles for ditch and creek flowlines shall extend a minimum of 200-feet beyond the project, both upstream and downstream. Typical cross sections at 50-foot intervals shall be submitted.
- Profiles for existing and proposed storm, sanitary, and water mains.
- All existing and proposed sanitary, water, storm lines and other utilities crossing the profile.

e. Pathways

A separate plan and profile view shall be provided for each pedestrian pathway or multi-use trail. Pedestrian pathways and multi-use trails shall be hard surface, unless they are in a Natural Resource Area. Pedestrian pathways and multi-use trails shall be designed in accordance with the *City's Trail Development Handbook* and *City's Standard Drawing 400*.

f. Curb Returns

Each curb return shall be individually designed and shall include a profile and plan view. See *Chapter 3, Section 14,* for more information.

3. SITE GRADING

a. Site Grading Plan

A Site Grading Plan is required for any project that requires a permit per *HVMC 15.12.030*. Existing and proposed grading contours shall be shown at a minimum of 2-foot intervals and shall extend a minimum of 200 feet off-site. The grading plan shall be prepared from recent ground surveys and shall show all existing and proposed surface drainage conveyances, natural resource sensitive areas, storm drainage collection structures, and all storm drainage outfalls. The grading plan shall note the source of the survey information, date of the field work, and the location of the original survey documents.

The limits of the proposed grading shall be clearly delineated on the grading plan. The grading plan shall require the installation of orange construction fencing at the grading limits. The grading plan shall be designed in conformance with the *HVMC Section 16.42.050 – Tree cutting and preservation*.

Setbacks from the development property line for the top of a cut slope or the toe of a fill slope shall be in accordance with *HVMC Section 15.12.100 - Setbacks*. Terracing for cut or fill slopes shall be in accordance with *HVMC Section 15.12.110 – Drainage and terracing*. Grading plans for areas where grading will be within 10 feet or less of the development property line shall include cross sections every 50 feet as necessary, with a minimum of three cross sections. These cross sections shall extend a minimum of 50 feet each side of the property line and shall show proposed and existing grades, structures, and utility facilities.

b. Erosion and Sediment Control Plan

An Erosion and Sediment Control (ESC) Plan is required for all projects that require a Site Grading Plan. The ESC Plan shall have all information noted in the previous section for the Site Grading Plan, as well as ESC measures for all necessary phases of construction. The City of Happy Valley has adopted the use of the latest Erosion Prevention and Sediment Control Manual from Clackamas County, Water Environment Services (WES) for assistance in determining the best management practices (BMP's) for the site.

The goal of the ESC Plan is to keep all sediment on the site. Preserving the natural vegetation as an erosion control method in addition to other BMP's is encouraged. Vegetated cover shall be maintained on slopes and/or reinforced through new plantings for stability and erosion control purposes. Vegetation shall not be stripped from any area outside of the grading limits.

Note: Experience has shown that once the fine clayey soils in the Happy Valley area become waterborne, they are not easily separated from water. Mechanical systems, such as Baker Tanks, are the most effective means of filtration for clay soils typical to Happy Valley.

The ESC Plan shall include all construction drawing information required by the Oregon Department of Environmental Quality (DEQ) NPDES 1200-C permit. A site-specific drainage plan for the temporary collection and treatment of surface water and ground water during the construction phase shall be included in the ESC plan.

c. Cement-Amended Action Plan

When a contractor or developer requests to use Cement-Treated Base (CTB) or Cement-Amended Soils on a project, they will be required to provide the City with a stormwater monitoring action plan for City review. If the Cement-Amending is proposed for use, the project geotechnical engineer shall be on site while the work is underway, inspecting the work and providing recommendations for the amount and depth of the cement or lime amendment.

Stormwater run-off over areas where Cement-Amending has recently been placed is much more likely to have increased pH levels, which poses an environmental risk to the surrounding ecosystems. To alleviate these concerns, the City of Happy Valley is requiring that an action plan be developed, and appropriate erosion and sediment control (ESC) Best Management Practices (BMPs) implemented prior to Cement-Amending on-site.

The action plan shall show how the permittee will ensure that stormwater discharge does not impact the adjacent environment. Off-site stormwater discharge must meet the following Water Quality standards:

- Turbidity: Below 10% above background turbidity, per DEQ
- pH: Between 6.5 and 8.5

Testing for these parameters must occur at minimum once a day during active stormwater discharge from the site until such time as the Cement-Amending has cured. All testing records and results shall be submitted to the City of Happy Valley on a weekly basis.

The submitted Action Plan shall have the following components:

- Sequencing Plan showing the approximate date(s) each area of the site will be cement-treated, this can be either in Excel format or visually represented on the site plan.
- Flow Control Plan demonstrating the flow path of run-off from Cement-Amended areas.
- Testing Plan to test collected storm water run-off from Cement-Amended areas, including testing schedule and testing location(s).
- Treatment Schedule to treat collected storm water run-off from Cement-Amended areas that do not meet the above Water Quality standards.
- Discharge Plan
    - Plan to dispose of storm run-off not meeting Water Quality standards, **OR**
    - Plan to discharge storm run-off meeting Water Quality standards post-treatment.

If the project has a 1200-C permit through DEQ, in addition to the City's Erosion Control Permit, the action plan shall meet all requirements of the 1200-C permit.

The action plan must be submitted for review and approval **prior** to using Cement-Amendments onsite. Failure to notify the City prior to Cement-Amending will be considered a violation of the City's permits and could result in Enforcement Action being taken.

Record the location of Cement-Amended Base or Cement-Amended Soils within the project. These locations shall be included in the project As-built Construction Plans.

4. TREE CUTTING AND PRESERVATION

Provide a Tree Removal and Protection Plan in accordance with *HVMC Section 16.42.050 – Tree cutting and preservation*.

The Tree Removal and Protection Plan shall identify each tree to be removed, protective fencing around trees or vegetation to be protected, and shall map proposed mitigation and erosion control measures. The plan shall also include the existing and proposed grades on the site.

5. GEOTECHNICAL REPORT

Many development sites in Happy Valley are on slopes, therefore a Geotechnical Report by a licensed registered engineer shall be included with the initial submittal of the construction plans. The Geotechnical Report shall include and make recommendations on the following items:

- Statement of understanding about the site development proposal.
- Site Preparation – clearing of vegetation and organic debris, removal of existing subsurface structures, depth of over-excavation, and critical points where inspection by the geotechnical engineer is required.
- Engineered Fills, Grading and Slope Steepness– preparation of existing ground prior to placing fill, benching and fill slope keyway requirements, sub-drain installations, compaction requirements for engineered fills, suitable fill materials, lift thickness, moisture content, finish fill and cut slope steepness, finishing of slope face, placement of topsoil on slopes, frequency of inspection and testing by the geotechnical engineer.
- Wet Weather Earthwork – imported fill materials for work in wet weather, on-site treatment of existing soils for use in fill construction, limiting work areas during wet weather, sealing ground surface to limit moisture exposure, and frequency of observation of excavation and fill placement by geotechnical engineer.
- Excavating Conditions and Utility Trenches – shoring or side slope needs for excavations, backfill lift thicknesses, and frequency of inspection and testing by the geotechnical engineer.

- Erosion Control Considerations – observation of soil types and their erosion potential, recommended methods to minimize erosion during construction.

- Foundations recommendations for specific lots, groundwater recommendations for specific lots, footing and wall drain recommendations, and seismic design recommendations.

6. NATIVE VEGETATION REPORT

A Native Vegetation Report may be required in areas where existing vegetation is proposed to be removed by development. The report shall be prepared in accordance with *HVMC Subsection 16.32.070.B.2.c.*

7. RETAINING WALLS

Retaining walls greater than four feet in height and walls less than four feet in height that experience a surcharge shall have a professional engineer or geotechnical engineer registered in the State of Oregon provide stamped design calculations and detail drawings required for the retaining wall construction. Wall height shall be measured from the "lowest adjoining finished grade" to the top of the wall. Surcharge is considered to be a slope greater than 5:1, a parking lot, driveway, street, or any similar feature.

The wall design shall take into consideration the proposed grading in front of the wall, the proposed slope behind the wall, the wall drainage system, and the required setbacks for any proposed structures near the wall.

Retaining wall detail drawings shall be provided in the construction plan set and shall include at a minimum; wall profile, the degree of wall batter, wall cross section at the highest point of the wall, wall reinforcing geotextile requirements, wall drainage systems, and wall backfill requirements.

Refer to *HVMC Section 16.50.100* regarding retaining wall design requirements, setbacks, screening and terracing. When a retaining wall crosses multiple lots, a wall easement or maintenance agreement recorded against the impacted lots will be required. Retaining wall maintenance is the responsibility of the Home Owners Association (HOA) or the property owner when the wall is located on a single lot.

Fencing or railing may be required on walls 30-inches or higher. Fencing shall be black, vinyl-coated chain link, stained cedar, or alternative fencing or railing approved by the City Engineer.

8. DETENTION/WATER QUALITY

Fencing around stormwater detention facilities shall be six-foot tall, black vinyl-coated chain link or the most current requirement of Clackamas County Service District No. 1.

Underground detention pipe systems are not allowed in the public right-of-way without approval from the Public Works Director.

9. LOT DRAINAGE DESIGN

Weep holes through the curb are not allowed in the City of Happy Valley.

For those lots that are located on the downhill side of the street, care must be taken with the design of the storm sewer system. If the roof drains, foundation drains, crawl space drains and wall drains for the proposed structure cannot be taken by gravity to the storm sewer system in the street, an additional storm system shall be placed at the rear of the lots to catch this storm water. The drains cannot be daylighted on lots. The storm system at the back of the lots shall be placed in an easement in accordance with Water Environment Services requirements.

It may be necessary to install french drains along the development boundaries to protect the downhill properties from surface water impacts caused by the development improvements.

10. UTILITY INSTALLATIONS

a. All public utilities associated with or adjacent to a subdivision, PUD, multi-family, land partition, road improvement, or nonresidential construction project, shall be placed underground. Franchise utility construction may be included in the Right-of-Way Permit for the development project. The Owner, or the Owner's representative, is responsible for coordinating with the individual utilities and for constructing improvements per the approved construction plans.

b. Utility lines, vaults and pedestals shall be placed in the 8' Public Utility Easement (PUE) behind the right-of-way and shall be joint trench whenever possible. An approved right-of-way permit is required for all installations.

c. On all phased (interim) road improvements, the necessary utilities shall be stubbed across the interim improvement to assure street cuts are not necessary when the road is expanded to its full width.

d. Underground utilities being constructed along existing paved streets shall not be located under the existing pavement unless approved by the City Engineer.

e. The minimum depth of utilities on improved roads shall be thirty (30) inches as measured from finished grade to top of utility. On unimproved roads, the minimum depth shall be forty (40) inches.

f. Service crossings shall maintain the same depth as the main pipeline or buried cable to a point two feet behind the curb or center of the road or ditch. In no case shall there be less than one foot of cover from the bottom of the curb or ditch to the top of the service line.

g. Utility maintenance work or new facility installations that will be installed under the pavement in existing rights-of-way must be bored rather than open cut. Utility vaults shall be placed outside of the pavement limits.

h. Street crossings shall be installed at a 90-degree angle to the public right-of-way.

i. Any bore pits that are required in the pavement for connection purposes must be T-cut in accordance with the *City's Standard Drawing 200*.

j. All excavations within the public right-of-way shall be backfilled with crushed rock in accordance with the *City's Standard Drawing 205*, except for excavations in collector or arterial facilities, which shall be backfilled with Control Density Fill (CDF) in accordance with the *City's Standard Drawing 210*. An alternative to CDF may be used per City Std. Dwg.

k. Temporary trench patches shall be made using hot mix asphalt.

l. Steel plates will not be allowed to cover excavations in the traveled way from November through April without express permission from the City Engineer. All excavations during these restricted months shall be backfilled and patched temporarily with hot mix asphalt until the final pavement restoration occurs. If CDF backfill is used during the months of restricted steel plate use, and a steel plate is required during cure time, the plate shall be recessed so that it does not stick up above the paved street surface. See *Chapter 6, Section 4.d,* for additional information.

m. The extent of pavement repair and restoration shall be determined by the City Engineer on a case-by-case basis. For example, if the utility excavation is within 5 feet of the existing edge of pavement or within 5 feet of an existing trench patch, the pavement removal and replacement will need to be extended to include these areas. Pavement seams are not allowed to be located within the wheel path of a vehicle lane. Adjacent areas of existing pavement distress will also need to be removed and replaced as determined by the City Engineer.

n. If utility work requires the removal of an existing sidewalk or driveway, the affected concrete panels will need to be replaced in their entirety.

o. Utility work is not allowed on weekends. In the event of an emergency, a testing firm must be present during backfilling operations to confirm that compaction of the backfill was performed in accordance with City specifications. If CDF backfill is required, a copy of the truck ticket from the delivery is required to be submitted in lieu of backfill compaction for emergency retroactive permits. If compaction testing, or a CDF truck ticket, is not available for submittal, additional excavation, testing, or pavement restoration may be required prior to permit closeout.

p. All abandoned utilities shall be removed from the right-of-way by the applicant/owner, unless the City Engineer allows the utilities to remain by permit. No exemptions shall be made for aerial network. Should the City have to remove any such utilities, a bill will be presented to the utility owner for the cost of removal.

