SECTION 8

ROAD ELEMENTS AND ROADSIDE FEATURES

8 - 01 STREET ENDS

See Standard Drawing 8-010.

Permanent street ends of 150 feet or less in length (measured from the edge of traveled way of the intersecting street to the end of the street) will not require a circular turnaround or hammerhead.

Permanent street ends between 150 and 1000 feet (measured from the edge of traveled way of the intersecting street to the beginning of cul-de-sac) shall be provided with a circular turnaround or hammerhead as shown on Standard Drawing 8-010. Temporary street ends may use a hammerhead design in lieu of a cul-de-sac.

Permanent street ends in excess of 1000 feet are discouraged but will be considered for cases where lots are large and/or difficult terrain exists, provided, the number of single family lots served by the street does not exceed 25 or the Average Daily Trip (ADT) generated from the properties served by the street does not exceed 250.

The maximum grade in any street end within the cul-de-sac turnaround shall be 6 percent in any direction.

The city engineer will require off-street walkways to connect a street end at its terminus with other streets, parks, schools, bus stops, or other pedestrian traffic generators, if a demonstrated need exists. The City engineer may also require street ends be designed for future emergency vehicle access where connection to an existing street or future street is feasible.

See Standard Drawing 8-010, Street Ends, for layout.

8 - 02 MEDIANS

Where required for traffic control or landscape planters, medians shall be in addition to, not part of, the specified roadway width. Roadway on each side of median shall be not less than one half of the roadway width. Medians shall be designed so as not to limit turning radii or sight distance at intersections. Median curb edges shall be as specified in Section 8-04, or shoulder and ditch; except where median shoulders are provided in lieu of curb, they shall be a minimum 4 feet in width. Medians may be grassed, landscaped with native and drought tolerant vegetation, incorporate a LID BMP such as bioretention, or surfaced with aggregate or pavement.

8 - 03 SURVEY MONUMENTS AND CORNERS

See Standard Drawings 8-020, 8-030, 8-035.

All existing survey control monuments on or proximate to a construction site shall be referenced and tied to a minimum of three (3) off-site structures or monuments. All existing survey control monuments which are disturbed, lost, or destroyed during surveying or building shall be replaced, at the expense of the responsible builder or developer, by a Professional Land Surveyor registered in the State of Washington. Such replacement shall be documented and certified by the responsible Professional Land Surveyor.

Where specified in these standards, survey monuments shall be located in accordance with Standard Drawings 8-020 or 8-030 as appropriate in all subdivision and short plats where required.

Boundaries of final plats and short plats shall be established with markers described below except that boundary corners that consist of section or quarter section corners shall be established in accordance with Standard Drawing 8-020. In the case where a property corner is occupied by a fence post or other obstruction, an offset marker shall be provided along one of the boundary lines. Offset monuments shall only be set to witness section and quarter section corners.

Markers shall meet the following standards:

Standard steel reinforcing bars shall be at least 24 inches in length and at least ½-inch in diameter or at least .75 inches inside diameter for iron pipe. Such pipe or rebar shall be permanently tagged with the Land Surveyor's registration number.

Intersection points of a plat boundary with the centerline of a City road right-of-way centerline shall be monumented in accordance with Standard Drawing 8-020.

Monument, case, and cover shall be set in accordance with Standard Drawing 8-020 for all PC, PT, center of circular turnaround and intersection points. The point of intersection (PI) will be acceptable in lieu of a PC and PT for plat road curves, provided that such PI falls within the right-of-way.

Monument cases and covers shall be properly raised when road surface is raised due to paving. All new monument cases shall be referenced and tied prior to paving, and location verified by a Washington Professional Land Surveyor after paving.

8 - 04 CURB DETAILS

See WSDOT Standard Plan F-10.12-03 and F10.16-00 or their successor(s).

Vertical Curb and Gutter 18 inches wide or curb alone 6 inches wide and 12 inches high shall be used for all curbed roadways except as modified below:

Thickened asphalt edge, 12 inches wide, will be preferred for rural streets.

Extruded Cement Concrete Curb (see Standard Drawing 8-050) may be used for parking areas which will not become part of the city road system.

Where low impact development approaches are found to be acceptable by the City Engineer curb cuts or grates can be incorporated to allow for storm water to enter stormwater facilities and LID BMP's, at locations safe for traffic.

8 - 05 CONCRETE SIDEWALKS

See WSDOT Standard Plan F-30.10-03. or its successor(s).

A. REQUIRED LOCATIONS

Sidewalks shall be provided as indicated in the City's Comprehensive Plan, all designated urban locations, and or for continuity to existing or planned locations adjacent to urban locations as determined by the City Engineer. Planter strips are to be provided at all secondary arterial and collector streets unless otherwise approved by the City Engineer. The Engineer may consider hardships due to critical areas such as slopes and wetlands. This location is to be determined on a case-by-case-basis, subject to approval by the city engineer, to facilitate public transportation use and be consistent with the Comprehensive Plan.

Permanent street ends, ultimately serving 8 or less residential lots (80 ADT or less) will not require sidewalks on either side. In subdivisions where the proposed design provides for a comprehensive internal walkway system outside of public right-of-way sidewalk requirements may be waived or modified by the city engineer.

B. CURB RAMPS (WHEELCHAIR RAMPS)

See WSDOT Standard Plans F40.12-03, F40.15-03, and F45.10-02 or their successor(s).

Curb ramps shall be provided at all pedestrian crossings having vertical curb sections. One ramp shall be used on each curb return on residential streets and unsignalized intersections. At signalized intersections, a curb ramp shall be aligned with each crosswalk. Curb ramps shall also be provided to enable passage across radius return access points.

C. WIDTH

1. Sidewalks shall be, 5-foot minimum width.

2. Width of sidewalk is measured from the back of the curb to the back of the sidewalk when the sidewalk is adjacent to the curb.

3. Meandering sidewalks shall maintain the full design width around obstructions that cannot be relocated. Additional right-of-way (or easement) may be required to either relocate the obstruction or meander the sidewalk.

4. At bus stops, a landing pad at least 10 feet deep and 15 feet wide shall be provided for wheelchair operations.

D. THICKNESS

Concrete sidewalks shall be 4 inches thick when placed behind vertical curb and 6 to 8 inches thick at dropped curb driveways. Permeable pavement thickness shall be determined on a case by case basis by the designer.

8 - 06 CONNECTING PATHWAYS

See Standard Drawing 8-360.

Pathways may be used as a substitute for sidewalks in suburban locations as determined by the City Engineer. Connecting Pathways are to be 7 feet or greater from roadways unless no practical alternative exists and encouraged to be located either at the back of the right of way or in easements. Easements shall comply with Section 8-08. Connecting Pathways shall be a minimum of 6 feet wide. Surfacing shall be as specified in Section 8-11.

8 - 07 MULTI-USE TRAIL

See WSDOT Design Manual Chapter 1515 Shared-Use Paths

Multi-use trails (Shared-Use Paths) may be used as a substitute for Portland Cement Concrete sidewalks at one side of the roadway in urban areas. In rural areas surfacing requirements may be modified for equestrian usage or as determined by the city engineer.

Multi-use trails shall be a minimum of 10 feet wide. Access easements shall comply with Section 8-08. Surfacing materials shall be as specified in Section 8-11.

Multi-use trails shall be a minimum of 7 feet from the edge of the vehicular traveled way unless no practical alternative exists and when approved by the city engineer.

Access easement terminations shall be installed as required by the city engineer.

