Chapter 1030 Delineation

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1030.01 General

The primary function of delineation is to provide the visual information needed by a driver to operate a vehicle in a variety of situations. Delineation includes the marking of highways with painted or more durable pavement marking lines and symbols, guideposts, and other devices such as curbs. These devices can use retroreflectance, which is the reflecting of light from a vehicle's headlights back to the driver, to enhance an object's visibility at nighttime.

Delineation is a required design element (see Chapter 1105) on most projects. A decision to omit delineation is possible if the existing delineation is unaffected by construction and a safety performance evaluation (see Chapter 321) clearly shows that delineation is not a contributing factor to crashes. The Washington State Department of Transportation (WSDOT) uses the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) as a guide for the design, location, and application of delineation.

Consult with the Region Transportation Operations Office early in the design process to ensure the proposed delineation is compatible with current WSDOT policy and guidance regarding types of markings and material selection.

1030.02 Definitions

The following terms are defined in the Glossary of Terms:

- Delineation;
- extrude;
- mcd/m2/lux;
- pavement marking;
- pavement marking beads;
- pavement marking durability;
- retroreflection, coefficient of (RL);
- traffic paint;
- and wet film thickness.

1030.03 Pavement Markings

1030.03(1) Pavement Marking Types

Pavement markings have specific functions: they guide the movement of traffic, and they promote increased safety performance. In some cases, they are used to supplement the messages of other traffic control devices.

In other cases, markings are the only way to convey a message without distracting the driver. Pavement markings are intended to provide adequate performance year-round. Guidelines for the application of various pavement markings are provided in the Standard Plans Section M and the MUTCD.

1030.03(1)(a) Longitudinal Pavement Markings

Longitudinal pavement markings define the boundary between opposing traffic flows, and they identify the edges of traveled way, multiple traffic lanes, turn lanes, and special-use lanes. The Standard Plans Section M shows the dimensions of longitudinal pavement markings. Longitudinal pavement markings are as follows:

Barrier Centerline: A very wide—18 inches minimum, usually 20 inches: five 4-inch lines—solid yellow line or a combination of two single 4-inch solid yellow lines with yellow crosshatching between the lines, with a total width not less than 18 inches, used to separate opposing traffic movements where all movements over the line are prohibited. Barrier centerline locations require the approval of the Region Traffic Engineer and Access Engineer.

Centerline: A broken yellow line used to separate lanes of traffic moving in opposite directions, where passing in the opposing lane is allowed.

Dotted Extension Line: A broken white or yellow line that is an extension of an edge line or centerline used at exit ramps, intersections on horizontal curves, multiple turn lanes, and other locations where the direction of travel for through or turning traffic is unclear.

Double Centerline: Two parallel solid yellow lines used to separate lanes of traffic moving in opposite directions where passing in the opposing lane is prohibited.

Double Lane Line: Two solid white lines used to separate lanes of traffic moving in the same direction where crossing the lane line marking is prohibited.

Double Wide Lane Line: Two solid wide white lines used to separate a concurrent preferential lane of traffic where crossing is prohibited.

Drop Lane Line: A wide broken white line used in advance of a wide line to delineate a lane that ends at an off-ramp or intersection.

Edge Line: A solid white or yellow line used to define the outer edges of the traveled way. Edge lines are not required where curbs or sidewalks are 4 feet or less from the traveled way.

Lane Line: A broken white line used to separate lanes of traffic moving in the same direction.

No-Pass Line: A solid yellow line used in conjunction with a centerline where passing in the opposing lane is prohibited.

Reversible Lane Line: Two broken yellow lines used to delineate a lane where traffic direction is periodically reversed.

Solid Lane Line: A solid white line used to separate lanes of traffic moving in the same direction where crossing the lane line marking is discouraged.

Two-Way Left-Turn Centerline: Two yellow lines, one solid and one broken, used to delineate each side of a two-way left-turn lane.

Wide Broken Lane Line: A wide broken white line used to designate a portion of a high-occupancy vehicle (HOV) lane located on a divided highway where general-purpose vehicles may enter to make an exit.

Wide Dotted Lane Line: A wide broken white line used to designate a portion of a high-occupancy vehicle (HOV), or business access and transit (BAT) lane located on an arterial highway where general-purpose vehicles may enter to make a turn at an intersection.