11. SURVEY

a. General

This Manual, *Section 170* of the APWA specifications and ORS 209.140-155, define the requirements for protection of existing survey monuments during any construction and setting new survey monuments following construction.

b. Plats

The City Engineer will not approve or sign any partition, subdivision, or planned unit development (PUD) plat until the necessary public infrastructure to serve the proposed and affected existing lots has been installed. If 80% of the required public improvements are complete, and the developer has provided an acceptable performance guarantee to the City for 125% of the value of the incomplete work in accordance with *Municipal Code Section 16.63.080.B.2*, the plat may be signed. (Note that plat approval is not the same as building permit release. See *Chapter 1, Section 7* for building permit release.)

c. Existing Survey Monuments

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

In accordance with ORS 209.150, any person or public agency removing, disturbing, or destroying any survey monument of record in the office of the County Surveyor shall cause a registered Professional Land Surveyor to file a reference with the County Surveyor and replace the monument with 90 days of the removal, disturbance, or destruction. The registered professional Land Surveyor referencing and replacing the monument shall do so in the same manner that is provided for public land survey corners according to ORS 209.140 and shall notify the County Surveyor of that action within two business days. The costs of referencing and replacing the survey monument shall be paid by the person or public agency causing the removal, disturbance, or destruction. Failure to comply with this provision is subject to penalty according to ORS 209.990.

d. New Survey Monuments

Street Centerline Monumentation shall be in accordance with *ORS 92.060 Subsection (2) and/or 209.15 Section 2*. The centerlines of all street right-of-way shall be monumented before the City will accept a street improvement project. Monuments shall be set under the direction of a registered Professional Land Surveyor. A record of survey must then be filed in compliance with ORS 209.250 and any additional requirements set forth by the City or the County Surveyor.

All centerline monuments shall be placed in a monument box conforming to City standards and the top of the box shall be set at design finished grade. Monument boxes shall be of a type approved by the City before installation in accordance with the *City's Standard Drawing 170*. If monument boxes are installed after the pavement has been placed, a circular saw shall be used, and the void filled with concrete or approved equal material.

The following centerline monuments shall be set:

- At centerline intersections created with existing streets or new streets.
- The centers of all cul-de-sacs.
- Curve points in accordance with ORS 92.06 and 209.15.

All underground utilities shall be placed to not interfere with Centerline Monumentation.

e. New Survey Benchmarks

When permanent benchmarks are established the surveyor of record shall submit verification to certify how the benchmark was established and that it is accurate to the nearest 0.10 ft. The City will provide a bronze cap for the benchmark.

12. EASEMENTS

An 8-foot-wide permanent Public Utility Easement (PUE) shall be granted along all proposed and existing street frontages in new developments. In some cases, a permanent Sign, Slope, Public Utility and Sidewalk Easement may be required in lieu of the PUE.

The developer shall furnish all necessary utility easements in accordance with each utility company's requirements. Water easements are under the jurisdiction of the Sunrise Water Authority or Clackamas River Water. Storm and sanitary sewer easements are under the jurisdiction of Water Environment Services of Clackamas County.

Site distance easements shall be encompassed in a separate open space tract. See *Chapter 3, Section 4c*, for more information.

Private street, alley and public access easements shall be placed in dedicated tracts per *HVMC 16.12.030*.

13. PERMITS

The following permits must be obtained prior to beginning project construction:

a. Tree Removal Permit

A Type B Permit is required when trees are to be removed in conjunction with a subdivision, PUD, land partition or nonresidential construction project. The Type B Tree Removal Application is reviewed and approved through the City's Planning Division. The application is available on the City's website. The Tree Removal Application must be approved and issued by City staff prior to the removal of trees.

b. Site Development Permit

The Site Development Permit application provides the City with specific details about development and grading projects. The permit is available on the City's website. The application shall be submitted electronically per the online instructions. You will receive confirmation of submittal once all required items have been received. There are often multiple reviews required to ensure the application, plans, and other materials meet the City's requirements for permit issuance. The City will complete a review of the application, plans, and supplemental documents. Once the review is complete, the City will respond with

comments and a request for resubmittal or let you know the application is approved and what steps are required to begin construction.

The application will expire within 12 months from the date of submittal, or 120 days after the City's last communication with the applicant, whichever is longer. For example: The City responds to the initial application with a list of comments to be addressed. The applicant has 120 days from receipt of the City's comments to respond with a re-submittal. The City will review the re-submittal and respond with either: a) A request for a subsequent submittal; Or b) an approval and a list of next steps for permit issuance and construction. The applicant has 120 days from receipt of this second response from the City to resubmit or obtain the issued permit. The City Engineer may approve an extension to the 120 days if requested in writing by the applicant. Once the permit is issued, there will be an expiration date on the permit per the Development Guarantee Agreement.

c. Engineering Erosion Control Permit

The permit application is available on the City's website, and is required for any construction, grading or excavation work that disturbs more than 500 sf of ground. The application should include a site plan with proposed Erosion and Sediment Control (ESC) Best Management Practices (BMPs) located and detailed on the plan.

If the applicant is disturbing more than an acre of land, a DEQ 1200-C permit is required in addition to the City's ESC permit. The 1200-C permit must be applied for directly through DEQ. The city will not issue an ESC permit for projects that disturb more than an acre without first obtaining a copy of the approved 1200-C cover letter from DEQ.

d. Right-of-Way Permit

The Right-of-Way permit allows for the installation of improvements or utilities within the existing or proposed public right-of-way. The Right-of-Way permit is available on the City's website. The Right-of-Way permit must be reviewed and approved by City staff prior to the issuance of a permit and construction. Right-of-Way Permit applications not issued within four months from the time of submittal will expire.

When applying for a Right-of-Way permit, please keep in mind, per *Chapter 1, Section 2.c.*, the City has pavement cut moratoriums for recently paved streets. A map illustrating which streets currently have moratoriums on them may be found on the City's website.

e. Road Closure Permit

A Road Closure Permit is a type of Right-Of-Way permit required for any proposed road closure. A Road Closure Permit requires a minimum of four weeks' time to process due to additional notifications and City staff review. A begin and end date, along with a work-zone traffic control and detailed detour plan, is required for all proposed Road Closures. If the Road Closure is approved, a Temporary Traffic Order will be issued by the City. The Road Closure Permit is available on the City's website. The Road Closure permit must be reviewed and approved by City staff prior to any closure or roadway impacts.

f. Revocable Encroachment Permit

In general, private appurtenances are not allowed in public rights of way. If the location of a private object in the public right of way is unavoidable, a revocable encroachment permit may be approved by the City Engineer to address the encroachment and its liability. A Hold Harmless agreement will be required in conjunction with the Encroachment Permit. The permit application is available on the City's website and may be submitted electronically.

CHAPTER 3
STREET DESIGN

1. GENERAL REQUIREMENTS

a. Functional Classification

The functional classifications of existing and proposed streets in Happy Valley are established by the City's Transportation System Plan (TSP). The street cross section for each functional classification is set in the TSP, specifying the street width, right-of-way width, public utility easement width, number of travel lanes, the planter strip, sidewalk configuration, and bike lane requirements. City Standard Drawings 100 thru 145 reflect the TSP cross section requirements.

Collector Streets: There are multiple options for collector facility cross sections in the TSP that may be proposed through the land use application process. Collector cross sections with on-street parking may be considered on roadways located east of SE 162nd Avenue. On-street parking is not allowed within 100 feet of an intersection or where the posted speed limit is over 30 miles per hour. On street parking requires a minimum 8-foot-wide parking space between the bike lane and curb. A two-lane cross section may only be considered where environmental constraints are present to limit the impacts of the roadway, and where a center left turn lane is not required. Use of the two-lane collector cross section requires approval from the City Engineer.

b. Access Management

Access spacing standards are defined in the City's TSP. New development and roadway projects located on City street facilities shall meet the access spacing standards within the TSP. Access points include public streets, private streets, and private commercial or residential driveways. Block lengths shall be in accordance with *Municipal Code Subsection 16.50.030.B.9*.

The City Engineer shall have the authority to limit access and designate access locations on public streets under the jurisdiction of the City.

c. Structural Pavement Sections

Subgrade evaluation and recommendations shall be prepared by a professional engineer registered in the State of Oregon whose area of expertise is geotechnical engineering and shall be summarized in a geotechnical report. The geotechnical report shall address subgrade drainage and groundwater considerations for year-round conditions. Recommendations for both dry-weather and wet-weather construction shall be included.

The minimum design life for City streets is 25 years. *City's Standard Drawing No. 160* outlines the minimum pavement sections used in Happy Valley for each functional classification. Projected traffic loadings or poor soil conditions may require a special pavement design section. Asphalt pavement shall be designed using one of the

following nationally recognized procedures: the AASHTO method or the Asphalt Institute method.

Aggregate base shall meet *ODOT Specifications Section 00641* for dense-graded base aggregate. Base rock shall be compacted in accordance with ODOT Specifications.

Asphaltic concrete pavement (ACP) pavement shall be designed and constructed in accordance with *ODOT Specifications Section 00744*.

The top lift of asphalt concrete pavement shall be placed prior to the acceptance of the project.

Sawcut lines and pavement seams shall be sealed. Cold joints and overcuts shall be crack sealed with Crafco Roadsaver 534 or approved equal. Hot paved joints may be sand sealed at the time of paving with CRS-1 or CRS-2 emulsified asphalt or approved equivalent.

d. Design Speed

Design speed shall be as follows:

- Local and Neighborhood streets shall have a design speed of 25 miles per hour.
- Arterials and Collectors streets will have design speeds determined by the City's Traffic Engineer per ORS 810.180.

e. Subsurface Drainage

- If required by the geotechnical engineer, subsurface street drainage shall be an integral part of street design. Subsurface drains shall be designed and constructed to properly address the affected soil.
- If no subsurface drainage is required based on a soils report, a transverse perforated drainpipe may be required below the sub-base rock at the point of each sag vertical curve.
- The subsurface drains are for the purpose of collecting and conveying subsurface water only, not surface runoff. They are not to be considered part of the storm drainage system for storm drainpipe sizing purposes.
- Subsurface drains shall connect and drain into the storm drainage system at catch basins, curb inlets, gutter inlets, manholes or roadside ditches. Surcharge from the storm drainage system shall not be allowed to back up into the subsurface drains.
- Alternative subsurface drainage measures may be used if approved by the City Engineer.

f. Guardrails

The following specifies the minimum requirements for the location and type of guardrails:

- The decision of whether to install a guardrail or not shall be based on information found in the AASHTO publication, "*Guide for Selecting, Locating and Designing Traffic Barriers*".
- Guardrails shall be designed and constructed per ODOT's Standard Drawings for Design and Construction.

2. HORIZONTAL STREET ALIGNMENT

a. The layout of streets shall provide for the continuation of streets existing in adjoining partitions, subdivisions, planned unit developments or of their project alignments when adjoining property is not subdivided or partitioned.

b. The centerline alignment of street improvements shall be identical with the centerline of the right-of-way. The centerline of a proposed street extension shall be aligned with the existing street centerline.

c. Curb line radii shall be concentric with the right-of-way.

d. Horizontal curves shall meet the minimum radius requirements set by AASHTO *A Policy on Geometric Design of Highways and Streets*, latest edition, except as noted in e below.

e. The minimum centerline radius for street curves shall be as follows:

Arterials	Three hundred (300) feet
Collectors	Two hundred (200) feet
Neighborhood	One hundred (100) feet
Local Residential	One hundred (100) feet*

*90° turns may be used on very low volume local streets with the addition of an eyebrow as noted in *Section 5f* of this Chapter.

f. The length of the roadway transitions from a wider width to a narrower width shall be based upon the following:

$$L = \frac{WS^2}{60} \quad \text{for speeds less than 45 MPH}$$

Where L = minimum taper length (ft)
S = design speed (MPH)
W = offset (shift) width (ft)

Within bike lanes or shoulders, roadway width transitions shall have a minimum 10 (length) to 1 (offset) taper.

g. Roadway width transitions from a narrower width to a wider width shall be designed with a three to one taper.

h. Delineators, as approved by the City Engineer, may be installed to define the roadway width configuration. Maximum spacing of delineators shall be the numerical value of the design speed, in feet, i.e., thirty-five (35) foot spacing for thirty-five (35) mph.

i. In situations where a tapered transition cannot be provided, end of road markers shall be installed at the end of the wider section of the street and a taper shall be appointed and delineated as approved by the City Engineer. If the wider section does not provide an additional travel lane, only the end of road markers are required without the transition.

3. VERTICAL STREET ALIGNMENT

a. The construction plans shall include a design profile for all streets within the project. The profile shall conform to *Section 2d of Chapter 2*.

b. Minimum tangent street gradients shall be 1% along the crown and gutterline.

c. Maximum street gradients shall be 8% for arterial and collector streets, and 10% for neighborhood and local residential streets. Grades in excess of 10%, but not more than 12%, may be permitted on local residential streets for short distances and must be approved by the City Engineer on an individual basis.

d. Intersection landings shall conform to *Section 4e* of this Chapter.

e. Grade changes of more than 1% shall be accomplished with vertical curves.

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

g. Street grades, intersections, and super elevation transitions shall be designed to not allow concentrations of storm water to flow across the travel lanes.

h. Shed sections and offset crowns may be allowed and must be approved by the City Engineer on an individual basis.

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

j. Vertical curves shall be parabolic and conform to the values in Table 3-1 and are calculated as shown below:

$$K = \frac{L}{A}$$

Where A = algebraic difference in grades (percent)
L = length of vertical curve (feet)

Table 3-1
Design Controls for Stopping Sight Distance for Crest and Sag Vertical Curves

Design Speed (MPH)	K-Crest	K-Sag
15	3	10
20	7	17
25	12	26
30	19	37
35	29	49
40	44	64
45	61	79
50	84	96
55	114	115

K-values based upon AASHTO *A Policy on Geometric Design of Highways and Streets*, latest edition.
NOTE: K-sag values may be reduced if street lighting is present. AASHTO publication, *Policy on Geometric Design of Highways and Streets*, latest edition, shall serve as a guide

k. The minimum vertical curve length shall be fifty (50) feet.

l. K-Sag values may be reduced to K-Crest values if adequate street lighting is present along the entire sag vertical curve.

m. Streets intersected by streets not constructed to full urban standards shall be designed to match both present and future vertical alignments of the intersecting street. The requirements of this manual shall be met for both present and future conditions.