8 - 08 SPECIAL ACCESS EASEMENTS

Where it is necessary to facilitate pedestrian circulation between neighborhoods, schools, shopping areas, transit facilities, or other activity centers, the city engineer may require the dedication of a public access easement or tract. Easements for Connecting Pathways shall be a minimum of 10 feet wide. Easements for Multi-use Trails shall be a minimum of 20 feet wide.

Improvements to the easement shall include a sidewalk, walkway, or trail consistent with other non-motorized facilities in the area. Fences shall be constructed along access easements in residential areas where buildings will be located nearer than 25 feet to the edge of the easement. Diverters or bollards shall be installed when required by the city engineer.

8 - 09 BIKEWAYS OR BIKE LANES

Bikeways or bike lanes locations will be consistent to the City's Comprehensive Plan. Shoulders for bicycle use at urban locations shall be a minimum of 5 feet paved plus a one foot curb offset. Shoulders for bicycle use at suburban locations shall be a minimum 5 feet asphalt paved plus a two-foot ballasted graveled edge.

The following provides clarification for stormwater requirements related to bike lanes:

A. A bike lane that is contiguous with the roadway is considered to be pollution generating hard surface (P-GHS).
B. A bikeway separated from the roadway is **not** considered to be pollution generating hard surface (P-GHS).
C. On-site stormwater management (Minimum Requirement #5) in the stormwater manual as amended in BIMC 15.20 may be superseded or restricted where they are in conflict with transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way.
D. Water quality treatment (Minimum Requirement #6) and flow control (Minimum Requirement #7) in the stormwater manual as amended in BIMC 15.20 are only triggered if the new hard surfaces total 5,000 square feet or more **and** total 50% or more of the existing

hard surfaces within the project limits. The project limits shall be defined by the length of the project and the width of the right-of-way.

8 - 10 DRIVEWAYS

See WSDOT Standard Plan F-80.10-04 and Standard Drawings, 8-150, 8-160, 8-170, 8-175 and 8-180 and WSDOT Standard Plan F-80-04 or its successor(s).

Type 2 or Type 3 Concrete Driveway Entrances shall be used unless otherwise approved by the City Engineer. The City Engineer may consider hardships due to critical areas such as slopes and wetlands.

Where no curbing exists along the roadway, an asphalt approach may be used as shown in Standard Drawings 8-150 and 8-170. As an alternative, a Portland Cement Concrete approach may be used as shown in Standard Drawings 8-160 and 8-180.

Shared driveways are encouraged to reduce impervious surface areas. Permeable pavement is encouraged for privately maintained driveways outside of the right-of-way.

Driveways are discussed in detail in Section 6, Site Access.

8 - 11 SURFACING REQUIREMENTS

All materials and workmanship shall be in accordance with the *WSDOT/APWA Specifications*, these standards, and as approved by the city engineer.

The following are the minimum requirements for surfacing for specific facilities as described elsewhere in these standards.

	Facility	Surfacing Requirements
1.	Streets	Per specific design See Standard Drawings 7-020, 7-030, 7-040, 7-050, 7-060, 7-065 and 7-066
2.	Concrete Sidewalks	4” Portland Cement Concrete (adjacent to vertical curb)
		6” or 8” Portland Cement Concrete (adjacent to dropped curb) Or permeable Pavement
3.	Asphalt Shoulder	Same as 1 above (road shoulder)

4. Connecting Pathway 2" ¼' minus crushed rock over 4" of ¾" minus crushed rock or cinders

5. Multi-Use Trail 2" HMA over 2" CSTC or permeable pavement

Streets shall be designed with a structural section that considers the load bearing capacity of the soils and the traffic carrying requirements of the roadway. Plans shall be accompanied by the soils and traffic analysis on which the design is based. Shoulders shall be constructed to the same structural section as the roadway.

Pavement designs submitted to the City shall be based on a design life of 20 years with a growth factor of 2%.

All minimum surfacing requirements assume an acceptable, well drained, stable, compacted subgrade. Additional measures may be required at the city engineer's discretion if evidence exists of unstable subgrade.

Asphalt Treated Base may be substituted for Crushed surfacing top course (CSTC) may be substituted for ATB in the ratio of 2.0 inches of CSTC per inch of ATB (compacted depths) where it can be demonstrated to the city engineer's satisfaction that it can be placed without contamination of any surfacing materials.

For privately maintained driveways, sidewalks, and connecting pathways the City will consider deviations from surfacing and compaction requirements to allow for the use of permeable materials and wheel strips for infiltration. The City will allow the use of WSDOT's General Special Provisions (GSP's) for Porous Hot Mix Asphalt (PHMA), Porous Warm Mix Asphalt (PWMA), and Pervious Concrete (PConcrete) developed by the Construction Materials Committee of the American Public Works Association (APWA).

Permeable pavement shall be replaced in-kind where feasible. Patching pervious asphalt with conventional asphalt is acceptable if it is less than 10 percent of the total facility area and does not impact the overall facility function. Take appropriate precautions during pavement repair and replacement to prevent clogging of adjacent surfaces.

8 - 12 GUARDRAIL

Evaluation of embankments for guardrail installations shall be in accordance with Chapter 1610 of the *WSDOT Design Manual* or the *AASHTO Roadside Design Guide*.

Guardrail installations shall conform to WSDOT/APWA Plan C-1, Beam Guardrail Type 1.

End anchors shall conform to WSDOT/APWA Plan C-6, Beam Guardrail Anchor Type 1.

8 - 13 BOLLARDS

See Standard Drawing 8-190.

A. When necessary to deny motor vehicle access to an easement, tract, or trail, the point of access shall be closed by two bollards supporting a cable or chain and a road closed barricade sign. Bollards shall be 12 feet apart.

B. Bollard design shall be in accordance with Standard Drawings 8-190 or other design acceptable to the city engineer. No fire apparatus access roads shall be blocked in this manner without the concurrence of the city fire marshal.

8 - 14 ROADWAY BARRICADES

See WSDOT Standard Plan K80.20-10 or its predecessor(s).

Temporary and permanent barricades shall conform to the MUTCD and these standards.

Type I or Type II barricades are intended for use in situations where traffic is maintained through the construction area. They may be used singly or in groups to mark a specific hazard or they may be used in a series for channeling traffic.

On construction projects when a road section is closed to traffic, Type III barricades shall be erected at the points of closure. Type III barricades shall extend completely across a roadway and its shoulders (as a fence) or from curb to curb. Where provision must be made for access of equipment and authorized vehicles, the Type III barricades shall be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where job site access is provided through the Type III barricades, the developer/contractor shall assure proper closure at the end of each working day.

In the general case, Type III permanent barricades shall be installed to close arterial roadways or other through streets hazardous to traffic. They shall also be used off lanes where tapers are not sufficiently delineated.

Signs may be erected on barricades, particularly those of the fixed type. The ROAD CLOSED and Detour Arrow signs, and the Large Arrow warning signs may be mounted effectively on or above the barricade that closes the roadway.

For night time use, it is desirable to add flashing warning lights when barricades are used singly and steady-burn lights when barricades are used in a series for channelization.

8 - 15 STREET ILLUMINATION

See Standard Drawing 8-350.

Luminaires of suitable type and candlepower shall be provided where directed by the city engineer on arterials and as intersection identifiers where other streets intersect arterials. Type of installation shall be as per *WSDOT/APWA Specifications* and as required by the city engineer. No installation will be permitted within a sidewalk unless the unobstructed sidewalk width is consistent with ADA requirements.