Wide Lane Line: A wide solid white line used to separate lanes of traffic moving in the same direction, at ramp connections, storage lanes at intersections, and high-occupancy vehicle (HOV) lanes, or at business access and transit (BAT) lanes, bike lanes, and other preferential lanes where crossing is discouraged.

See MUTCD Chapter 3B for further information for these markings.

1030.03(1)(b) Transverse Pavement Markings

Transverse pavement markings define pedestrian crossings and vehicle stopping points at intersections. They are also used to warn motorists of approaching conditions, required vehicular maneuvers, or lane usage. See the Standard Plans Section M for details of some of these pavement markings. Typical transverse pavement markings are as follows:

Access Parking Space Symbol: A white marking used to designate parking stalls provided for motorists with disabilities. The marking may have an optional blue background and white border.

Aerial Surveillance Marker: White markings used at one-mile and one-half-mile intervals on sections of highways where the State Patrol uses airplanes to enforce speed limits.

Bicycle Lane Symbol: A white marking consisting of a symbol of a bicyclist and an arrow used in a marked bike lane. The bicycle lane symbol is to be placed immediately after an intersection and at other locations as needed (see the MUTCD). Typical spacing is 500 feet, with a maximum distance of 1,500 feet.

Crosswalk Line: A series of parallel solid white lines used to define a pedestrian crossing.

Drainage Marking: A white line used to denote the location of a catch basin, grate inlet, or other drainage feature in the shoulder of a roadway.

HOV Symbol: A white diamond marking used for high-occupancy vehicle lanes. The spacing of the markings is an engineering judgment based on the conditions of use. Typical spacing is 1000 feet for divided highways and 500 feet for arterial highways.

Railroad Crossing Symbol: A white marking used in advance of a railroad crossing where grade crossing signals or gates are located or where the posted speed of the highway is 40 mph or higher.

Stop Line: A solid white line used to indicate the stopping point at an intersection or railroad crossing.

Traffic Arrow: A white marking used in storage lanes and two-way left-turn lanes to denote the direction of turning movement. Arrows are also used at ramp terminals and intersections on divided highways to discourage wrong-way movements.

Traffic Letters: White markings forming word messages, such as “ONLY,” used in conjunction with a traffic arrow at drop-lane situations. Traffic letters are not required for left- and right-turn storage lanes where the intended use of the lane is obvious.

Wide Line: A wide solid line used for traffic islands, hash marks, chevrons, and other applications. A wide line used in conjunction with a centerline marking shall be yellow. A wide line used in conjunction with a lane line or right edge line marking shall be white.

Yield Line Markings: A series of white triangular markings indicating that the lane yields.

1030.03(2) Pavement Marking Materials

Pavement markings are applied using various materials. These materials are divided into two categories: paint and plastic. When selecting the pavement marking material to use in a project, consider the initial cost of the material and its durability; the location; the traffic conditions; the snow and ice removal practices of the particular maintenance area; and the region’s ability to maintain the markings.

Both painted and plastic pavement markings can accomplish the goal of providing a visible (daytime) and retroreflective (nighttime) pavement marking at the completion of a contract. The difference between the two marking materials is the projected durability of the markings. Paint used on sections of highway subjected to high traffic volumes and/or snow-removal operations might have a durability of only two to three months. Maintenance crews cannot restripe a highway during winter months; therefore, if a painted marking wears out prematurely, the highway will not have a stripe until maintenance crews can restripe in April or May. When these conditions are encountered in a highway project, consider a more durable plastic marking material and application type that will provide the desired durability for the marking.

Check with your Region Transportation Operations Office for any specific pavement marking policy. For the recommended pavement marking material for different highway types and snow-removal practices, see Exhibit 1030-1. Consult with the Region's Transportation Operations and Maintenance offices to select the best material for the project.

1030.03(2)(a) Paint

Paint is the most common pavement marking material. It is relatively easy to apply and dries quickly (30–90 seconds in warm, dry weather) after application. This allows the application to be a moving operation, which minimizes traffic control costs and delays to the roadway users. On construction contracts, paint is applied with two coats: the first coat is 10 mils thick, followed by a second coat 15 mils thick. The disadvantage of using paint as a pavement marking material is its limited durability when subjected to traffic abrasion, sanding, or snow-removal activities. Specify paint only where it will have a durability that will provide a retroreflective stripe until maintenance crews can repaint the line and extend its usefulness until the next repainting.

