

# SECTION 8 - ROAD ELEMENTS AND ROADSIDE FEATURES

## TABLE OF CONTENTS

---

SECTION	PAGE
8 - 01 STREET ENDS.....	1
8 - 02 MEDIANS.....	1
8 - 03 SURVEY MONUMENTS AND CORNERS.....	2
8 - 04 CURB DETAILS.....	3
8 - 05 CONCRETE SIDEWALKS.....	3
A. For Urban Areas.....	3
B. Curb Ramps (Wheelchair Ramps).....	4
C. Width.....	4
D. Thickness.....	4
8 - 06 ASPHALT WALKWAYS.....	4
8 - 07 MULTI-USE TRAIL.....	4
8 - 08 SPECIAL ACCESS EASEMENTS.....	5
8 - 09 BIKEWAYS OR BIKE LANES.....	5
8 - 10 DRIVEWAYS.....	5
8 - 11 SURFACING REQUIREMENTS.....	6
8 - 12 GUARDRAIL.....	7
8 - 13 BOLLARDS.....	7
8 - 14 ROADWAY BARRICADES.....	8
8 - 15 STREET ILLUMINATION.....	9
A. Street Light Construction.....	9
8 - 16 MAIL BOXES.....	11
A. City Engineer Responsibility.....	11
B. Local postmaster responsibility.....	11
C. Owner or resident responsibility.....	12
D. Developer/contractor responsibility.....	12
E. Installation Methods.....	12
8 - 17 SIDE SLOPES.....	13
8 - 18 STREET TREES AND LANDSCAPING.....	13
8 - 19 ROADSIDE OBSTACLES.....	13

---

Revise July 2002

# SECTION 8 - ROAD ELEMENTS AND ROADSIDE FEATURES

## TABLE OF CONTENTS

---

8 - 20	SAFETY RAILS .....	14
8 - 21	ROCK WALLS (ROCKERIES).....	14
A.	<i>Materials</i> .....	14
B.	<i>Rockery Construction</i> .....	15
8-22	TRAFFIC CONTROL SIGNS.....	17
8 - 23	STREET DESIGNATION SIGNING - (REVISED 8-23.4.5 MARCH 2004).....	18
A.	<i>DESCRIPTION</i> .....	18
B.	<i>MATERIALS</i> .....	18
C.	<i>CONSTRUCTION REQUIREMENTS</i> .....	20

## 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, 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.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

### **8 - 04 CURB DETAILS**

See Standard Drawings 8-040, 8-050.

Vertical Curb and Gutter 18 inches wide or curb alone 6 inches wide and 12 inches high (see Standard Detail 8-040) 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.

### **8 - 05 CONCRETE SIDEWALKS**

See Standard Drawings 8-060, 8-070, 8-090, 8-100.

#### **A. FOR URBAN AREAS**

Concrete sidewalks shall be provided as indicated in the City's Comprehensive Plan. 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. Paragraphs 1 and 2 may be waived or modified by the city engineer in the following cases:

1. On existing streets where it would be unduly difficult or impractical to construct a sidewalk due to grade and/or construction problems.
2. In subdivisions where the proposed design provides for a comprehensive internal walkway system outside of public right-of-way.

The concrete sidewalk requirements specified above may be waived in favor of asphalt walkways by the city engineer when conditions dictate a flexible pavement design. The width of asphalt walkways when constructed behind a curb and gutter section shall conform to those for concrete sidewalks.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

### B. CURB RAMPS (WHEELCHAIR RAMPS)

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.

See Standard Drawings 8-060, 8-070, and 8-080.

### C. WIDTH

1. Sidewalks fronting residential property uses shall be constructed of Portland Cement Concrete, 5 foot minimum width.
2. Sidewalk fronting commercial or industrial property uses shall be constructed of Portland Cement Concrete, 7 feet minimum (excluding curb) width.
3. 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.
4. 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.
5. 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, 5 inches thick when placed behind rolled curb, and 6 to 8 inches thick at dropped curb driveways (see Standard Drawings 8-120, 8-130, 8-140).

### **8 - 06 ASPHALT WALKWAYS**

Surfacing details for shoulder and off-shoulder asphalt walkways are specified in Section 8-11. See Standard Drawing 8-110.