A. STREET LIGHT CONSTRUCTION

All workmanship, materials, and testing shall be in accordance with WSDOT/APWA, MUTCD, NEC, or City of Bainbridge Island development guidelines unless otherwise specified below. In cases of conflict the most stringent guideline shall apply.

Electrical permits and inspections are required for all street lighting installations. The contractor is responsible for obtaining said permits prior to any type of actual construction. These permits are available from the Department of Labor and Industry in Bremerton.

A clearly marked service disconnect shall be provided for every lighting circuit. The location and installation of the disconnect shall conform to National Electrical Code (NEC) and City standards. The service disconnect shall not be mounted on the luminaire pole. The service disconnect shall be of a type equal to a Meyers MEUGL-M100C-UM or Unicom CP111B-01113A service, 120-240 VAC, 103W, Caltrans Type 3B with contactors, photo electric cell and test switch. All service disconnects shall be used to their fullest capabilities, i.e., maximum number of luminaires per circuit.

All lighting wire shall be copper with a minimum size of #8. All wire shall be suitable for wet locations. All wire shall be installed in schedule 40 PVC conduit with a minimum diameter of 1-1/4 inches. A bushing or bell-end shall be used at the end of a conduit that terminates at a junction box or luminaire pole. Conductor identification shall be an integral part of the insulation of the conductors throughout the system, i.e., color coded wire. Equipment grounding conductor shall be #8 copper. All splices or taps shall be made by approved methods utilizing epoxy kits rated at 600 volts (i.e., 3-M 82-A2). All splices shall be made with pressure type connectors (wire nuts will not be allowed). Direct burial wire will not be allowed. All other installation shall conform to NEC, WSDOT/APWA, and MUTCD standards.

Each luminaire pole shall have an in-line, fused, water tight electrical disconnect located at the base of the pole. Access to these fused disconnects shall be through the hand-hole on the pole. The hand-hole shall be facing away from on-coming traffic. Additional conductor length shall be left inside the pole and pull or junction box equal to a loop having a diameter of one foot. Load side of in-line fuse to luminaire head shall be cable and pole bracket wire, 2 conductors, 19 strand copper #10 and shall be supported at the end of the luminaire arm by an approved means. Fuse size, disconnect installation, and grounding in pole shall conform to NEC standards.

Approved pull boxes or junction boxes shall be installed when conduit runs are more than 200 feet. In addition, a pull box or junction box shall be located within 10 feet of each luminaire pole and at every road crossing. Boxes shall be clearly and indelibly marked as lighting boxes by the legend, "L.T." or "LIGHTING". See WSDOT Standard Plan J-11a.

All lighting poles shall have tapered round shafts with a linear taper of between 0.125 and 0.14 inches per foot. All poles shall be Hapco 50700-005 or 50700-006 for single arm and Hapco 50701-010 for twin arm or approved equal. In existing developed areas, the City may approve/require use of other poles to establish consistency within the developed area.

Mounting heights, arm length, power source, luminaire, and wattage shall be as follows:

Mounting Height:	40 feet
Curb Overhang:	4 feet
Power Source:	240 VAC, Single Phase, 3 wire
Luminaire Type:	High Pressure Sodium Flat Lens Medium Cutoff I.E.S. Type 3
Distribution Wattage:	200 Watt, Residential Street Intersection
	150 Watt, Residential Street
	400 Watt, Collector

Portland Cement Concrete bases shall follow WSDOT Standard Plan J-1b, Sheet 1, Foundation Detail. Conduit shall extend between 3 and 6 inches above the concrete base.

Any modification to approved plans shall be reviewed and approved by the city engineer prior to installation.

8 - 16 MAIL BOXES

See Standard Drawings 8-220, 8-230, 8-240.

The responsibilities for location and installation of mailboxes in connection with the construction or reconstruction of City roads are as follows:

A. CITY ENGINEER RESPONSIBILITY

1. Requires road construction plans, whether for construction by the Department of Public Works or by a private developer, to show clearly the designated location or relocation of mailboxes, whether single or in clusters.

2. Requires with this information any necessary widening or reconfiguration of sidewalks with suitable knock-outs or open strips for mailbox posts or pedestals. The city engineer may require special turnouts for mail delivery vehicles for roads classified as arterials or neighborhood collectors.

3. Requires Mailbox Turnouts, for 3 or more mailboxes, in accordance with Standard Drawing 8-250, along all streets, except where such street is posted at 25 mph or less.

4. Requires these plans to bear a statement on the first sheet that mailbox locations as shown on these plans have been coordinated with the local postmaster. This will be a prerequisite to plan approval.

5. Requires construction of mailbox locations in accordance with these plans, subject to inspection and enforcement procedures.

B. LOCAL POSTMASTER RESPONSIBILITY

1. Designates location and manner of grouping of mailboxes. Note on the plans the type of mailbox delivery: Neighborhood Delivery and Collection Box Unit (NDCBU), Wood Structure Cluster or individual type box. Authenticate by stamp or signature when this data has been correctly incorporated into the plans.

2. Does all necessary coordination with owners or residents involved to secure agreement as to mailbox location, in accordance with these standards, and to instruct them regarding mailbox installation. Actual installation or relocation of NDCBUs is the responsibility of the developer or homeowners association.

C. OWNER OR RESIDENT RESPONSIBILITY

The owners or residents served by mailboxes, at time of original installation, will:

1. If using individual mailboxes, clustered or separated, install and thereafter maintain their own mailboxes as instructed by the U.S. Postal Service.

2. If NDCBU delivery, rely on U.S. Postal Service to provide and maintain NDCBUs.

D. DEVELOPER/CONTRACTOR RESPONSIBILITY

Existing mailboxes and no plans to replace them with NDCBUs:

If it is necessary to remove or otherwise disturb existing mailboxes within the limits of any project, the developer/contractor shall install the boxes temporarily in a position that their function will not be impaired. After construction has been completed, the developer/contractor shall reinstall boxes at locations in accordance with these Standards or as approved by the city engineer and use only existing posts or materials except where in conflict with these Standards. Any damage caused by the builder or it's contractor is to be repaired at the expense of the Developer.

Existing NDCBUs or plans to install NDCBUs:

The developer/contractor shall call the City of Bainbridge Island Postmaster to approve the location of the NDCBU and make the necessary location. Install the NDCBU as approved by the Postmaster.

E. INSTALLATION METHODS

Installation methods are as follows:

1. Single or double mailbox installations shall be set in accordance with Standard Drawing 8-220.

2. In more urbanized areas, boxes shall be clustered together when practical and when reasonably convenient to the houses served in accordance with Standard Drawings 8-820, 8-230, 8-240 and 8-250.

3. NDCBUs (Standard Drawing 8-240) will be installed by the U.S. Postal Service.

4. When mailboxes are located in the sidewalk, individually or in clusters, sidewalks shall be widened to provide a minimum of 5 feet of clearance around the mailboxes.

8 - 17 SIDE SLOPES

A. Side slopes shall generally be constructed no steeper than 3 to 1 for fill slopes and 2 to 1 for cut slopes. Steeper slopes may be approved by the city engineer upon showing that the steeper slopes, based on geotechnical analyses, will be stable. Slopes shall not exceed 2 to 1 for fill slopes and 1 to 1 for cut slopes.

B. Side slopes shall be stabilized by grass sod or seeding or by other planting or surfacing materials acceptable to the city engineer.