4. INTERSECTIONS

An intersection is defined as being the meeting of two streets having at least three legs.

a. The interior angle at intersecting streets shall be 90 degrees. Where intersecting streets cannot be kept at right angles due to existing development or topography, the interior angle shall not be less than 75 degrees. A tangent section shall be carried a minimum of 25 feet each side of intersecting right-of-way lines.

b. The centerlines of intersecting streets shall align with no offset.

c. Sight distance at intersections shall be per *Section 11* of this chapter. When a sight distance easement is needed at an intersection, an open space tract shall be dedicated, encompassing the required sight distance easement. Plantings or structures in the open space tract/sight distance easement shall conform to *Section 4d* of this Chapter.

d. A clear vision zone shall be provided at all intersections. The clear vision zone is defined as the triangular area beginning at the intersection of the projected right-of-way lines and extending 25 feet along each leg of the intersection. No fence, berm, wall, vehicle, hedge or other planting or structure shall be placed within the clear vision zone that would impede visibility between the height of 30 inches and 10 feet as measured from the top of curb, or in the absence of curb, from the established street centerline elevation. Poles, tree trunks, and similar objects less than 12 inches in width may be allowed in the clear vision zone if they meet the vertical requirements noted above.

e. At intersections, a landing shall be provided on the secondary or subordinate approach, or on a stop-controlled approach. The landing shall have a slope of 5 % or less for 50 feet. Landings are that portion of the traveled street that extend 50 feet beyond the projected curb line of the intersection street at full improvement. The landing shall incorporate a maximum 2% cross slope for pedestrian crossings at stop-controlled intersections.

f. Curb corners shall be designed so that the grade shall flow smoothly from one street to the other with proper attention directed to drainage.

g. Sidewalk curb ramps conforming to the Public Rights-of-Way Accessibility Guidelines (PROWAG) shall be provided at all corners of all intersections where crossing is permitted, regardless of curb type, and shall conform to *Section 13* of this Chapter and *City's Standard Drawings*.

h. Curb radii at intersections shall be as shown in Table 3-2 for the various function classifications with exceptions subject to approval by the City Engineer through a Design Exception Request. The right-of-way radii at intersections shall be sufficient to maintain at least the same right-of-way to curb spacing as the lower classified street.

Table 3-2
Minimum Turning Radii (feet)
Minimum radius along edge of pavement or curb

Functional Classification	Major Arterial	Minor Arterial	Collector	Neighborhood	Local
Major Arterial	35	35	30	25	25
Minor Arterial		35	30	25	25
Collector			25	25	25
Neighborhood				25	25
Local					25

If a bike lane or on-street parking exists, above radii may be reduced by five feet

5. CUL-DE-SACS, EYEBROWS, LOOP TURNAROUNDS

The following specifies the minimum requirements for cul-de-sacs, eyebrows, and loop turnaround areas. Other turnaround geometrics may be used when conditions warrant, and when the City Engineer and Clackamas Fire District #1 approve the design and application of its use:

a. Cul-de-sacs, eyebrows and other turnaround areas shall be allowed only on local or private streets. Cul-de-sacs shall not be more than 200 feet in length. Exceptions to the cul-de-sac length shall be in accordance with *Municipal Code Subsection 16.50.030.B.9.d*. The length of the cul-de-sac is measured along the centerline of the roadway from the nearside of the intersecting street to the farthest point of the cul-de-sac.

b. The maximum grade in a cul-de-sac, turnaround or eyebrow shall be 5 percent.

c. The minimum curb radius for the cul-de-sac bulb shall be 48-feet. The minimum curb radius for transition into cul-de-sac bulbs and eyebrows shall be 28-feet. 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.

d. Cul-de-sac and other turnaround areas shall have an 8-foot public utility easement extending outside the right-of-way around the cul-de-sac, continuously.

e. Provide pedestrian connectivity at the end of the cul-de-sac in accordance with *Municipal Code Subsection 16.50.030.B.9.d.iv*.

f. An eyebrow corner may be used on a local street when expected average daily traffic (ADT) counts will not exceed 400 vehicles. The minimum inside curb radius for an eyebrow shall be 28-feet. The minimum curb radius for the eyebrow shall be 40-feet. The minimum centerline radius for an eyebrow shall be 44-feet.

g. A “mini” cul-de-sac bulb radius may be proposed on a development during the land use application process if there are topographic or natural resource constraints on the land. Topographic constraints shall be limited to transition slopes (15-24.99%) or

conservation slopes (>25%). Natural resource constraints shall include wetlands or riparian corridors that exist on the land. The minimum curb radius on the “mini” cul-de-sac shall be 30-feet. An emergency turnaround, approved by the Fire District, shall be included in the “mini” cul-de-sac design and will require public access easements for any portion of the emergency turn around outside the cul-de-sac bulb. “Mini" cul-de-sac bulbs must be approved by the City Engineer through a Design Exception Request.

6. STUB STREETS AND HALF STREETS

a. Stub streets allow for future street extensions and shall be constructed to the development property line. A temporary all-weather turn-around shall be provided at the end of stub streets that exceed 150 feet in length. The turnaround shall be built to Clackamas Fire District #1 standards. Barricades or end of street markers shall be placed at the end of all stub streets in accordance with *City’s Standard Drawing 310 and/or 315*. Public stub streets that cannot be extended in the future are required to end in a cul-de-sac.

b. Half street and road widening designs require cross section data that illustrates the elevations at street centerline, sawcut line, and gutter line at 25 feet on center. Stations, offsets, and cross slopes shall be shown on the plans.

c. The minimum paved width for frontage improvements shall be 24-feet.

d. Cross slope grade breaks created by a new gutter line shall be provided for half street improvements. The maximum grade break between the existing and proposed cross slopes shall be 2 percent.

e. The minimum cross slope on the new half street shall be 2%. The maximum cross slope shall be 5%.

f. Cross sections shall be provided through existing driveways and shall include existing and proposed grades and slopes.

7. PRIVATE STREETS AND ALLEYS

a. Private streets within single-family residential developments shall be designed to provide access to no more than five dwelling units.

b. Private streets serving attached housing and multifamily housing developments shall provide commercial drives in conformance with *City’s Standard Drawing No. 275 or 280*.

c. The pavement section shall be capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds in accordance with the standards set by Clackamas Fire District #1 development codes.

d. The paved width, unobstructed clear zones and structural roadway section for private streets shall be in accordance with *City's Standard Drawing No. 120*.

e. The maximum grade for private streets shall be 12%.

f. Where existing grades are such that private streets must exceed 12% to provide access to a site, the developer shall submit a Design Exception Request for a variance to the City and Clackamas Fire District #1 for review and approval.

g. Gates for private streets or driveways shall meet the requirements of *Section 17* in this chapter of the Design Manual.

8. RAISED MEDIANS

a. The raised median shall be set back at least two feet from the median lane on both sides.

b. Raised medians within a cul-de-sac bulb shall require mountable curb and gutters on the outside of the radius for emergency vehicles.

c. Street lighting shall be sufficient to provide illumination of the raised median.

d. Objects, such as trees, shrubs, signs, light poles, etc., shall not physically or visually interfere with vehicle or pedestrian traffic in the travel-way.

e. The style and design of the raised median shall be site specific. The raised median designs and landscaping shall be subject to Planning Commission approval.

9. CURB AND SIDEWALKS

a. Curb and gutter shall be provided on both sides for all road classifications. Sidewalks shall be provided on both sides for all public roadways. Construction of curb and gutter and sidewalks shall be per the *City's Standard Drawings*.

b. The minimum grade for curb and gutter shall be 1%.

c. The minimum unobstructed width of the sidewalk is to be five feet in accordance with *Municipal Code Subsection 16.50.030.H.2.j*.

d. Sidewalks shall be separated from the curb as indicated in the TSP and standard details.

e. Sidewalk transverse slope shall match the roadway slope unless otherwise approved. Sidewalk cross slope shall be designed to 1.5%, sloping toward the road.

f. ***Sidewalk Trip Hazard*** – A sidewalk trip hazard exists if there is a vertical height difference between adjacent sidewalk panel sections. If the sidewalk is raised less than 2-inches, the concrete may be ground to remove the trip hazard in accordance with *City's Standard Drawing 255*. If the sidewalk is raised more than 2-inches, the panel should be removed and replaced to eliminate the trip hazard. Please contact the Engineering Division or visit our website for permitting information or to obtain information on additional alternatives when the sidewalk trip hazard is associated with tree root intrusion.

10. DRIVEWAYS

a. Driveways shall conform to *City's Standard Drawings*. Driveway drops shall be constructed by cutting the vertical curb. Curb removal for existing driveways shall be by sawcutting, removal, and replacement of the curb and gutter. Any over cuts in the pavement shall be crack sealed.

b. All driveways shall be paved with asphalt or concrete per *Municipal Code Subsection 16.41.030.B.3*. Any alternative to this shall be approved by the City Engineer.

c. One driveway per lot is the City standard. Design exceptions may be made, per the City's Driveway Policy, if approved by the City Engineer through a Design Exception Request.

d. Driveway access spacing shall be in accordance with the City's TSP.

e. Driveways shall meet the minimum intersection sight distance requirements. See *Section 11* in this chapter for additional information.

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

g. The maximum driveway grade for a single-family dwelling is 12% in accordance with Clackamas Fire District #1 standards. When fire sprinklers are installed, a maximum driveway grade of 15% may be allowed with the approval of the City Engineer and Clackamas Fire District #1. Grades greater than 12% will affect emergency response time.

h. The maximum width of a residential driveway throat shall be 35 feet as shown on *City's Standard Drawing 270*.

i. Provide a five-foot buffer from the edge of a driveway wing to a fire hydrant, street tree, and/or streetlight. An exception may be made in developments with 3000 sf lots, or less, on a case-by-case basis.

j. Gates for private streets or driveways shall meet the requirements of *Section 17* in this chapter of the Design Manual.

11. SIGHT DISTANCE

Sight distance at intersections shall meet the minimum requirements for intersection sight distance (ISD) set by AASHTO "*A Policy of Geometric Design of Highways and Streets*", latest edition, based upon the design speed.

No person shall place objects in the right-of-way or private property in such a way that they limit ISD. Adequate ISD should be provided at all existing intersections and shall be provided at all new intersections.

An applicant shall provide evidence that proposed improvements will not create situations where sight distance is made inadequate for other driveways, intersections, or other sections of roadway.

Intersection Sight Distance Measurements:

a. ISD shall be measured from a driver's eye height of 3.5 feet and 14.5 feet from the edge of the nearest travel lane (edge line, bike lane line or if neither exits, edge of pavement) to an object height of 3.5 feet above the roadway surface and measured along the center of a travel lane.

b. At the intersection of a local roadway and a private driveway serving up to two dwelling units, sight distance may be measured 10-ft from the edge of the nearest travel lane except where backing maneuvers are likely to occur.

c. Where a significant percentage of trucks will intersect a roadway, sight distance measurements may also dictate compliance with the truck sight distance measurements of AASHTO.

d. The following table gives general sight distance measurements for specific conditions and design speeds. Adjustments to the sight distance table for street grade, design vehicle, or other factors, with regard to ISD, shall be made per AASHTO guidelines.

Design Intersection Sight Distance, Left Turn from Stop

Design Speed (MPH)	Intersection Sight Distance for Passenger Cars (ft)
25	280
30	335
35	390
40	445
45	500
50	555
55	610

ISD based upon AASHTO A Policy on Geometric Design of Highways and Streets, latest edition.

NOTE: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane roadway with no median and minor street/driveway approach grades of 3 percent of less. For other conditions, the time gap should be adjusted, and the sight distance recalculated.

Access that doesn't comply with the above criteria is subject to denial, removal, or modification. Any intersection that does not meet AASHTO intersection sight distance will require a Design Exception Request for review by the City Engineer. The request may be found on the City's website.

12. TYPICAL CROSS SECTIONS

Grading outside the improved areas shall be 2% upward to the right-of-way line, 5:1 upward or downward within the public utility easement and no steeper than 2:1 up or down outside the public utility easement.

Cross-slope of streets shall be not less than 2% or greater than 5%. Wherever practicable, the crown of the street and top of curb shall have the same elevation.

13. PLANTER STRIP

The planter strip landscaping and street trees shall conform to *Municipal Code Section 16.42.040*. A landscape plan for the planter strip landscaping and street trees shall be included the construction plan set as noted in *Section 2b of Chapter 2*.

14. CURB RETURNS / ACCESSIBILITY

All curb returns, ramps, and landings shall be designed to meet the Public Rights of Way Accessibility Guidelines (PROWAG). If existing conditions prevent the adherence to PROWAG, a Design Exception Request may be submitted to Engineering for consideration. The applicant's engineer shall demonstrate why a design exception is required.

Because of the steep topography in Happy Valley, an individual curb return design shall be included in the plan set for each curb return. Provide a profile of the curb return that extends 50

feet beyond the PC/PT of the curb return. Provide a plan view of each curb return with spot elevations and sidewalk slopes at the PC/PT, landing, and ramps

Landings and turning spaces shall have a maximum design grade of 1.5% slope in all directions. The maximum design grade for ramps shall be 7.5% percent. The minimum grade is 1%. All grades shall slope toward the street. Yellow truncated domes are to be installed in the throat of the ramp. The gutter slope across the ramp throat shall be designed at 1% minimum and 1.5% maximum design slope.