Paint is one of two material types dependent upon the solids carrier: solvent or water. The designer is encouraged to specify waterborne paint. Solvent paint is subject to a monetary penalty because it contains a high level of volatile organic compounds (VOCs). There is an Environmental Protection Agency (EPA) Clean Air Act penalty assessed on solvent paint that is passed on to those who purchase solvent paint in quantity.

Durable waterborne paint or high-build waterborne paint is formulated to allow application thicknesses greater than 15 mils. It is more durable than standard waterborne paint and provides additional service life. The additional thickness permits the use of larger beads that enhance wet night retroreflectivity.

Low-temperature waterborne paint is intended to extend the paint season later into the fall, although it may also be used earlier in the spring. The paint is formulated for application temperatures of 35° Fahrenheit and rising, though durability can be affected when applied during conditions where standard waterborne paint could have been used.

1030.03(2)(b) Plastic

Plastic markings have a higher installation cost than paint. They can, however, be a more cost-effective measure than paint because of their longer service life. Plastic marking materials may provide a year-round retroreflective pavement marking, while paint may not last until the next restriping. Plastic marking materials currently listed in the *Standard Specifications* include the following:

1030.03(2)(b)(i) Type A: Liquid Hot Applied Thermoplastic

Thermoplastic material consists of resins and filler materials in solid form at room temperature. The material is heated to a semiliquid, molten state (400° Fahrenheit) and is then applied to the roadway by spray or extrusion methods. This material can be used for both transverse and longitudinal line

applications. Special equipment is required for both the initial application and subsequent maintenance renewal. Sprayed material can be applied at a thickness of 30 mils and dries in 30 to 60 seconds.

The durability of material applied in this manner is slightly longer than that of paint. Extruded material is applied at a thickness of 125 mils and has a drying time of 15 minutes. This material can be applied as a flat line or applied with ridges or profiles (bumps) that enhance wet night visibility. These profiles produce a rumble effect similar to raised pavement markers when a vehicle crosses over the marking. (Profiles come in the shape of a raised bar at set intervals and are formed simultaneously with the extruded baseline.)

1030.03(2)(b)(ii) Type B: Preformed Fused Thermoplastic

This material consists of a mixture of pigment, fillers, resins, and beads that are factory produced in sheet form, 125 mils thick. The material is applied by heating (drying) the pavement and top heating the material. The heating process fuses the preformed thermoplastic material to the pavement surface. These materials, which are used for transverse markings, are available in white, red, blue, and other colors.

1030.03(2)(b)(iii) Type C: Cold Applied Preformed Tape

Preformed tape is composed of thermoplastic or other materials that are fabricated under factory conditions. After curing, the material is cut to size and shipped to the work site in rolls or in flat pieces. The material is then applied to the roadway with an adhesive on the underside of the tape. Preformed tape is available in 60, 90, or 125 mils (WSDOT does not currently specify 125 mil tape.) The most durable application of preformed tape is achieved when the tape is either inlaid (rolled) into hot asphalt with the top of the tape flush with the surface of the pavement or placed in a groove cut into the pavement surface with the top of the tape slightly below the surface of the pavement.

ASTM has classified preformed tape into two categories: Type 1 and Type 2. Type 1 tape has a profiled surface and a requirement to have a retroreflectivity of over 500 mcd/m2/lux. Type 1 tape has proven to be very durable. It is used on high-volume, high-speed highways. Type 2 tape has a flat surface and a requirement to have a retroreflectivity of over 250 mcd/m2/lux. Field tests show that Type 2 tape has a shorter durability than Type 1 tape.

1030.03(2)(b)(iv) Type D: Liquid Cold Applied Methyl Methacrylate (MMA)

Methyl methacrylate can be applied by either spraying or extrusion. Sprayed applications can be one or two coats, 30 to 45 mils thick. Extruded applications are 90 mils thick for asphalt concrete pavement or Portland cement concrete pavement, or 120 mils thick for open-graded asphalt pavement. MMA can also be extruded using specialized equipment to produce a textured line 150 mils thick. The material is not heated and can be applied within an approximate temperature range of 40° to 105° Fahrenheit, provided the pavement surface is dry. The material can be used for both transverse and longitudinal applications. The material can also be applied with profiles (bumps) that slightly enhance wet night retroreflectivity. The profiles also produce a rumble effect similar to raised pavement markers.

1030.03(2)(c) Beads

Glass beads are small glass spheres used in highway markings to provide the necessary retroreflectivity. The beads are dropped onto the wet marking material immediately after it is applied (drop-on beads) or premixed into the wet marking material.