8 - 18 STREET TREES AND LANDSCAPING

With the exception of landscaped medians, and landscaping on the Island's main street of Winslow Way, maintenance of landscaping with-in the City's right of way shall be the responsibility of the fronting property owner.

Native and drought tolerant vegetation is preferred for landscaping. Post-construction soil quality and depth in accordance with the stormwater manual as amended by BIMC 15.20 is required for all disturbed pervious surfaces.

Shrubs should have a mature height of not more than 3.5 feet.

While planting trees along public streets is encouraged, some species have root systems that may damage curbs, gutters, sidewalks, and utilities. In addition some species are inappropriate for use because they block visibility, are susceptible to wind damage, or drop fruit or debris. Table A in the appendices to this chapter contains a list of approve trees for given applications.

Trees located in the right-of-way must be planted to the following standards:

A. 3.5 feet back from the face of curb
B. 5 feet from underground utility lines
C. 15 feet from driveway entrances or as necessary to maintain site lines.
D. 30 feet from roadway intersection or as necessary to maintain site lines.
E. 15 feet from utility poles.
F. 20 feet from other trees.
G. 20 feet from street lights.

The City will allow storm-water planters, rain gardens, and other vegetated storm water BMP's in medians and planter strips.

8 - 19 ROADSIDE OBSTACLES

A. WSDOT Clear Zone distances shall be used as a guide for evaluation and placement of old, and placement of new, roadside features within the public right-of-way.

For streets with posted speed limits of 35mph and less the clear zone distance is 10 feet in accordance with the WSDOT Design Manual. The maximum speed limit on Bainbridge Island is 35mph. The clear zone for secondary arterials and collectors streets is 10 feet.

B. In general, existing or new roadside features which could present a hazard to the public should be placed outside of clear zone areas unless justified to the city engineer's satisfaction by suitable engineering studies considering traffic safety, or, where shielded by a barrier, placed in an area normally inaccessible to vehicles or utilize a breakaway design. EXCEPTION: Clustered Mailboxes or NDCBU Mailboxes in accordance with Standard Drawings 8-220, 8-230, and 8-240 placed along streets posted at 25 mph or less.

C. Locations of poles shall be compatible with driveways, intersections, and other roadway features (i.e., they shall not interfere with sight distance, roadway signing, traffic signals, culverts, etc.). To the greatest extent possible, installation of poles and other above ground appurtenances will not be permitted in sidewalks or walkways.

D. Costs of relocating poles or obstacles to achieve these standards are the responsibility of the developer whose project necessitates compliance with these standards. This is not intended to prevent the developer from making financial arrangements with an appropriate utility or other owner of the obstacle to accomplish removal of the pole or obstacle.

8 - 20 SAFETY RAILS

See Standard Drawing 8-260, 8-270, and 8-280.

Wooden railings may be used when approved by the city engineer. Wooden railings shall be sturdily constructed of pressure treated timbers and hot dipped galvanized carriage bolts (no nails allowed). Posts shall be minimum 4 x 4 on four (4) foot centers. Three (3) 3 x 6 rails shall be bolted to the posts. Alternate designs may be considered.

8 - 21 ROCK WALLS (ROCKERIES)

See Standard Drawings 8-290, 8-300, and 8-310.

To provide a competent and adequate rockery structure, rock walls intended for cut sections over 8 feet in height and fill sections over 4 feet in height shall require design by a geotechnical engineer or other professional engineer qualified in rock wall design. Construction of such rockeries shall be constructed in accordance with these standards and the geotechnical engineer's supplemental recommendations.

A geotechnical engineer shall be retained to monitor rockery construction and to verify, in writing, that the rockery was constructed in general accordance with these standards and with the supplemental recommendations, in a professional manner and of competent and suitable materials.

Where rockeries cannot be constructed without significant foundation settlement or outward thrust upon the rockery, a structural wall of acceptable design such as a reinforced concrete retaining wall shall be provided. Such structural wall shall be designed by a professional engineer qualified in retaining wall design.

A. MATERIALS

Rock density shall be greater than one hundred sixty (160) pcf.

Rock Size	Rock Weight	Average Dimension
One Man	50 - 200 pounds	12 - 18 inches
Two Man	200 - 700 pounds	18 - 28 inches
Three Man	700 - 2000 pounds	28 - 36 inches
Four Man	2000 - 4000 pounds	36 - 48 inches
Five Man	4000 - 6000 pounds	48 - 54 inches
Six Man	6000 - 8000 pounds	54 - 60 inches

In rockeries over eight feet in height, it shall not be possible to move the large sized rocks (four to six man size) with a pry bar. If these rocks can be moved, the rockery should not be considered capable of restraining any significant lateral load.

B. ROCKERY CONSTRUCTION

1. Geotechnical Engineer - The geotechnical engineer retained to provide necessary supplemental rockery construction guidelines shall be a practicing geotechnical/civil engineer licensed as a professional civil engineer in the State of Washington who has at least four years of professional employment as a

geotechnical engineer in responsible charge, including experience with fill construction and stability and rockery construction.

2. Guarantee or Warranty - The developer/contractor shall furnish to the city engineer any guarantee or warranty furnished as a normal trade practice in connection with the materials used or construction methods employed.

3. Slopes - Slopes above rockeries should be kept as flat as possible, but shall not exceed 2:1 (Horizontal: Vertical) unless the rockery is designed specifically to provide some restraint to the load imposed by the slope. Any slope existing above a completed rockery shall be provided with a vegetative cover to help reduce the potential for surface water flow induced erosion. It shall consist of a deep root, rapid growth vegetative mat and typically will be placed by hydro-seeding and covered with a mulch.

4. Monitoring - All rockeries constructed against cuts in excess of eight feet in height and fills in excess of four feet in height shall be periodically monitored during construction by the geotechnical engineer to verify the nature and quality of the materials being used are appropriate, that the construction procedures are appropriate, and that the rockery is being constructed in a generally professional manner and in accordance with these Standards and any supplemental recommendations by the geotechnical engineer. On completion of the rockery, the geotechnical engineer shall submit to the city engineer copies of the rockery examination reports along with a final report summarizing rockery construction.

5. Fill Compaction - Where rockeries are constructed in front of a fill, the fill shall be placed and compacted in a manner that will provide a competent fill mass. To achieve this goal, all fills shall consist of relatively clean, organic and debris free granular materials with a maximum size of four inches. Ideally, but particularly if placement and compaction is to take place during the wet season, they shall contain no more than five percent fines (silt and clay size particles passing the number 200 mesh sieve). All fills shall be placed in thin lifts not exceeding ten inches in loose thickness. Each lift shall be compacted to at least 95 percent of the maximum dry density, as determined by ASTM Test Method D-1557-78 (Modified Proctor), before any additional fill is placed and compacted. In-place density tests shall be performed at random locations within each lift of the fill to verify this degree of compaction is being achieved. Walls over 4 feet in height must be designed by a licensed engineer.

6. Fill Construction and Reinforcement

    a. For rockeries 8 feet in height and less, the fill shall be overbuilt beyond the location of the fill face to be protected. See Standard Drawing 8-300.

b. For rockeries greater than 8 feet in height, the fill shall be reinforced using a geogrid or geotechnical fabric. This form of construction requires a design by the geotechnical engineer for each specific use. The vertical spacing of the reinforcement, the specific type of reinforcement, and the distance to which it must extend back into the fill, and the amount of lapping must be determined on a rockery-by-rockery basis. See Standard Drawing 8-310.