Curb ramps shall conform to *City's Standard Drawing No. 245*. Alternatively, ODOT's RD700 drawings may be used instead.

15. MT. SCOTT/SCOUTERS MOUNTAIN (MSSM) REGIONAL TRAIL

The Mount Scott/Scouters Mountain (MSSM) Trail Loop is planned to be a non-motorized, multi-use trail system that will link numerous schools, parks, local trails and businesses in the Clackamas County, Happy Valley and southern Portland area. A link to the final trail alignment can be found on the City's website. Due to topographic constraints, achieving accessibility throughout the system may not be feasible in many locations. The multi-use trail within the City of Happy Valley shall be hard-surfaced, 10'-12' wide, and designed in accordance with *City's Standard Drawing 400*. Bridges shall be 8' wide and designed by a professional engineer registered in the State of Oregon.

16. CATCH BASINS

Streets with bike lanes shall have curb inlets or combination inlets to eliminate or minimize the grate located in the bike lane. Catch basins shall be spaced per WES requirements and at all sag points in vertical curves. Catch basins shall be placed on the upstream side of curb ramps. Catch basin placement in a driveway approach should be avoided when possible. If unavoidable, the catch basin shall be modified per the City's Standard Drawing, *Retrofit of Inlet at Driveway*.

17. NO PARKING ZONES

No Parking Zones shall be signed. In addition, the curb shall be painted yellow on public streets, and painted red on private streets unless an exception is made by the City Engineer. Vehicles parked in No Parking Zones and No Parking Fire Zones may be ticketed or towed. Enforcement of No Parking Zones on private streets shall be the responsibility of the HOA and shall be included in the development's CC&R's.

18. GATES

Gates are not permitted in the public right of way, except in cases of rare exception. Any gates placed in the public right of way shall be with the approval of the City Engineer, shall meet all Fire District Requirements, and will require a Revocable Encroachment Permit.

All Gates located on public roads, private streets, or access driveways shall meet the requirements found in Clackamas Fire District #1 Oregon Fire Code Applications Guide and shall be approved by CFD#1.

Installation of a gate on any roadway or access driveway connected to the public right of way or a public access easement, shall be permitted through Engineering.

Swing gates shall swing inward and not toward the intersecting roadway.

CHAPTER 4
ROUNDABOUT DESIGN GUIDELINES AND STANDARDS

1. GENERAL

The standards below represent the City of Happy Valley's guidelines for roundabout (RAB) evaluation and design. These standards formalize the City's practice on the preference for the design and construction of RABs. The City has developed these standards to achieve uniformity and consistency for RABs within the city. These specific design elements supplement the criteria and framework of RAB design found in many official publications through the National Cooperative Highway Research Program (NCHRP), Federal Highway Administration, Transportation Research Board, and the state of Oregon.

2. DESIGN AND APPROVAL

a. Reference Documents

All RABs designed and constructed in the City shall be consistent with the latest editions of all national, state, and local standards that pertain to roadway and intersection design. The City standards shall take precedence, followed by Clackamas County Roadway Standards. Reference documents that are suggested for review include, but are not limited to, the following:

- City of Happy Valley Engineering Design and Standard Details Manual
- Happy Valley Municipal Code (HVMC)
- Clackamas County Roadway Standards
- A Policy on Geometric Design of Highways and Streets (AASHTO)
- Oregon Department of Transportation (ODOT) Highway Design Manual (HDM)
- Highway Capacity Manual (HCM)
- NCHRP Report 572: Roundabouts in the United States
- NCHRP Report 672: Roundabouts: An Informational Guide
- Manual on Uniform Traffic Control Devices (MUTCD)

b. Plan Approval

The design of a RAB shall be accompanied by a traffic analysis that includes a.m. and p.m. peak hour turning movement counts for existing conditions and future year vehicle turning movement projections, consistent with the City's Transportation System Plan (TSP). A capacity analysis shall be performed for existing and projected traffic volumes identifying an acceptable level of service (LOS). City Policy 5a establishes minimum intersection operating standards to be maintained for the City of Happy Valley. All RAB intersections shall operate at LOS D or better during the peak hours of analysis. Each approach must meet LOS E and a volume-to-capacity (V/C) ratio of 0.85 or better based upon HCM methodology or another

methodology approved by the City. The capacity analysis shall follow the models presented in NCHRP Report 572 or the HCM.

Methods given in NCHRP Report 672 or another preapproved reference document shall be used to develop a figure that describes the fastest paths for all turning movements for each approach leg to the RAB in which a passenger vehicle can navigate the proposed curves (Figure 4.1). The maximum entering design speed shall be 15 to 20 mph for a mini-RAB, 20 to 25 mph for a single-lane RAB, and 25 to 30 mph for a double-lane RAB (Table 4.2). Use Section 6.7.1 of NCHRP Report 672 to determine the vehicle speed for the fastest path.

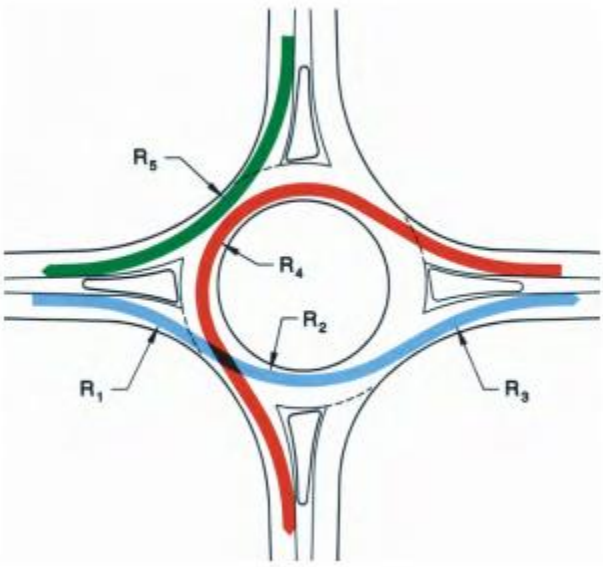

Figure 4.1. Vehicle path radii

c. Design Vehicle

The design vehicle will be chosen by the City based upon the RAB size, the location of the RAB, the roadway functional classification, the surrounding land uses, and the types of vehicles likely to use the RAB. Vehicles larger than the design vehicle are accommodated as necessary. The types of vehicles expected to use the roundabout (no matter how infrequent) needs to be considered. Table 4.1 shows the design vehicle for the roadway functional classification.

Table 4.1. Design Vehicle per Road Classification

Roadway Functional Classification	Design Vehicle (Permitted On Truck Apron)	Design Vehicle (Prohibited On Truck Apron)
Arterial	AASHTO WB-67	City Bus/Fire Truck
Collector	AASHTO WB-67	City Bus/Fire Truck
Local	AASHTO WB-50	City Bus/Fire Truck

3. GEOMETRIC DESIGN

RAB systems typically use the following design vehicle criteria; mini-RABS (AASHTO SU-40 or a city-bus); single-lane use (AASHTO WB-50), and double-lane use (AASHTO WB-67).

a. Inscribed Circle Diameter

The inscribed circle diameter shall be designed to accommodate the design vehicle, specified number of lanes, and the maximum entry and circulating speeds. The diameter shall be chosen to be the smallest diameter to accommodate the aforementioned and minimize excessive speeds. Landscaping for the central island is discussed in section 6.0. Table 4.2 lists typical inscribed circle diameters.

Table 4.2. RAB Category Characteristics

Roundabout Geometry	Inscribed Circle Diameter (feet)	Max. Entering Design Speed (mph)	Daily Service Volume (vehicles/day)
Mini	45 - 90	15 - 20	15,000 (max.)
Single-Lane	90 - 180	20 - 25	Up to 25,000
Double-Lane	150 - 220	25 - 30	Up to 45,000

b. Deflection

The design of RABs shall encompass three types of deflection: entry, exit, and central island. These types of deflection are paramount in the design of RABs to ensure speeds are kept within the desirable range, path overlap is minimized, proper circulation is achieved, and all design vehicles can be accommodated. The ODOT HDM intersection chapter on modern RABs and NCHRP 672 outline the procedures for determining the operating speed for the types of deflection.

c. Approach Alignments

Approach alignments should intersect the center of the inscribed circle as best as possible. A slight offset to the left of the inscribe circle diameter is permissible to achieve the desired entry speed. Offset right approaches are not permitted because of their most likely effect of increasing entry speeds. No more than five approaches are allowed to each RAB. Each approach alignment should be targeted as best as possible to intersect other approach alignments at 90 degrees.

d. Approach Size

Entry width and radii are vital to the performance of RABs. The target design width at entry should be 16 feet per lane but should not exceed 20 feet per lane. double-lane approaches shall not exceed 32 feet in width. The radius of the entry shall be designed to control the fastest path speed while accommodating the design vehicle without overlap into the adjacent lane (if two lanes). Typically, a compound curve is used at the entry to control the entry speed while accommodating the design vehicle. It is suggested that the first geometry design trial use a small radius curve between 60 and 120 feet followed by a larger curve (approximately 150 feet).

Exit widths shall be based upon the design vehicle movement and gradually taper to the normal road width. The radius of the exit is usually larger than the entry radius to promote acceleration to the road's posted speed. However, design of this radius shall consider pedestrian crossing safety. Typical exit radii range from 50 to 800 feet for single-lane RABs and 200 to 1,000 feet for double-lane RABs.

e. Splitter Islands

Splitter islands are to be designed to aid in the control of entry and exit speeds and provide pedestrian crossing landings. The minimum length of each splitter island is 20 feet. The varying width of the splitter islands will be dependent upon the approach leg geometry, but the crosswalk landing within the splitter island shall be a minimum width of 10 feet and 6 feet in length (as measured in the direction of pedestrian traffic) and shall meet Public Right-of-Way Accessibility Guidelines (PROWAG). The minimum total length of the splitter islands and crosswalk is 50 feet (see Figure 4.2 for further details). Landscaping for splitter islands are discussed in *Section 6.0*.

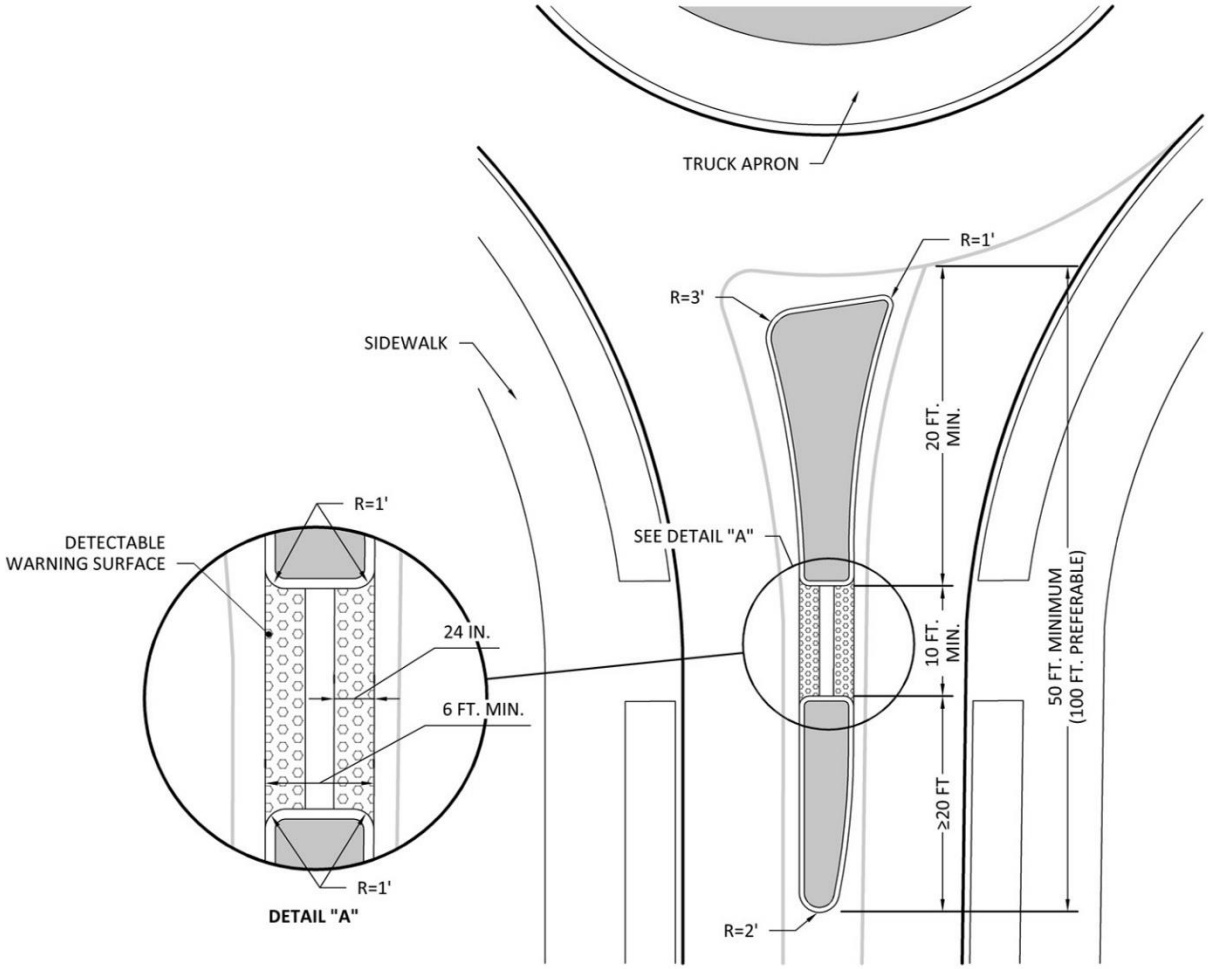

Figure 4.2. Splitter island

f. Circulatory Road

The circulatory road pavement shall be constructed of asphalt concrete. The pavement structural section (thickness) shall be designed for a 25-year life cycle, as determined by a pavement design analysis for a RAB. This will likely result in a thicker than the normal road section. The typical circulatory road width shall match the entry width (typically 2 feet wider than the normal road width). Table 4.3 lists the range of the roadway width standards for single- and double-lane RABs.