### **8 - 07 MULTI-USE TRAIL**

Multi-use trails may be used as a substitute for Portland Cement Concrete sidewalks or asphalt walkways in rural areas for equestrian usage or as determined by the city engineer.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

Multi-use trails shall be a minimum of 6 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 4 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. Pedestrian access easements or tracts shall be a minimum of 5 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. Widths vary according to AASHTO Standards for Class I, II, and III Bikeways.

### **8 - 10 DRIVEWAYS**

See Standard Drawings 8-120, 8-130, 8-140, 8-150, 8-160, 8-170, 8-175 and 8-180.

For residential property uses utilizing vertical curbs, access points shall be constructed as shown on Standard Drawing 8-130, Drop Curb Driveway-Residential with Planter.

For commercial or industrial property uses utilizing vertical curbs, access points shall be constructed as shown on Standard Drawing 8-140, Drop Curb Driveway-Commercial/Industrial.

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.

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.

<u>Facility</u>	<u>Surfacing Requirements</u>
1. Arterials	Per specific design
2. Non-arterials	See Standard Drawings 7-020, 7-030, 7-040, 7-050, 7-060, 7-065 and 7-066
3. Concrete Sidewalks	4" Portland Cement Concrete (adjacent to vertical curb) 5" Portland Cement Concrete (adjacent to rolled curb) 6" or 8" Portland Cement Concrete (adjacent to dropped curb)
4. Asphalt Shoulder	Same as 1 or 2 above (road shoulder)
5. Asphalt Walkway	2" Class B ACP (Modified) (off-shoulder) over 2" CSTC
6. Multi-Use Trail	4" of ¾" minus crushed rock or cinders
7. Bikeway	Same as 1 or 2 (road shoulder)
8. Bikeway	2" Class B ACP over (off-road) 2" CSTC

Arterial road/streets shall be designed with a structural section that takes into account 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.

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.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

Pavement markings when required by the Engineer shall be hot applied or cold applied thermoplastics, reflectorized, in accordance with Section 8-22 of the WSDOT/APWA Specifications. Painted markings may be used when approved by the Engineer.

Modified Class B ACP for Off-Shoulder Walkway. ACP Class B shall be modified by elimination of the coarse aggregate; i.e., substitute the 3/8" screen for the 5/8" screen.

The gradation requirements for gravel borrow as specified in WSDOT/APWA Specifications, Section 9-03.13, is superseded by the following:

GRAVEL BORROW		
% Passing	1-1/4" square opening	100*
% Passing	1/4" square opening	25 - 75
% Passing	US No. 40 sieve	0 - 25
% Passing	US No. 100 sieve	0 - 5
% Passing	Sand Equivalent	50 min.
All percentages by weight	Sand Equivalent	50 min.

\* The largest aggregate shall be no larger than one-half the total depth of the gravel borrow course. If requested by the contractor, the screen size may be increased with the Engineer's approval if the larger size aggregate will be necessary.

### 8 - 12            **GUARDRAIL**

Evaluation of embankments for guardrail installations shall be in accordance with Chapter 710 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. Signs shall be similar to a Type I barricade as shown in Standard Drawing 8-200. 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 Standard Drawings 8-190, 8-200, 8-210.

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 equal to or greater than the minimum required for that sidewalk.

**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.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

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.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

### 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 his 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 6 feet of clearance around the mailboxes.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

### 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

(RESERVED)

### 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 posted speeds greater than 35 mph, clear zone distances are contained within Chapter 710, Traffic Barriers, of the WSDOT Design Manual. The same distances are also included in Appendix 1, entitled "Control Zone Guidelines - Utilities" of the WSDOT Utility Manual.

- 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 his/her 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

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

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 hydroseeding 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 his/her 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.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

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.

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

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 TRAFFIC CONTROL SIGNS

The developer is responsible for providing all traffic control signs. Traffic control signing shall comply with the provisions as established by the U.S. Department of Transportation on Uniform Traffic Control Devices (MUTCD) most recent edition with two exceptions.

1. Stop Signs shall be 30 inches in diameter with high intensity reflectorization sheeting.
2. Mounting height shall be seven (7) feet from the bottom of the sign to the finished grade.

8 – 23      **STREET DESIGNATION SIGNING - (Revised 8-23.4.5 March 2004)**

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 is 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

## ROAD ELEMENTS AND ROADSIDE FEATURES

---

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 2 1/2" 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 ditchline, 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 post 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.