7. Rockery Keyway - A keyway consisting of a shallow trench of between twelve (12) and eighteen (18) inches in depth shall be constructed the full length of the rockery, and inclined back slightly towards the face being protected. It shall be dug as wide as the rockery (including the width of the rock filter layer). The keyway subgrade shall be firm and to the geotechnical engineer's satisfaction.

8. Keyway and Rockery Drainage - On completion of keyway excavation, a shallow ditch or trench, approximately twelve (12) inches wide and deep, shall be dug along the rear edge of the keyway. A minimum four-inch diameter perforated or slotted drain pipe, or equivalent approved by the engineer, shall be placed in this shallow trench and shall be bedded on and surrounded by a free-draining rock. This drain pipe shall be installed with sufficient gradient to initiate flow, and shall be connected to a positive and permanent discharge.

   a. Positive and permanent drainage shall be considered to mean an existing, or to be installed, storm drain system, a swale, ditch or other form of surface water flow collection system, a detention or retention pond, or other stable native site feature or previously installed collection system.

9. Rockery Thickness - The individual rockery thickness, including the rock filter layer, shall be at least 40 percent of the rockery height as a guide. The individual rocks shall be arranged in a single course thick, when measured to include the filter layer is equal to the required rockery thickness.

10. Rock Selection - Rock shall be as nearly rectangular as possible. Any rock of basically rounded or tetrahedral form shall be rejected or used for filling large void spaces. The rock material shall be hard, sound, durable, and free from weathered portions, seams, cracks, and other defects.

11. Rock Placement - The first course of rock shall be placed on firm unyielding soil. There shall be full contact between the rock and soil. The bottom of the first course of rock shall be a minimum of twelve (12) inches below the lowest adjacent site grade.
    Rocks shall be placed so that there are no continuous joint planes in either the vertical or lateral direction. Each rock shall bear on at least two rocks below it. The final course shall have a continuous appearance and be placed at the base of the facing so that it will be stable and have a stable appearance.

12. Face Inclination - The face of the rockery shall be inclined at a gradient of about 1:6 (Horizontal: Vertical) back towards the face being protected.

13. Voids - rock selection and placement shall be such that there will be minimum voids and, in the exposed face, no open voids over six (6) inches across in any direction. After setting each course of rock, all voids between the rocks shall be chinked on the back with quarry rock to eliminate any void sufficient to pass a two-inch square probe.

14. Filter Layer - A drainage filter shall be installed between the rear face of the rockery and the solid face being protected. This filter layer shall be at least twelve (12) inches thick (18 inches for walls greater than 8 feet in height). It shall be composed of two to four inch quarry spalls or other material approved by the geotechnical engineer. The material shall be placed in lifts to an elevation approximately six (6) inches below the top of each course of rocks as they are placed, until the uppermost course is placed. Any such material spilling onto the bearing surface of one rock course shall be removed before setting the next course.

15. Surface Drainage - Surface drainage from above the rockery shall be intercepted and directed away from the rockery to a positive and permanent discharge well below and beyond the toe of the rockery.

8-22 PAVEMENT MARKING AND DELINEATION

Refer to WSDOT Standard Plan M9.50-02, M-9.60-02, M15.10-01, M17-10-02, and M-24.40-02 or their successor(s).

The developer is responsible for providing all pavement marking and delineation. Roadway pavement markings and other delineators shall be installed in accordance with the U.S. Department of Transportation's Manual of Uniformed Traffic Control Devices most recent edition, except as noted in this section.

The City of Bainbridge has the following pavement marking requirements:

A. All pavement markings with the exception of paint striping shall be installed with thermoplastic material.

B. Except for Arterial Roadways and intersections, stop lines shall be 18 inches in width.

C. Speed hump markings shall comply with Figure 3B-29-Option A, in the MUTCD.

8-23 TRAFFIC CONTROL SIGNS

Refer to WSDOT Standard Plan K-80.10-01 or its successor.

The developer is responsible for providing all traffic control signs. All traffic control signs and installations must comply with the latest edition of the Manual of Uniformed Traffic Control Devices (MUTCD), as modified by the Washington State Transportation Commission per RCW 47.36.030.

8 – 24 STREET DESIGNATION SIGNING

A. DESCRIPTION

This work shall consist of furnishing and installing street designation signing in accordance with the Plans, these Specifications, and the Standard Plans at the locations shown in the Plans or where designed by the Engineer.

B. MATERIALS

1. Sign Panels: Signs shall be constructed of extruded aluminum material conforming to ASTM B209 alloy 6061-T6 or alloy 5052-H36 or H38. Vertical dimension of sign shall be nine (9) inches and extruded aluminum thickness shall be ¼ inch at the outer edge and taper to 1/8 inch in the center portion of sign panel. Maximum horizontal dimension of the sign shall not exceed 42 inches. The panel shall have square corners.

2. Reflective Sheeting: Reflective sheeting shall be double-faced reflectorized engineer grade vinyl, color green. The reflective sheet shall cover the entire sign panel. No borders are to be present.

3. Lettering: Three types of lettering are defined for use on street designation signs. The lettering types are as follows:

    a. Identification – defines the type for street. Types of streets may include but are not limited to Road (RD), Drive (DR), Place (PL), Court (CT) and Avenue (AV).

    b. Section of City – defines the orientation of the street within the City of Bainbridge Island roadway system coordinates. Orientation designations include North (N), East (E), South (S), West (W), and all intermediate directions such as Northeast (NE).

c. Proper Street Name – unique nomenclature by which the street shall be known and referenced. The Proper Street Name shall be attained by application to the City of Bainbridge Island. The City shall review the application for name redundancy and social appropriateness prior to granting the request.

Lettering shall be reflectorized engineer grade vinyl, color white. Lettering shall be six (6) inches in height, capitalized and in Helvetica font. When sign space in limited, Identification and Section of City lettering shall be no less than three (3) inches in height. Standard abbreviations are allowed for Identification and Section of City lettering as illustrated in the proceeding section, items "a" and "b". Standard abbreviations shall not exceed two (2) letters per abbreviation. Abbreviations shall not be used for Proper Street Name. A 1 ½ inch margin shall be maintained around the sign perimeter between the outside edge of the sign and the lettering. Section of City lettering shall be placed either prior to the Proper Street Name or following the Identification in accordance with the City authorized name.

4. Sign Posts: The City Engineer or Engineer's Representative shall determine the type of post to be used for each application. Wood sign posts will typically be used in unpaved areas, and steel sign posts will typically be used in paved areas. All sign posts shall be installed plumb.

Wood Sign Posts: Wood sign posts shall consist of one solid untreated Western cedar timber and shall conform to guidelines for Construction Grade (Light Framing, Section 122-b West Coast Lumber Inspection Bureau or Section 40.11 Western Wood Products Association). Posts by definition are presumed square and shall have a four (4) inch nominal thickness. Posts shall not be wrapped or encased in any other materials.

Steel sign posts shall be 2" square by 12' long, perforated or knockout plugged, galvanized tube steel. Posts will be formed from cold rolled steel strip which has been zinc coated and is commercial quality (1.25 oz.) conforming to ASTM Specification A-525.

Steel sign posts installed at the time of paving shall be inserted into a sleeve embedded in the new pavement. The sleeve shall be galvanized, perforated steel, 2 ¼" x 2 ¼" x 24" long, wrapped in duct tape before embedment to prevent penetration of debris through the bottom and perforations. Before placement, a minimum 4" long bolt shall be inserted horizontally through the bottom row of perforations to prevent the sleeve from being pulled out of the pavement. 2" of the sleeve shall be exposed vertically above the pavement. Once the sign post is inserted into the sleeve, the two shall be fastened together with a 5/16" galvanized corner bolt or straight bolt.