Table 4.3. Circulatory Road Width

Roundabout Geometry	Width (feet)
Single-Lane	16 – 20
Double-Lane	28 - 32

Path overlap on the circulatory road is permissible for a double-lane RAB for large design vehicles (WB-62 and WB-67) to assist in minimizing a large inscribed circle diameter. All other vehicles are required to remain in the same lane. Entry and exit paths are prohibited from vehicle overlap. Each approach to the RAB shall be tested for path overlap. If there is a path conflict at the entry or exit, then a larger radius curve, wider lane width, compound curve, or tangent section shall be used on the approach.

The truck apron inside of the circulatory road shall be portland cement-based, stamped concrete with a width ranging from 5 to 10 feet. The concrete section shall be designed for a 30-year life cycle (minimum) as determined by a pavement design analysis. The precise width shall be determined by the turning movement analysis of the design vehicle and the specific RAB geometry. A 2 percent cross slope down from the central island shall be used within the truck apron. The City's mountable curb and gutter engineering detail shall be used between the truck apron and the circulatory road. At the back edge of the truck apron, a vertical curb shall be placed per the City's vertical curb engineering detail.

g. Clear Zone and Sight Distance

Clear zone and sight distance should follow the procedures set forth in A Policy on Geometric Design of Highways and Streets and The Roadside Design Guide (AASHTO). All approaches to the RAB and the circulatory road shall be investigated for adequate stopping sight distance and intersection sight distance. Sight distance shall be checked by assuming the driver's line of sight at 3.5 feet above the roadway to an object height of 2 feet above surface grade for stopping sight distance at every point within the roundabout and on each entering and exiting approach. Sight distance shall be checked from the driver's line of sight at 3.5 feet above the roadway to an object height of 3.5 feet above surface grade for intersection sight distance from each entrance to the roundabout to vehicles within the circulatory roadway and to vehicles entering immediately upstream of the driver. NCHRP Report 672 provides the information and equations for sight distance. Refer to Figures 4.3 through 4.6 for sight distance requirements. Landscaping shall correspond to the sight distance triangles for each RAB. Refer to section 6.0 for coordination on vegetation type.

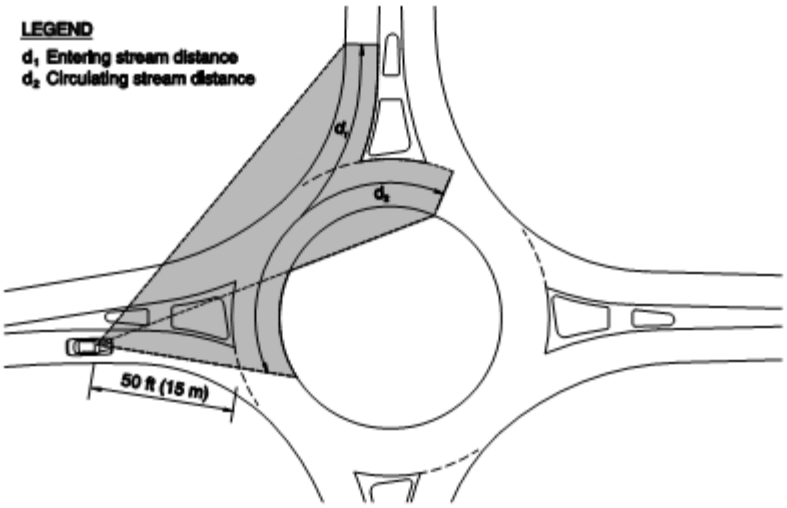

Figure 4.3. Intersection sight distance (courtesy NCHRP Report 672)

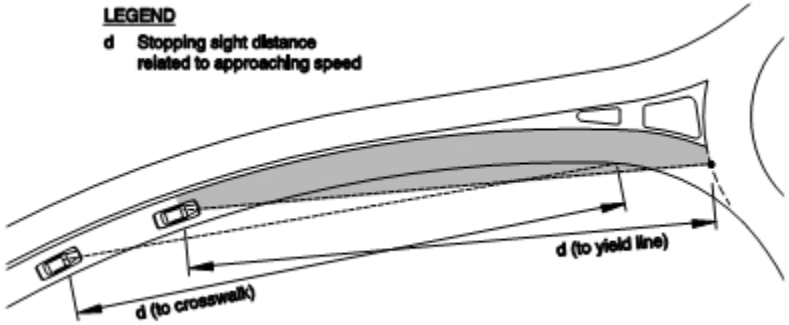

Figure 4.4. Stopping sight distance on approach (courtesy NCHRP Report 672)

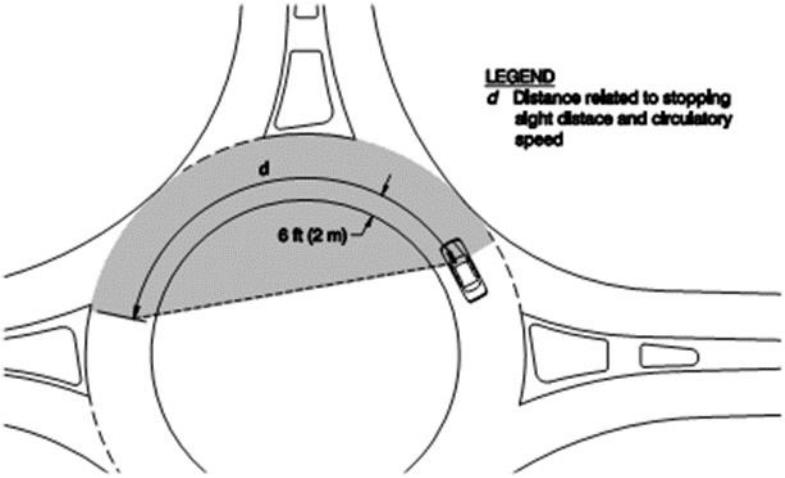

Figure 4.5. Stopping sight distance on circulatory roadway (courtesy NCHRP Report 672)

Figure 4.6. Sight distance to crosswalk exit (courtesy NCHRP Report 672)

4. BICYCLE AND PEDESTRIAN USE

a. Sidewalks

All sidewalks shall be constructed to meet PROWAG and accessibility standards. Sidewalk width along approaches shall match the standard width of the road functional classification outlined in the City's TSP. Sidewalk width shall be 10 feet between bicycle slip ramps, where the sidewalk is shared between pedestrians and bicycles. A minimum 4.5-foot landscape buffer shall be provided between the sidewalk and RAB. Sidewalks shall be designed and constructed per the City's standard for sidewalks.

b. Crosswalks

Crosswalks shall be accompanied by ADA-compliant ramps and provided across all RAB approaches. The crosswalk shall be perpendicular to the approach centerline to produce a straight path across the approach. The minimum crosswalk landing within the approach splitter island shall be 6 feet by 10 feet (Figure 4.2). The minimum setback from the circulatory roadway shall be 20 feet. A detectable warning surface shall be placed on each side of entry to the landing within the approach splitter island. The landing is to be level to the roadway and not ramped. The pedestrian crosswalk striping shall be per the City's standard.

c. Bicycle Lanes

RABs shall accommodate bicycles on roadways that provide a bicycle lane. The bicycle lane shall end along the approach to the RAB, and a bicycle slip ramp at an angle between 35 to 45 degrees shall be provided to direct the bicyclist onto the sidewalk. At exits, the bicycle slip ramp angle may be as small as 20 degrees and shall be placed after the crosswalk.

5. STRIPING AND SIGNAGE

a. Striping

RAB striping shall follow the City's engineering design details and conform to the latest edition of the MUTCD. All pavement markings shall be thermoplastic. A 4-inch-wide dotted pavement marking shall delineate the circulatory roadway at all entries. Supplemental yellow edge lines shall be used along the edge of the splitter islands.

All other striping shall follow the suggested guidance of the current edition of the MUTCD.

b. Signage

All RAB signage shall conform to the latest edition of the MUTCD. The following are the minimum requirements for signage.

- Advanced RAB warning signs (W2-6) with cross street names are required on all approaches to RABs.
- At the beginning of each approach to the splitter islands (approach tip) a Keep Right (R4-7) with a Type 3 Object Maker (OM3-L) below shall be installed.
- Yield signs (R1-2) shall be placed on the right side of the approach for single-lane RABs before the entry to the circulatory roadway. Yield signs shall be placed on the right side and in the splitter island of the approach for double-lane RABs before entry to the circulatory roadway. Where there is inadequate line of sight on the approach to see the Yield sign, a YIELD pavement marking will be required in addition to the sign.
- RAB directional arrow signs (R6-4 series) shall be used in the central island. Each approach leg shall be accompanied by a R6-4 sign. Mini-RABs may be exempt from the R6-4 signs.

All other signage shall follow the suggested guidance of the current edition of the MUTCD.

6. LANDSCAPE STANDARDS

The following landscape standards are provided to create consistent and visually appealing RABs throughout the City. These standards are specific to RABs and supplement the landscaping and design standards provided in the HVMC. Nothing in the standards below are intended to replace street tree or roadway landscaping requirements found in other code sections. RABs are often located at entrances or gateways to a City, and it is important to have aesthetic treatments that will provide visual interest, continuity, and consistent character. While continuity in character is desired, specific standards differ depending on the RAB size. This landscape standard section provides landscaping and hardscaping requirements for mini-RABs and single- and double-lane RABs. The landscape standards are the same for the single- and double-lane RABs, and the discussion of these features has been combined below. Landscaping is to comply with the landscape zone requirements included in *Section 6.8*.

a. Roundabout Landscape General Provisions

RAB areas not designated for vehicular or pedestrian circulation shall be landscaped with plants, decorative hardscape paving, or a combination of landscape and hardscape treatments. Plantings shall only be use in areas with a minimum width of 18 inches to maintain plant health. The primary landscape/hardscape areas shall include the center island of the RAB, the splitter islands at the approaches, and the perimeter landscape areas between the curb and back of right of way around the perimeter of the RAB. Depending on the RAB size, the landscape requirements shall be as shown in Tables 4.4 through 4.6 below. Landscape requirements are detailed below and shall be installed per HVMC 16.42.030.

RAB Landscape will be designed with the following planting targets.

- Evergreen plants are to be used for 60% +/- of the landscape area.
- Perennials, herbaceous, and non-woody plants are to be used primarily as accent plantings and not exceed 20% +/- of total landscape area.
- Ornamental grasses are not to exceed 25% +/- of the landscape area.
- Groundcover plants are to be sized and spaced to provide full coverage after 2 seasons in accordance with HVMC 16.42.030.

Planting targets are intended to provide an attractive landscape year-round when deciduous plants, perennials, and grasses are generally dormant. RAB landscape designs are to be reviewed by a landscape maintenance contractor or city maintenance personal familiar with these RAB standards (see example planting plan Figure 4.7.)

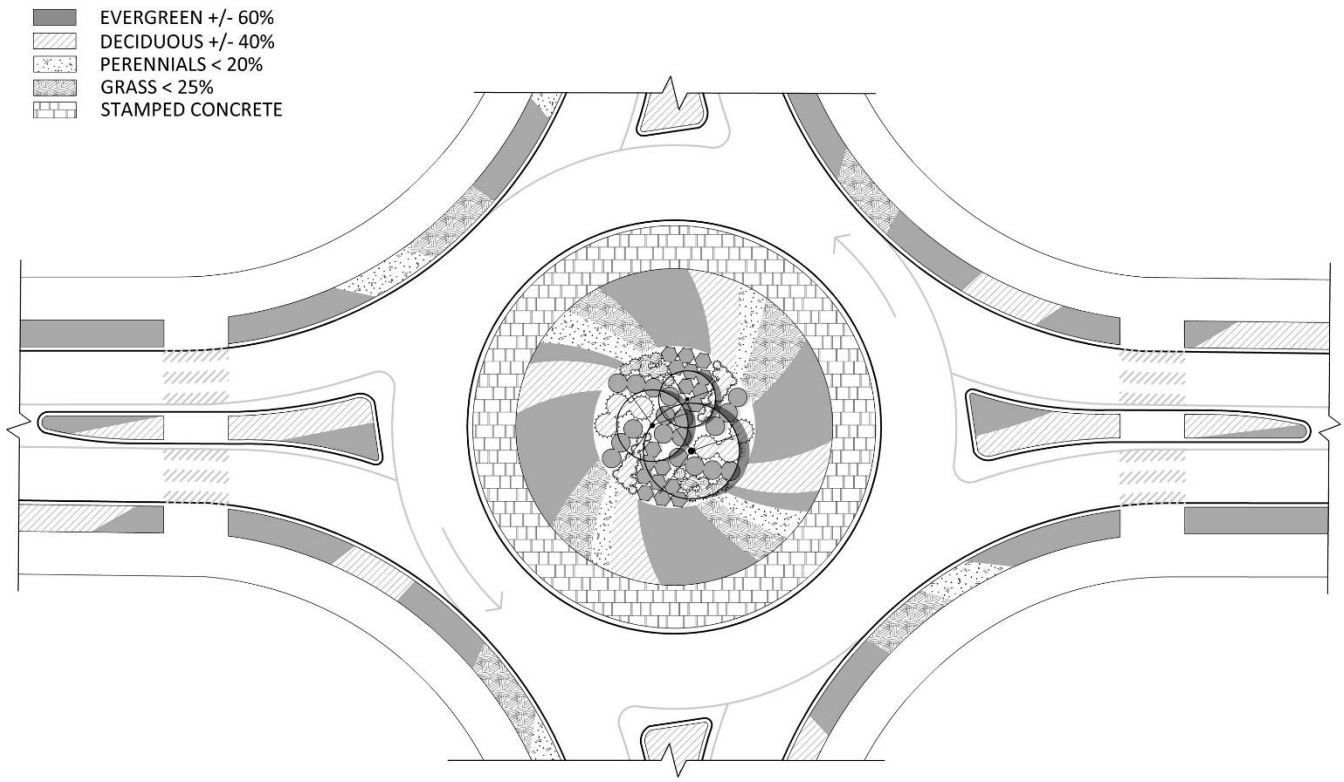

Figure 4.7. Example planting plan

b. Hardscape Areas

Hardscape used in RABs shall consist of stamped concrete paving or other approved decorative hardscape material. Decorative hardscapes within vehicular circulation areas shall be engineered to accommodate vehicle loading. Refer to section 3.6 for engineering requirements.