Steel sign posts installed on existing pavement shall be inserted into a 24" long sleeve as specified above. The sleeve shall be centered and welded, full perimeter, to a galvanized 1/4" thick by 10" square steel plate. The plate shall have four 5/8" diameter holes, one per corner, and shall be fastened to the pavement using four galvanized anchor bolts, ½" x 5 ½". Once the sign post is inserted into the sleeve, the two shall be fastened together with a 5/16" galvanized corner bolt or straight bolt.

5. Sign Mounting Hardware: shall be made of stainless or galvanized steel. Wood post hardware shall consist of two (2) 5/16" x 21/2" lag bolts and two 5/16" flat washers, per sign. Post cap shall be made of cast aluminum that if four (4) inches by (4) inches.

   Steel post hardware shall consist of two (2) 5/16" x 2" hex head bolts, two (2) 5/16 flat washers, and two 2) hex nuts, per sign.

C. CONSTRUCTION REQUIREMENTS

Each street sign and mounting post to be erected in the right-of-way (ROW) must meet the following requirement:

1. Application and Issuance of a City of Bainbridge Island ROW permit.

2. No signs are to be placed in a ditch line, bio-swale or other stormwater drainage course.

3. No signs may be placed within two (2) feet of the paved or graveled driving surface.

4. Each mounting posted shall be buried to a minimum depth of two (2) feet.

5. Each sign mounted on a post shall be seven (7) feet from the bottom of the sign to the finish grade.

6. No mounting post shall extend beyond the top of the mounted sign.

7. Mounting posts shall be backfilled with gravel material in accordance with WSDOT Standard Specification 9-03.9(3) for Crushed Surfacing Base Course. Native material and concrete shall not be used as backfill.

City of Bainbridge Island - Approved Street Tree List

Large Columnar Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Acer nigrum 'Green Column' Green Column Black Sugar Maple	50	10	No	6	Good close to buildings
Fraxinus americana 'Empire' Empire Ash	50	25	No	6	Use for areas adjacent to taller buildings when ash tree is desired species
Ginko biloba 'Princeton Sentry' Princeton Sentry Ginkgo	40	15	No	6	Very narrow growth
Nyssa sylvatica Tupelo	60	20	No	6	Handsome chunky bark
Quercus 'Crimschmidt' Crimson Spire Oak	45	15	No	6	Hard to find in the nursery trade
Quercus frainetto Italian Oak	50	30	No	6	Drought resistant – beautiful green, glossy leaves in summer.
Quercus robur 'fastigiata' Skyrocket Oak	40	15	No	6	Columnar variety of oak
Taxodium distichum 'Mickelson' Shawnee Brave Bald Cypress	55	20	No	6	Deciduous conifer - tolerates city conditions

Large Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Acer saccharum 'Bonfire' Bonfire Sugar Maple	50	40	No	6	Fastest growing sugar maple
Acer saccharum 'Commemoration' Commemoration Sugar Maple	50	35	No	6	Resistant to leaf tatter
Acer saccharum 'Green Mountain' Green Mountain Sugar Map	45	35	No	6	Reliable fall color
Acer saccharum 'Legacy' Legacy Sugar Maple	50	35	No	5	Limited use - where sugar maple is desired in limited planting strip area
Aesculus flava Yellow Buckeye	60	40	No	6	Least susceptible to leaf blotch – large fruit – fall color is varied, but quite beautiful
Cercidiphyllum japonicum Katsura Tree	40	40	No	6	Needs lots of water when young – can produce large surface roots.
Fagus sylvatica Green Beech	50	40	No	6	Silvery-grey bark

Fagus sylvatica 'Asplenifolia' Fernleaf Beech	60	50	No	6	Beautiful cut leaf
Fraxinus latifolia Oregon Ash	60	35	No	6	Only native ash in PNW

Large Trees, Continued

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Fraxinus pennsylvanica 'Patmore' Patmore Ash	45	35	No	6	Extremely hardy, may be seedless
Fraxinus pennsylvanica 'Urbanite' Urbanite Ash	50	40	No	6	Tolerant of city conditions
Ginkgo biloba 'Magyar' Magyar Ginkgo	50	25	No	6	More upright and narrow than 'Autumn Gold'
Gymnocladus dioicus 'Espresso' Espresso Kentucky Coffee	50	35	No	6	Very coarse branches - extremely large bi-pinnately compound leaves
Liquidambar styraciflua 'Rotundiloba' Rotundiloba Sweetgum	45	25	No	8	Only sweetgum that is entirely fruitless. Smooth rounded leaf lobes
Liriodendron tulipifera Tulip Tree	60	30	No	8	Fast-growing tree – can get very large in open conditions
Metasequoia glyptostroboides Dawn Redwood	50	25	No	6	Fast growing deciduous conifer
Platanus x acerifolia 'Bloodgood' Bloodgood London Planetree	50	40	No	8	More anthracnose resistant than other varieties – large tree that needs space
Platanus x acerifolia 'Yarwood' Yarwood London Planetree	50	40	No	8	High resistance to powdery mildew
Quercus bicolor Swamp White Oak	60	45	No	8	Interesting shaggy peeling bark
Quercus coccinea Scarlet Oak	60	40	No	6	Best oak for fall color
Quercus garryana Oregon Oak	50	40	No	8	Native to Pacific Northwest
Quercus imbricaria Shingle Oak	60	50	No	6	Nice summer foliage - leaves can persist throughout the winter
Quercus muhlenbergii Chestnut Oak	60	50	No	6	Coarsely toothed leaf
Quercus robur English Oak	60	40	No	8	Large, sturdy tree. Acorns do not need dormant cold period to germinate, so can be invasive.

Quercus rubra Red Oak	60	45	No	8	Fast growing oak – large tree that needs space
Quercus velutina Black Oak	60	50	No	8	More drought tolerant than red oak
Taxodium distichum Bald Cypress	55	35	No	8	A deciduous conifer, broadly spreading when mature – columnar when young

Large Trees, Continued

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Ulmus 'Homestead' Homestead Elm	60	35	No	6	Complex hybrid - close in form to American elm - Resistant to Dutch elm disease
Ulmus 'Frontier' Frontier Elm	50	35	No	6	Resistant to Dutch elm disease
Zelkova serrata 'Greenvase' Green Vase Zelkova	45	40	No	6	Attractive exfoliating bark provides Winter appeal. Dark green leaves turn orange-red and purple in Fall
Zelkova serrata 'Village Green' Village Green Zelkova	40	40	No	6	Green Vase, Mussichino and Halka are improved forms

Medium / Large Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Acer campestre Hedge Maple	50	30	No	5	Contrary to its name, this is not a small tree – nice overall shape and structure
Acer campestre 'Evelyn' Queen Elizabeth Hedge Maple	40	30	No	5	More upright branching than the species.
Acer freemanii 'Autumn Blaze' Autumn Blaze Maple	50	40	No	6	Cross between red and silver maple – fast growing with good fall color
Acer miyabei 'Morton' *State Street Maple*	40	30	No	6	Similar to, but faster growing and larger than Hedge maple
Acer platanoides 'Emerald Queen' Emerald Queen Norway Maple	50	40	No	6	One of the fastest growing cultivars of Norway maple – **Do NOT plant within 1000' of greenbelts – can be invasive**

Acer platanoides 'Parkway' Parkway Norway Maple	40	30	No	6	Somewhat tolerant of verticillium wilt - **Do NOT plant within 1000' of greenbelts – can be invasive**
Acer pseudoplatanus 'Atropurpureum' Spaethii Maple	40	30	No	5	Leaves green on top purple underneath.
Acer rubrum 'Scarsen' Scarlet Sentinel Maple	40	25	No	6	Leaves are darker green and larger than those of other Red Maples, and they hold up well in summer heat.
Aesculus x carnea 'Briottii' Red Horsechestnut	30	35	No	6	Resists heat and drought better than other horsechestnuts
Betula jacquemontii Jacquemontii Birch	40	30	No	5	White bark makes for good winter interest – best for aphid resistance, but does have issues with Bronze Birch Borer
Corylus columa Turkish Filbert	40	25	No	5	Tight, formal, dense crown - not for areas with high pedestrian traffic as tree can have significant debris from nut production. **Great Plant Pick**
Fraxinus americana 'Autumn Applause' Autumn Applause Ash	45	25	No	6	Purple fall foliage - Compact tree - reportedly seedless
Fraxinus pennsylvanica 'Cimmzam' Cimmaron Ash	50	30	No	6	More upright than 'Patmore' with more bronze/cinnamon fall color
Ginko biloba 'Autumn Gold' Autumn Gold Ginkgo	45	35	No	6	Narrow when young

Medium / Large Trees, Continued

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Liquidambar styraciflua 'Moraine' Moraine Sweetgum	40	25	No	8	Light green foliage. More compact than other varieties of sweet gum. Brittle branches
Nothofagus antarctica Antarctic Beech	50	35	No	5	Rugged twisted branching and petite foliage – difficult to find in the nursery trade
Tilia americana 'Redmond' Redmond Linden	50	30	No	8	Pyramidal, needs extra water when young
Tilia cordata 'Greenspire' Greenspire Linden	40	30	No	6	Symmetrical, pyramidal form – sometimes has structural issues due to tight branch attachements
Ulmus parvifolia 'Emer II' Allee Elm	45	35	No	5	Exfoliating bark and nice fall color – Resistant to Dutch Elm Disease

Medium Columnar Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Acer platanoides 'Columnar' Columnar Norway Maple	45	15	No	5	Good close to buildings – **Do NOT plant within 1000' of greenbelts – can be invasive**
Acer rubrum 'Bowhall' Bowhall Maple	40	20	No	6	An upright, pyramidal form that is significantly wider than 'Armstrong' or 'Columnare'
Carpinus betulus 'Fastigiata' Pyramidal European Hornbeam	40	15	No	5	Broadens when older
Fagus sylvatica 'Dawyck Purple' Dawyck Purple Beech	40	12	No	6	Purple foliage.
Liriodendron tulipifera 'Fastigiatum' Columnar Tulip Tree	40	10	No	6	Good next to buildings – can have problems with tight branch angles
Malus 'Tschonoskii' Tschonoskii Crabapple	30	15	Yes	5	Sparse green fruit, pyramidal
Oxydendron arboreum Sourwood	35	12	No	5	Consistent and brilliant fall color
Prunus sargentii 'Columnaris' Columnar Sargent Cherry	35	15	No	8	Upright form. The cherry with the best fall color. Can suffer from brown rot in spring.
Prunus x hillieri 'Spire' Spire Cherry	30	10	Yes	6	One of the few 'wire friendly' columnar cherries. Can suffer from brown rot in spring.
Pyrus calleryana 'Cambridge" Cambridge Pear	40	15	No	5	Narrow tree with better branch angles and form than the species – brittle limbs may still be a problem with breakage due to ice or wet snow

Medium Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Acer grandidentatum 'Schmidt' Rocky Mt. Glow Maple	25	20	Yes	5	Intense red fall color - Limited availability in nursery trade
Acer rubrum 'Karpick' Karpick Maple	40	20	No	6	Finer texture than other narrow forms of columnar maple
Acer truncatum x A. platanoides 'Keithsform' Norwegian Sunset Maple	35	25	No	5	Reliable fall color - nice reddish orange
Acer truncatum x A. platanoides 'Warrensred' Pacific Sunset Maple	30	25	Yes	5	Limited use under higher wires

Betula albosinenesis var septentrionalis Chinese Red Birch	40	35	No	5	White and pink peeling bark
Carpinus caroliniana American Hornbeam	25	20	Yes	5	Outstanding fall color (variable – yellow, orange, red) – nice little tree
Cladrastis kentukea Yellowwood	40	40	No	5	White flowers in spring, resembling wisteria flower – blooms profusely only every 2 to 4 years – yellow/gold fall color
Cornus controversa 'June Snow' Giant Dogwood	40	30	No	5	Frothy, 6-inch clusters of white flowers in June
Cornus 'Eddie's White Wonder' Eddie's White Wonder Dogwood	30	20	Yes	5	A hybrid of C. florida and C. nuttalii
Crataegus crus-galli 'Inermis' Thornless Cockspur Hawthorne	25	30	Yes	5	Red persistent fruit
Crataegus phaenopyrum Washington Hawthorne	25	20	Yes	5	Thorny – do not plant in high use areas
Crataegus x lavalii Lavalle Hawthorne	25	20	Yes	5	Thorns on younger trees
Davidia involucrata Dove Tree	40	30	No	5	Large, unique flowers in May
Eucommia ulmoides Hardy Rubber Tree	50	40	No	6	Dark green, very shiny leaves – insignificant fall color
Fagus sylvatica 'Rohanii' Purple Oak Leaf Beech	50	30	No	6	Attractive purple leaves with wavy margins
Halesia monticola Mountain Silverbell	45	25	No	5	Attractive small white flower
Halesia tetraptera Carolina Silverbell	35	30	No	5	Attractive bark for seasonal interest
Koelreuteria paniculata Goldenrain Tree	30	30	Yes	5	Midsummer blooming – slow growing
Magnolia denudata Yulan Magnolia	40	40	No	5	6" inch fragrant white flowers in spring
Magnolia grandiflora 'Victoria' Victoria Evergreen Magnolia	25	20	Yes	5	Evergreen magnolia – can be damaged in years with wet, heavy snow
Magnolia kobus 'Wada's Memory' Wada's Memory Magnolia'	30	20	Yes	5	Does not flower well when young