c. Irrigation

Irrigation for planted areas is required in the center island and the perimeter areas. Irrigation shall be permanent, underground irrigation designed to provide 100 percent landscape coverage to establish and sustain RAB plantings. Alternatively, a xeriscape landscape plan can be used in lieu of permanent irrigation. Xeriscaping is defined as a landscape that requires no irrigation, and can consist of drought-tolerant plants, decorative rockery, and gravels. A xeriscape design may be submitted for review and approval by the Planning Official and/or Design Review Board.

d. Public Art

Integration of public art is encouraged and required in the development of single- and double-lane RABs. The City of Happy Valley Public Art Committee advises the City in the creation,

development, and implementation of public art. Proposed art within RABs shall be reviewed and approved by the committee.

e. Wayfinding and Signs

Wayfinding signs welcome visitors to the city and help visitors and residents navigate the city and find desired destinations. Wayfinding signs may be required in the development of RABs.

f. Mini-Roundabout Standards

Given the size of a mini-RAB and the need for the center island to be fully mountable to accommodate truck turning movements, plant material is not appropriate. To achieve visual appeal, mini-RABs shall incorporate specialty hardscape paving within the center island, full perimeter (planter strip) landscaping, groundcover, xeriscape, or specialty paving on all splitter islands (Figure 4.8). Required mini roundabout design features are identified in Table 4.4.

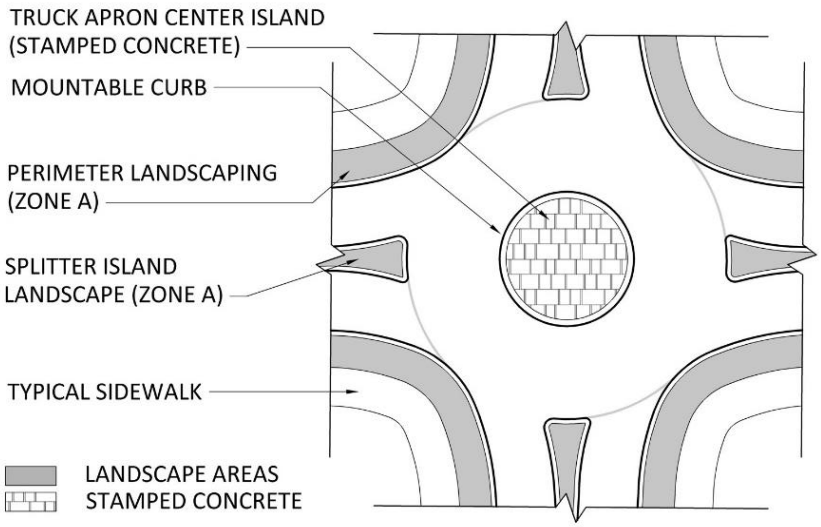

Figure 4.8. Mini Roundabout Design Features

Table 4.4. Mini Roundabout Design Features

Design Features	Requirement
Hardscape Required	Splitter Island: yes, stamped concrete (where landscaping is not provided) Truck Apron: yes, stamped concrete (where landscaping is not provided)
Center Island Landscaping	Specialty paving (Zone A)
Center Island Irrigation	No
Splitter Island Landscaping	Groundcover/Xeriscape (Zone A)
Splitter Island Irrigation	No
Perimeter Landscaping	Groundcover/low shrubs (Zone A)
Perimeter Irrigation Available	Yes
Public Art Required	No
Landscape Lighting Required	No
Wayfinding Signage	Optional

g. Single- and Double-Lane Roundabouts Standards

Single- and double-lane RABs shall have fully landscaped center islands that meet the clear zone and site distance landscaping requirement in section 6.h. Fully landscaped means 100 percent of the available planting area shall be landscaped with a combination of trees, shrubs, or evergreen groundcover. Public art shall be incorporated, and a diversity of plant material included to create visual interest throughout the year. Required single- and double-lane roundabout landscape features are included in Table 4.5.

Table 4.5. Single- and Double-Lane Roundabout Design Features

Design Feature	Requirement
Hardscape Required	Splitter Island: yes, stamped concrete (where landscaping is not provided) Truck Apron: yes, stamped concrete (where landscaping is not provided)
Signalized Pedestrian Crossing	Depends on location (requirement will be determined in consultation with the City's engineer)
Center Island Landscaping	Fully landscaped (Zone B and C)
Center Island Irrigation	Yes
Splitter Island Landscaping	Groundcover/Xeriscape (Zone A)
Splitter Island Irrigation	No
Perimeter Landscaping	Groundcover/low shrubs (Zone A)
Perimeter Irrigation	Yes
Public Art Required	Yes
Landscape Lighting Required	Yes (Center Island)
Wayfinding Signage	Optional

h. Landscape Zones

To ensure that landscaping meets the clear zone and site distance requirements included in section 3.g., all single- and double-lane RABs shall comply with the landscape zones identified in Figure 4.9. This figure illustrates the design intent of the landscape standards. The spatial requirements for each landscape zone shall be consistent with the site-specific sight distance analysis, street geometry, and other roadway design considerations.

As noted in section 6.g., only Zone A landscape materials are allowed in the center island of mini-RABs, as the center island is fully mountable. Single- and double-lane roundabout landscape zone requirements are described below. The maximum heights for plantings and landscape features are included in Table 4.6.

Table 4.6. Maximum Landscape Heights

Landscape Zone	Maximum Landscape Height
Zone A	12 inches and under
Zone B	24 inches and under
Zone C	Over 24 inches

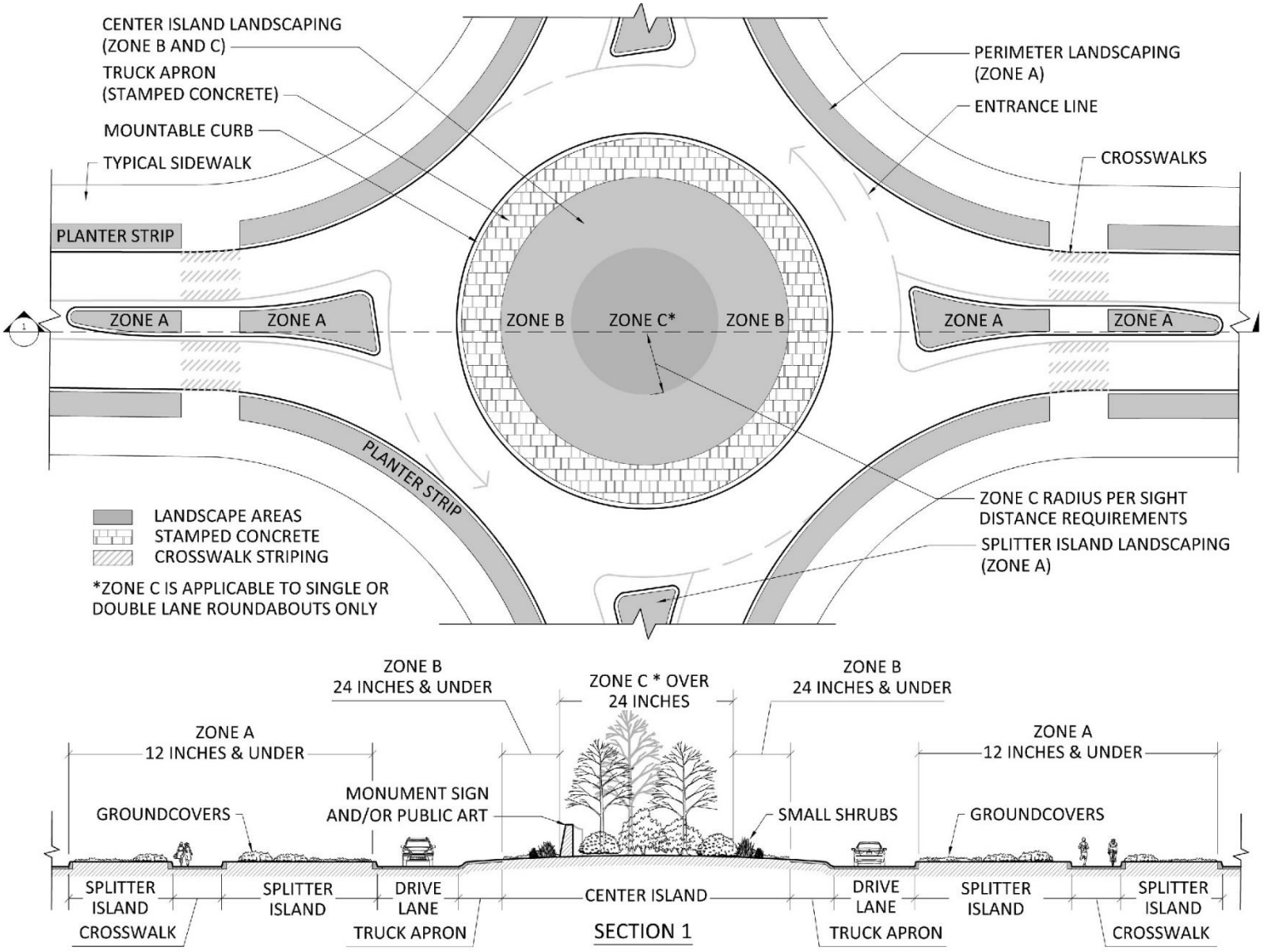

Figure 4.9. Landscape zones

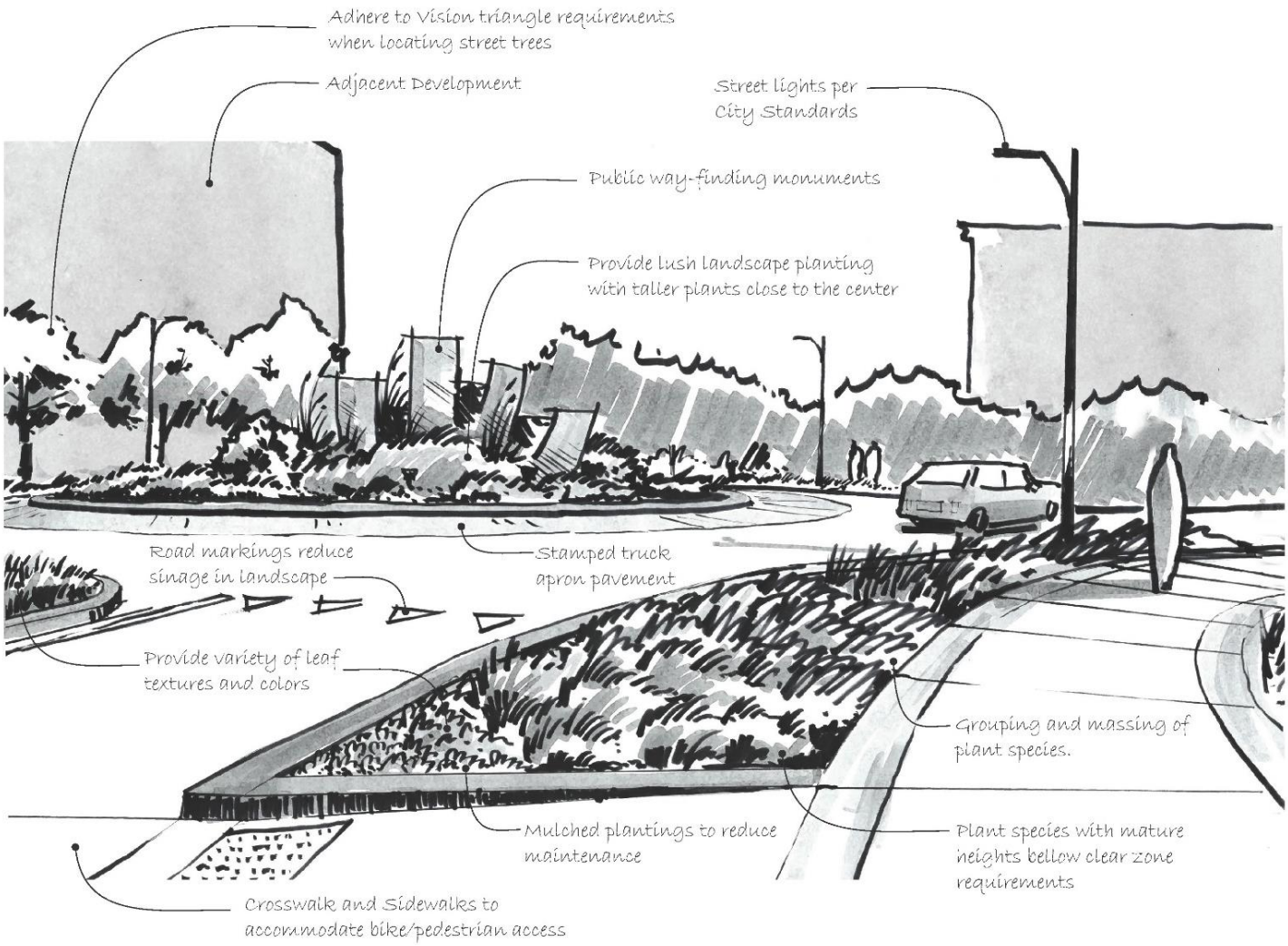

Figure 4.10. Roundabout character

i. Plant List

A suggested plant list has been established for the three landscape zones found in the RABs. Happy Valley promotes the use of native and adapted plants that are appropriate for local and site-specific growing conditions and the designer is encouraged to use native and drought tolerant species. The plant species listed are specific to RABs, and their use is encouraged to build a cohesive look throughout the city while allowing for variety. To foster creativity and flexibility plants not found on the RAB list may be added to designs during the submittal process and are subject to reviewed by the Planning Official. Plants found to be successfully in the City's median plantings can also be added. The Happy Valley native plant list included in the *Municipal Code* (Appendix A of Title 16 Land Development Code) is specific to the City's Habitat Conservation Areas though appropriate plants on this list may be considered in the design of RABs. This habitat conservation list also details nuisance and prohibited plants that may not be used.

All plant material shall meet the landscape height standards outlined above and per *Municipal Code Subsection 16.42.030*. Street trees and planter strips are required per *Municipal Code Subsection 16.42.040*. All plants require proper siting based on sun exposure, wind, and other microclimate conditions, and not all species on the list will succeed in every condition.

Table 4.7. Zone A and Zone B Plant List

Botanical Name	Common Name	Plant Height
Arctostaphylos uva-ursi `Vancouver Jade`	Vancouver Jade bearberry	< 6"
Arctostaphylos uva ruse 'Emerald Carpet'	Emerald Carpet bearberry	12 - 18”
Ceanothus gloriosus	Point Reyes creeper	6 - 18"
Ceratostigma plumbaginoides	Plumbago	6 - 12”
Cotoneaster salicifolius ‘Repens’	Spreading willowleaf cotoneaster	12 - 18”
Dianthus plumarius ‘Rose De Mai’	Rose De Mai dianthus	12 - 18”
Echinacea purpurea `Alba`	White coneflower	6 - 18"
Epimedium X versicolor 'Sulfureum'	Bishop’s hat	8 - 12”
Festuca glauca ‘Elijah Blue’	Elijah blue fescue	8 - 12”
Fragaria chiloensis	Beach strawberry	< 6"
Geranium macrorrhizum	Bigroot geranium	< 6"
Hemerocallis X `August Bright`	August Bright daylily	6 - 18"
Helianthemum nummularium	Rock rose	6 - 18"
Iberis sempervirens	Candytuft	6 - 18"
Juniperus horizontalis `Glauca`	Creeping Juniper	6 - 18"
Liriope muscari `Big Blue`	Big Blue lilyturf	6 - 18"
Ophiopogon japonicus	Mondo grass	12 - 18"
Rubus calycinoides `Emerald Carpet`	Emerald Carpet creeping raspberry	6 - 12"
Sedum X `Autumn Joy`	Autumn Joy sedum	6 - 18"
Sedum oreganum	Oregon sedum	< 6"
Stachys byzantina	Lamb’s ear	10 - 18”
Veronica peduncularis ‘Georgia Blue’	Speedwell	6 - 8”

Table 4.8. Zone C Plant List

Botanical Name	Common Name	Plant Height
Achillea millefolium	Yarrow	24 - 36”
Arctostaphylos 'John Dourley'	John Dourley manzanita	18 - 24”
Arctostaphylos ‘Pacific Mist’	Pacific Mist manzanita	18 - 24”
Berberis thunbergii var. Atropurpurea ‘Crimson Pigmy’	Crimson Pigmy barberry	18 - 24”
Brachyolottis greyi	Senecio greyi	48 - 60”
Calamagrostis x acutiflora `Karl Foerster`	Feather reed grass	18 - 36”
Calluna vulgaris sp.	Heather	18 - 36"
Camassia quamash	Camas	18 -14”
Carex obnupta	Slough sedge	18 - 36"
Choisya ternata	Mexican orange	36 - 72”
Cistus corbariensis	White rockrose	18 - 36"
Cornus sericea `Kelseyi`	Kelseyi dogwood	18 - 36"
Cotoneaster horizontalis	Rockspray cotoneaster	24 - 60”
Deschampsia cespitosa	Tufted hair grass	18 - 36"
Euonymus alatus compactus	Burning bush	6 - 8’
Holodiscus discolor	Ocean-spray	10 - 15'
Ilex crenata `Convexa`	Convex-leaf holly	18 - 36"
Ilex crenata `Hellerii`	Heller japanese holly	18 - 36"
Itea verginica ‘Little Henry ‘	Little Henry sweetspire	24 - 48”
Ligustrum japonicum ‘texanum’	Waxleaf privet	>72”
Juncus patens	California gray rush	18 - 36"
Juniperus squamata ‘Blue Star’	Blue Star juniper	24 - 36”
Lavandula sp.	Lavender	18 - 36"
Lonicera pileata	Privet honeysuckle	18 - 36"
Mahonia aquifolium	Oregon grape	36 - 72”
Mahonia aquifolium ‘Compacta’	Compact Oregon grape	24 - 36”
Miscanthus sinensis `Morning Light`	Eulalia grass	36 - 72”

Botanical Name	Common Name	Plant Height
Miscanthus sinensis `Purpurescens`	Flame grass	18 - 36"
Nandina domestica `Gulf Stream`	Heavenly bamboo	36 - 72”
Nandina domestica `Firepower`	Firepower heavenly bamboo	18 - 24”
Pennisetum species	Fountain grass	18 - 36"
Perovskia atriplicifolia `Taiga`	Russian sage	18 - 60"
Pinus mugo pumilio	Dwarf mugo pine	18 - 36"
Potentilla alba	White cinquefoil	18 - 36"
Rhaphiolepis umbellata	Yedda hawthorn	36 - 72”
Rhaphiolepis umbellata ‘Minor’	Dwarf yeddo hawthorn	36 - 48”
Rosa rugosa `Snow Pavement`	Snow pavement rugosa rose	36 - 72”
Rosmarinus officinalis sp.	Rosemary	18 - 36"
Salix purpurea `Nana`	Dwarf arctic willow	36 - 72”
Salvia x superba sp.	Sage	36 - 72”
Spiraea betulifolia `tor`	Birchleaf spirea	18 - 36"
Spiraea densiflora	Sub-alpine spiraea	18 - 36"
Spiraea douglasii	Western spirea	6 - 10’
Spiraea japonica	Japanese spirea	18 - 36"
Symphyotrichum novae-angliae ‘Purple Dome’	Aster 'Purple Dome'	18 - 24”
Thuja occidentalis ‘Danica’	American arborvitae	12 - 24”
Trachelospermum jasminoides	Star jasmin	12 - 36”
Vaccinium ovatum	Evergreen huckleberry	6 - 10’
Viburnum davidii	David viburnum	18 - 36"
Viburnum tinus ‘Compactum’	Compact spring bouquet	36 - 60”
Yucca sp.	Yucca	36 - 72”
Zauchneria sp.	California fuchsia	36 - 72”

Note: All plant heights are approximate in nature. Maintenance may be required for individual plants that exceed heights restrictions dictated by planting zone. Pruned accordingly or removed and replaced with approved equal.

CHAPTER 5
SITE IMPROVEMENT PLANS

1. GENERAL

Site improvement plans for commercial, industrial, and multifamily developments are reviewed by the Engineering Division. Site improvement plans shall be designed and stamped by a professional engineer, registered in the State of Oregon, herein after referred to as the Design Engineer. These projects are generally conditioned through the Design Review land use approval process. *Chapter 2 of the Engineering Design Manual* provides drawing requirements for the Site Improvement Construction Plans.

2. GRADING AND EROSION SEDIMENT CONTROL

The Engineering Division reviews the site grading and erosion sediment control plans for commercial, industrial, and multifamily developments. *Chapter 2, Section 3,* provides the requirements for the grading and erosion sediment control design.

3. RETAINING WALLS

Retaining walls greater than four feet in height, and walls less than four feet in height that experience a surcharge, shall have a professional engineer or geotechnical engineer registered in the State of Oregon provide stamped design calculations and detail drawings required for the retaining wall construction. See *Chapter 2, Section 7,* for retaining wall design guidelines.

4. PARKING AREAS

The goal of site design in Happy Valley is to provide for the safe movement of all vehicles, pedestrians, and service providers. All parking areas shall have paved surfaces. General parking area slopes shall not exceed 5%. Drive aisles not adjacent to parking spaces shall not exceed a longitudinal slope of 12%. Cross slopes shall not exceed 5%.

a. Parking Lot Layout

The parking lot design shall be in accordance with *Municipal Code Section 16.43.030* and shall be stamped by a professional engineer, registered in the State of Oregon. To be considered a parking space, adequate maneuvering area shall be provided for each vehicle to enter, and exit said parking space using a 3-point turn. Adequate aisles or turnaround areas shall be provided so that all vehicles are able to enter the public right-of-way in a forward-facing manner.

Bicycle parking shall be provided in accordance with *Municipal Code Section 16.43.040*.

Minimum AASHTO sight distance requirements shall be met at all streets and internal site intersections and driveways.

The Design Engineer shall provide the City with a site plan exhibit showing the expected routes and turning patterns for emergency vehicles, garbage trucks, and delivery trucks interior to the site. This vehicle maneuvering exhibit shall be separate from the construction drawings.

The fire turnaround locations and dimensions shall be superimposed on the Site Improvement Plan in the construction plan set and shall be approved by Clackamas Fire District #1.

b. Off Street Loading Areas

Off street loading areas shall be provided per *Municipal Code Section 16.43.050*. Sufficient space for turning and maneuvering of both delivery vehicles and passenger vehicles shall be provided onsite and in no instance shall the loading or parking areas conflict with each other or with vehicle maneuvering areas.

School loading zones designed for the continuous forward flow of passenger vehicles for the purpose of loading and unloading children shall be located on site for schools with a capacity of greater than 25 students.

Exceptions for loading areas within the right of way may only be per *Municipal Code Section 16.43.050*.

c. Heavy Pavement Section

The route through the parking lot for emergency vehicles, garbage trucks, and delivery trucks interior to the site shall have a pavement section capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds in accordance with the standards set by Clackamas Fire District # 1. The City's standard pavement section for residential streets will meet this requirement. The developer may submit pavement recommendations from a licensed geotechnical engineer for site specific pavement design.

d. Signage and Striping

Provide a parking lot signage and striping plan for review that is stamped by a professional engineer, registered in the State of Oregon. Compact parking stalls shall be striped as such. See *Municipal Code Section 16.43.030.F.2*.

e. Lighting

Adequate lighting shall be provided on all private access roads and parking lots in accordance with *Municipal Code Section 16.43.030.F.6*.

5. ACCESSIBILITY STANDARDS

Onsite accessible parking and access routes will be reviewed and permitted in conjunction with a Building Permit through the Building Division. If there is not a building permit associated with the onsite accessible parking or access routes, the Engineering Division will permit the work through a Site Development Permit. Accessibility requirements for parking lots, streets and intersections permitted with a Site Development Permit shall meet the requirements of the Oregon Transportation Commission's Accessibility Standards, latest edition.

All accessible routes that connect to the public right-of-way, shall provide a turning space where the onsite pedestrian walkway meets the public sidewalk. If the connection to the public right-of-way is at an existing sidewalk, it may be necessary to remove and replace a portion of the existing sidewalk to create the required turning space.

Accessible curb ramps located in the public right-of-way that are constructed in conjunction with a private access drive or onsite pedestrian walkway shall meet the requirements of PROWAG as well as City standards for public pedestrian routes.

6. SITE DRAINAGE

All private storm infrastructure shall be permitted and inspected through the City's Building Division.

Onsite surface water management facilities shall be reviewed and approved through Water Environment Services.

The site shall be developed to avoid concentrated runoff onto adjacent properties. In some cases, a cutoff trench may be required to prevent the run-on or run-off of surface water at or near property lines.

Concentrated surface runoff will not be allowed to flow over commercial driveways or sidewalks into the public street. The City does not allow weep holes in curbs which discharge to the public roadway.

7. LANDSCAPE PLAN

The Site Improvement Plans shall include a site landscape plan, signed by a landscape architect as specified in *Municipal Code Section 16.42*. Wheel stops shall be provided to protect landscaped areas and walkways where necessary.

CHAPTER 6
CONSTRUCTION

1. PRE-CONSTRUCTION MEETING

Prior to beginning construction, the Contractor responsible for performing the work under the City's permit shall attend a pre-construction meeting with City staff. See *Chapter 1, Section 6,* for more information. Any contractor performing work in the City of Happy Valley will need a Happy Valley Business License.

2. WORK HOURS

The work hours are closely monitored by the City throughout the construction of a project. A Construction Hours Sign shall be installed at the entrance of every construction site. The sign shall list the allowed construction hours for the City and shall be in accordance with the *City's Standard Drawing 350*.

The City Manager or the Director of Community Services may allow longer, or require shorter, work hours depending on site-specific conditions.