Medium Trees, Continued

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments

City of Bainbridge Island - Approved Street Tree List

Ostrya virginiana Ironwood	40	25	No	5	Hop like fruit – slow growing
Phellodendron amurense 'Macho' Macho Cork Tree	40	40	No	5	This variety is fruitless – fall color can be varied. High drought tolerance
Prunus cerasifera 'Krauter Vesuvius' Vesuvius Flowering Plum	30	20	Yes	5	Burgundy colored leaves – tree best used as an accent rather than in mass plantings
Pterostyrax hispida Fragrant Epaulette Tree	40	30	No	5	Pendulous creamy white flowers – fragrant – difficult to find in the nursery trade
Pyrus calleryana 'Aristocrat' Aristocrat Pear	40	30	No	5	One of the tallest flowering pears – good branch angles, but wood is brittle. **Reported as invasive in other areas.**
Pyrus calleryana 'Glen's Form' Chanticleer or Cleveland Select Pear	40	20	No	5	Selected variety of callery pear – good spring flowering. **Reported as invasive in other areas**
Pyrus calleryana 'Redspire' Redspire Pear	35	25	No	5	Selected variety of callery pear – good spring flowering. **Reported as invasive in other areas**
Quercus Ilex Holly Oak	40	30	No	5	Evergreen oak - Underside of leaf is silvery-white. Often has a prominent umbrella form
Rhamnus purshiana Cascara	30	20	Yes	5	Native tree – fall color depends on exposure – purplish fruit feeds many native birds
Robinia x ambigua Pink Idaho Locust	35	25	No	5	Fragrant flowers. Sterile variety. Drought tolerant. Some varieties will sucker profusely.
Sophora japonica 'Regent' Japanese Pagodatree	45	40	No	6	Has a rapid growth rate and tolerates city conditions, heat, and drought.
Sorbus aucuparia 'Mitchred' Cardinal Royal Mt. Ash	35	20	No	5	A vigorous tree with upright branches and a very symmetrical habit. Leaves are silvery underneath.
Sorbus x hybridia Oakleaf Royal Mt. Ash	30	20	Yes	5	It has leaves which are similar to English oak, and interesting bark for seasonal features.
Styrax japonica Japanese Snowbell	25	25	Yes	5	Reliable and easy to grow, it has plentiful, green ½" inch seeds. Flowers similar to lily in the valley
Tilia cordata 'De Groot' De Groot Littleleaf Linden	30	20	Yes	5	One of the smaller stature littleleaf lindens.
Tilia cordata 'Chancole' Chancelor Linden	35	20	No	6	Pyramidal when young. Fragrant flowers that attract bees.
Ulmus parvifolia 'Emer I' Athena Classic Elm	30	35	No	5	High resistance to Dutch Elm Disease. Drought resistant. Cinnamon colored exfoliating bark for seasonal interest.

Small Columnar Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Maackia amurensis Amur Maackia	30	20	Yes	5	Interesting exfoliating bark – flowering in June or July - varies in intensity from year to year
Malus 'Adirondack' Adirondack Crabapple	20	10	Yes	5	Very resistant to apple scab – one of the narrowest crabapples – persistant reddish ¼" fruit
Malus 'Red Barron' Red Barron Crabapple	20	10	Yes	5	Deep pink blossom and persistent red berries for seasonal interest
Prunus serrulata 'Amanogawa' Amanogawa Flowering Cherry	20	8	Yes	6	Pinkish flower bud, changing to white flower.
Sorbus americana 'Dwarfcrown' Red Cascade Mountain Ash	20	10	Yes	5	Nice winter form - Red berries in clusters

Small Trees

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Acer buegerianum Trident Maple	30	30	Yes	5	Somewhat shrublike – must train to a single stem – interesting bark
Acer circinatum Vine Maple	25	25	Yes	5	Avoid using on harsh sites – native tree
Acer ginnala 'Flame' Flame Amur Maple	25	20	Yes	5	Clusters of small cream colored flowers in spring – very fragrant. Nice fall color. Informal branch structure.
Acer griseum Paperbark Maple	30	20	Yes	5	Peeling cinnamon colored bark for seasonal interest
Acer palmatum Japanese Maple	20	25	Yes	5	Many varieties available – select larger varieties for street planting
Acer platanoides 'Globosum' Globe Norway Maple	20	20	Yes	5	Very rounded crown and compact growth
Acer triflorum Three-Flower Maple	25	20	Yes	5	Multi seasonal interest with tan, exfoliating bark and red, orange/red fall color
Amelanchier grandiflora 'Princess Diana' Princess Diana Serviceberry	20	15	Yes	4	Good for narrower planting strips
Amelanchier x grandiflora 'Autumn Brilliance' Autumn Brilliance Serviceberry	20	15	Yes	4	Good for narrower planting strips – reliable bloom and fall color

Arbutus 'Marina' Strawberry Tree	25	20	Yes	5	Substitute for Pacific madrone – can suffer severe damage or death due to cold weather - evergreen
Asimina triloba Paw Paw	30	20	Yes	5	Burgundy flower in spring before leaves – difficult to find in nursery trade
Carpinus japonica Japanese Hornbeam	20	25	Yes	5	Wide spreading, slow growing – fall color is not outstanding.
Cercis canadensis Eastern Redbud	25	30	Yes	5	Deep pink flowers on bare twigs in spring

Small Trees, Continued

Scientific & Common Name	Mature Height	Spread	Under Wires?	Min Strip Width	Comments
Cercis siliquastrum Judas Tree	25	30	Yes	5	Deep pink flowers on bare twigs in spring – drought resistant
Cornus alternifolia Pagoda Dogwood	25	25	Yes	5	Small white flowers in flat clusters – fall color is varied
Cornus kousa 'Chinensis' Kousa Dogwood	20	20	Yes	4	Does not do well on harsh, dry sites
Cotinus obovatus American Smoke Tree	25	25	Yes	4	Showy pinkish panicles of flowers in the spring – reddish purple leaves on some varieties
Lagerstroemia 'tuscarora' Tuscarora Hybrid Crape Myrtle	20	20	Yes	4	Light cinnamon brown bark lends year round interest – drought resistant – likes a warm site
Magnolia 'Elizabeth' Elizabeth Magnolia	30	20	Yes	5	Yellowish to cream colored flower in spring
Magnolia 'Galaxy' Galaxy Magnolia	25	25	Yes	5	Showy pink flowers
Magnolia x loebneri Loebner Magnolia	20	20	Yes	5	Flower is 'star' shaped rather than tulip like – white to pinkish white in March or April
Malus 'Golden Raindrops' Golden Raindrops Crabapple	20	20	Yes	5	Disease resistant – persistent yellow fruit in fall and winter.
Malus 'Donald Wyman' Donald Wyman Crabapple	25	25	Yes	5	Large white blossom – nice green foliage in summer
Malus 'Lancelot' ('Lanzam') Lancelot Crabapple	15	15	Yes	4	Red flower buds, blooming white – red persistent fruit
Parrotia persica Persian Parrotia	30	20	No	5	Blooms before it leafs out – drought tolerant - Varied fall color - reds, oranges and yellows
Prunus 'Frankthrees' Mt. St. Helens Plum	20	20	Yes	5	Burgundy colored leaves – tree best used as an accent rather than in mass plantings

City Bainbridge Island - Approved Street Tree I t

Prunus 'Newport' Newport Plum	20	20	Yes	5	Burgundy colored leaves – tree best used as an accent rather than in mass plantings
Prunus 'Snowgoose' Snow Goose Cherry	20	20	Yes	5	This selection sports abundant white flowers and healthy green, disease-resistant foliage
Prunus cerasifera 'Thundercloud' Thundercloud Plum	30	20	No	5	Burgundy colored leaves – tree best used as an accent rather than in mass plantings – can produce significant fruit
Prunus x yedoensis 'Akebono' Akebono Flowering Cherry	25	25	Yes	6	Has masses of large, semi-double, pink flowers – most widely planted cherry in Pacific Northwest
Sorbus alnifolia Korean Mountain Ash	35	30	No	5	Simple leaves and beautiful pink/red fruit
Stewartia monodelpha Orange Bark Stewartia	30	20	Yes	5	Extraordinary cinnamon colored bark – avoid hot, dry sites.
Stewartia psuedocamellia Japanese Stewartia	25	15	Yes	5	Patchwork bark, white flower in spring
Styrax obassia Fragrant Styrax	25	20	Yes	5	Smooth gray bark and fragrant white flowers