In addition to the allowed work hours, site clearing, earth moving, installation or construction of underground utilities, paving of streets and sidewalks, foundation forming and pouring, and structural framing shall be entirely prohibited on Sundays and holidays. The following holidays will be considered the same as Sundays: New Year's Day, Independence Day, Thanksgiving Day, and Christmas Day.

To perform work outside the hours and/or days defined in the Project's Site Development Permit; the Owner, Developer, or Engineer of Record (or Contractor if accompanied by a written authorization by Developer) shall submit a work hour variance application to the City's Code Enforcement Division. The application should indicate what special circumstances require the work to be performed outside the standard work hours. To be valid, the request must be approved by Code Enforcement. The approval must be in writing and this approval shall be available at the site on the approved workday, and a copy of it shall be submitted with the Engineer of Record's daily report to the City Engineer. Requests made with less than two days' notice may not be approved if Code Enforcement is not available.

Placement of pavement on future or existing public streets shall only occur Monday through Friday, excluding City recognized holidays. Pavement shall not be placed on weekends or holidays.

3. EROSION AND SEDIMENT CONTROL

The City of Happy Valley has adopted the Water Environment Services (WES) Erosion Prevention and Sediment Control Planning and Design Manual (latest version) as the standard for erosion and sediment control design and construction requirements. Developer shall have all sediment fencing, erosion and sediment control facilities, and construction entrances installed, inspected, and accepted by the City prior to beginning any work on the site.

a. Vegetative cover shall be maintained on slopes or established through new plantings for stability and erosion control purposes. Vegetation shall not be stripped from any steeply sloped area except for construction of utilities, internal streets, parking areas, pedestrian facilities, retaining walls and buildings.

b. Sediment that is tracked from a construction site and onto adjacent public streets will need to be removed immediately by mechanical means and not washed with water. Dust shall be controlled within the development during construction and shall not be permitted to drift onto adjacent properties.

c. Wet weather measures shall be implemented and maintained between the dates of October 1st and April 30th. **Note:** *Experience has shown that once the fine clay soils in the Happy Valley area become waterborne, they are not easily separated from water. Mechanical systems, such as Baker Tanks, are the most effective means of filtration for these soil types.*

d. When a contractor or developer requests the use of Cement-Treated Base (CTB) on a project, they will be required to provide a stormwater monitoring action plan for City review. If the CTB is for road base, a recommended pavement section from the project Geotech is required to be submitted for City review and approval. See *Chapter 2, Section 11* for more information.

e. Prior to project acceptance, the site vegetation must be established and/or final erosion control measures covering all exposed soils need to be in place.

4. SAFETY AND TRAFFIC CONTROL

a. The contractor is responsible for the safety of the work zone and for all persons and property encountering the work. The contractor shall comply with all OSHA requirements. Work zone traffic control shall conform to the most recent edition of the MUTCD and the Oregon Supplements to the MUTCD.

b. At the City's discretion, a traffic control plan shall be submitted prior to construction. A copy of the traffic control plan shall be on-site at all times.

c. Signs on temporary sign supports shall be retroreflective roll-up signs. Temporary traffic control measures shall not be located on sidewalks or in bike lanes. Sidewalk

and bike lane closures shall be signed in conformance with the MUTCD and included in the work zone traffic control plan. The roll-up signs shall be removed at the end of the workday and when work is not occurring.

d. Temporary trench patches:

- Temporary trench patches shall be made using hot mix asphalt.
- If an excavation has been backfilled with CDF, a steel plate may be used to cover the excavation until the mix cures (a minimum of 24 hours and a maximum of 48 hours). After curing, the steel plate shall be removed, and the excavation permanently patched per Standard Drawing Nos 160 & 200. If conditions are such that a permanent fix cannot be completed within this time frame a temporary hot mix asphalt patch is required until the final pavement restoration occurs.
- During the months of May through October, steel plates shall be secured in place with pins and asphalt ramping installed around all edges of the plate. During the months of November through April steel plates shall be installed flush with the pavement, typically requiring a grind and inset with the existing asphalt surface.
- As an alternate to CDF backfill, and to remove the requirement of steel plate placement, the City will accept granular backfill layered with cement at a ratio of one bag of dry cement per one cubic yard of aggregate typically layered at 6-inch to 8-inch compacted rock layers with 1-inch to 1-1/2 inch cement layers. This alternative trench backfill requires compaction testing similar to standard granular backfill. (Reference standard drawings)

e. It is the responsibility of the Developer's inspector to provide project oversight and ensure the construction of the project meets the project specifications and City Standards. The role of the City's inspector is one of observation only. The City's inspector may point out possible violations to the contractor but must rely on OSHA for determining and enforcing violations.

5. CONSTRUCTION INSPECTION

The City shall be provided access to inspect all improvements required under a permit or land use decision. The costs for inspection, plan review, and project coordination are assessed and included in the issuance of the Site Development Permit and/or Right-of-Way Permit fee.

All public improvements shall be inspected by the Developer's engineer who is an Oregon registered professional engineer or a qualified individual under the supervision of an Oregon registered professional engineer as required in the *Engineering Services Agreement (See Supplemental Documents)*.

Inspecting engineering firms, and all employees of such firms, shall not have a partnership, or any form of real property interest, in the development for which the improvements are required. The inspecting engineer's relationship to the project must be solely that of a professional service nature.

The City does not provide full inspection services for non-public funded public improvements.

a. City Inspection Activities:

An inspector from the City will provide secondary inspection services, which are listed below. Such inspection may extend to any or all parts of the work and to the preparation and/or manufacture of the materials to be used.

The City inspector is not authorized to:

- Revise, alter, or relax the provisions of the specifications, the approved plans, or these Standards.
- Direct how the work is to be performed.

The City inspector has the authority to:

- Act as a liaison between the Inspecting Engineer and the City.
- Monitor work progress and materials furnished, including without limitation; the preparation, fabrication, or manufacture of materials to be used.
- Perform administrative and coordination activities as required to support the processing and completion of the project.
- Require revisions to approved engineering plans when necessary due to conflicting field conditions.
- Temporarily suspend the work for safety deficiencies and allow work to proceed after safety deficiencies have been corrected.
- Temporarily suspend the work for erosion and sediment control deficiencies and allow work to proceed after erosion and sediment control deficiencies have been corrected.
- Exercise additional delegated authority.

The City inspector shall be present at the following inspections:

- Verification of the Construction Hours Sign installation and of the initial placement of Erosion and Sediment Control facilities. **NOTE: No work shall begin until the site erosion control has been inspected and approved by the City.**
- Proof roll of base rock prior to curb placement and paving on public and private streets.
- Stringline or form inspection for curb and gutter.
- Inspection of concrete forms for curb returns and accessibility facilities.
- Final determination of pavement restoration limits.
- Placement and compaction of pavement. See *Section 2* of this Chapter for placement of pavement work hours.
- Striping layout.

b. Inspecting Engineer's Activities

Privately funded inspection services required by the City are the primary inspection services on a project, are more comprehensive and intensive than City inspection services, and are the responsibility of the owner, developer, and designated inspecting

engineer. The following minimum activities are required of the developer's inspector/engineer:

- *Execute the Engineering Services Agreement accepting responsibility. (See Supplemental Documents for form)
- Maintain daily inspection reports which contain the following information:
    - Job number and name of Engineer and designees
    - Site development permit number
    - Date and time (arrival and departure) of site visits
    - Weather condition, including temperature.
    - Description of construction activities
    - Statements of directions to change plans, specifications, stop work, reject materials, or other work quality actions.
    - Public agency contacts which result in plan changes or other significant actions
    - Perceived problems and action taken.
    - Final and staged inspections
    - Record all material and soil types and conditions.
    - Record the location of Cement Amended Base or Cement-Amended Soils within the project. These locations shall be transferred onto the project As-built Construction Plans
    - Test results
    - Record all pavement grade and depth measurements by street stationing.
    - General remarks including citizen contact or complaints.
    - Maintain ESC daily logbook and ESC inspection reports.

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

- Obtain and use a copy of the City-approved construction plans, specifications, and a copy of this manual.
- Review and approve all pipe, aggregate, Portland cement concrete, asphaltic concrete, and other materials to ensure their compliance with City standard.
- *Approve all plan or specification changes in writing and obtain City approval. All changes to the approved plans or specifications must be with the approval of the City prior to the commencement of work affected by the revision.
- Monitor construction activities to ensure end products meet City specifications.
- *Perform (or have performed) material, composition, and other tests required to ensure City specifications are met.
- For street construction, perform the following inspections and record date of each:
    - Trench backfill meets material and compaction specifications.
    - Curbs, curb and gutter, catch basins and street inlets, and sidewalk ramps are built to line and grade and meet all accessibility requirements.

    - Subgrade meets grade and compaction specifications.
    - Base rock meets depth/thickness, gradation, grade, and compaction specifications.
    - Leveling course meets depth/thickness, gradation, grade, surface condition, and compaction specifications.
    - Wearing course meets material, depth/thickness, gradation, grade, surface condition, and compaction specifications.
- Provide the City with 24-hour notice of impending inspections.
- For grading, ensure that the grading plan, as staked, will result in acceptable slopes along exterior property lines, proper on and offsite drainage, and erosion control.
- Prior to requesting any building occupancy on commercial, multi-family, and/or other projects with concurrent site development and building permits, the engineer shall certify that all necessary public improvements have been installed and accepted in compliance with the City approved Site Development Permit construction plans. This certification shall also indicate that all items required (at or before occupancy of the first building) through the land use process, have been completed (including but not limited to payment of all fees, recording of all public rights of way and utility easements, and required maintenance bonds).
- Call to the City's attention within two working days all plan changes, material changes, stop work orders or errors or omissions in the approved plans or specifications.
- Notify the City 24-hours before the start of construction or resumption of work after shutdowns, except for normal resumption of work following Sundays or holidays.

*The inspecting Engineer of record must personally perform all activities marked by an (*) and must supervise all individuals performing delegated activities. Material testing not performed by the inspecting Engineer must be accomplished by a recognized testing firm or another registered engineer.

c. City Inspection Notification

Schedule City inspections directly with the City Inspector and copy the inspection requests at *inspect-engineering@happyvalleyor.gov.* A minimum 48-hours notification shall be given to the City when the following work is to be scheduled:

- Initial placement of erosion and sedimentation controls.
- Fencing of grading limits.
- Proof roll of base rock prior to curb placement and paving.
- Stringline or form inspection for concrete curb and gutter.
- Pavement restoration limits for cuts in existing pavement.
- Concrete form inspection of curb returns and pedestrian facilities. *Note: Form inspection by the City doesn't absolve the contractor from the responsibility of ensuring that the final concrete meets accessibility requirements and guidelines.*
- Placement and compaction of pavement. See *Section 2* of this Chapter for placement of pavement work hours.
- Striping layout.

d. Testing

All testing required by the City shall be at the Developer's expense. Testing shall be in accordance with the ODOT Manual of Field Test Procedures, most recent edition.

6. SITE GRADING

The following areas will need to be fenced using the standard four-foot orange construction fencing prior to construction:

- Grading limits
- Around trees slated for preservation - A tree removal permit must be obtained from the City prior to the removal of any trees on site in conformance with *Municipal Code Section 16.42.050*.
- Perimeter of conservation easement or environmentally sensitive areas

All construction trucking used for haul-off of excavated material shall perform transfer of trailers on-site. Surrounding City streets shall not be used as a staging area for dump trucks with trailers to perform transfers or staging of concrete, asphalt or other delivery trucks unless prior written authorization is provided by the City Engineer.

All construction sites shall be always maintained in a clean and sanitary condition. Construction debris, including food and drink waste, shall be restricted from leaving the construction site using proper disposal containers. Failure to comply may result in a "Stop Work" order until deficiencies have been corrected to the satisfaction of the City. Noise shall be kept at the minimum level possible during construction. The developer and/or contractor shall agree to aggressively ensure that all vehicles working on the development shall have adequate and fully functioning sound suppression devices installed and always maintained.

7. REVISION PROCESS

Any substantial deviation from the approved construction plans must have prior approval from the City. If the curb ramp forms differ from the approved construction plans, the design engineer will need to provide a revised plan for City approval.

8. UTILITY INSTALLATIONS

All utilities, including electrical power, telephone, cable TV, gas and others shall be placed under ground when associated with new improvements and development projects. See *Chapter 2, Section 10,* for additional information.

9. PLACEMENT OF ASPHALT AND CONCRETE

The City has adopted the *APWA/ODOT Oregon Standard Specifications for Construction*. The maximum lift thickness of asphalt pavement shall be 3-inches. The placement of asphalt and

concrete shall be in accordance with these standards. See *Section 2* of this Chapter for placement of pavement work hours.

10. PRESERVATION, RESTORATION AND CLEANUP

The owner, developer and/or contractor shall preserve, protect, and maintain existing site features beyond the construction limits. The existing public improvements surrounding the site, including, but not limited to, the existing asphalt surfaces, sidewalks, and ADA ramps, shall be restored to their original condition or better, prior to the City's acceptance of the project as complete.

Minor cracks in the curb and gutter shall be sealed with Sikaflex™ or approved equal. If curb needs to be replaced, minimum 5-foot curb sections will need to be maintained unless otherwise approved by the City. If sidewalk needs to be replaced, it shall be accomplished with full panel removal and replacement unless otherwise approved by the City.

11. PROJECT ACCEPTANCE

The City will do a final inspection walk through of the project when all elements on the approved construction plans are complete, the final erosion and sediment control measures are in place, and the City has received as-built plans with a letter of compliance and completion from the Engineer of Record. A project punch list will be prepared by the City outlining the items that need to be complete. Completion of the listed items are required prior to project acceptance and release of building permits or, in some instances, occupancy. See *Chapter 1, Section 7,* for additional information.