Proper installation of glass beads is critical to achieving good pavement marking retroreflectivity. Each glass bead works like a light-focusing lens, reflecting light back to the driver. Glass beads are embedded into the

pavement marking material; for optimum performance, the bead is embedded between 55% and 60% of its diameter.

Large glass and composite beads are effective when roads are wet. Large glass or composite beads are not appropriate for standard mil paint as the paint is too thin to properly embed the large glass or composite beads; therefore, WSDOT specifies small glass or composite beads for such paint applications. The use of large glass or composite beads is limited to high-build waterborne paint and other materials with a thickness of at least 22 mils.

1030.03(3) Pavement Marking Application Types

There are five application types used for pavement markings. Most pavement marking applications are applied directly to the pavement surface. In steel bit snow plowing areas, the pavement markings may be inlaid or grooved to protect the markings.

Because they are higher than the surrounding pavement surface, pavement markings are subject to rapid wear caused by traffic and snowplows. As they wear, they lose visibility and retroreflectivity, particularly in wet weather. Wear on the stripes can be greatly reduced and their durability considerably increased by placing them in a shallow groove in the surface of the pavement.

1030.03(3)(a) Application Types

The five application types for pavement markings are:

1030.03(3)(a)(i) Flat Lines

Flat lines are pavement marking lines with a flat surface.

1030.03(3)(a)(ii) Profiled Marking

A profiled pavement marking consists of a baseline thickness and a profiled thickness, which is a portion of the pavement marking line that is applied at a greater thickness than the baseline thickness. Profiles are applied using the extruded method in the same application as the baseline. The profiles may be slightly rounded if the minimum profile thickness is provided for the entire length of the profile. (See the Standard Plans M-20.20 for the construction details.)

1030.03(3)(a)(iii) Embossed Plastic Line

Embossed plastic lines consist of a flat line with transverse grooves. An embossed plastic line may also have profiles. (See the Standard Plans M-20.20 for the construction details.)

1030.03(3)(a)(iv) Inlaid Plastic Line

Inlaid plastic line is constructed by rolling Type C tape into hot mix asphalt (HMA) with the finish roller. This application is used infrequently by WSDOT and is not in the Standard Specifications.

1030.03(3)(a)(v) Grooved Plastic Line

Grooved plastic line is constructed by cutting a groove into the pavement surface and spraying, extruding, or gluing pavement marking material into the groove. The groove depth is dependent upon the material used, the pavement surface, and the location. The groove is typically in the range of 20 to 250 mils deep and 4 inches wide. Coordinate with the Region Transportation Operation Office on the use and dimensions of grooved plastic line marking.

1030.03(4) Raised Pavement Markers

Raised pavement markers (RPMs) are installed as positioning guides with long line pavement markings. They can also be installed as a complete substitution for certain long line markings. RPMs have a durability of two years, and they provide good wet night visibility and a rumble effect. RPMs are made from plastic materials and are available in three different types:

- Type 1 markers are 4 inches in diameter, ¾ inch high, and non-reflectorized.
- Type 2 markers are 4 inches wide, 4 inches long, ¾ inch high, and reflectorized.
- Type 3 markers are 6, 8, 10, or 12 inches wide, 4 inches long, ¾ inch high, and non-reflectorized.

Type 2 RPMs are not used as a substitute for right edge lines. They may be used to supplement the right edge line markings at lane reductions, at sections with reduced lane widths such as narrow structures, and at the gore of exit ramps. All other applications supplementing right edge line markings require the approval of the Region Traffic Engineer.

Red-backed RPMs are not desired and thus are only used at the discretion of the Region Traffic Engineer for specific locations. Research regarding their effectiveness for addressing wrong-way driving has been inconclusive to date.

Type 3 RPMs are used in locations where additional emphasis is desired, including vehicle separations and islands. Obtain approval by the Region Traffic Engineer for all installations of Type 3 RPMs. Retain approval in the Design Documentation Package.

Reflectorized RPMs are not required for centerline and lane line applications in continuously illuminated sections of highway. However, if illumination policies (see Chapter 1040) affect a section of limited access roadway, coordinate with the Region Traffic Engineer for RPM placement details. If reflectorized RPMs are used at an intersection within an illuminated section, they are also to be used throughout that section.

For raised pavement marker application details, see the *Standard Plans*.

1030.03(5) Recessed Raised Pavement Markers

Recessed raised pavement markers (RRPMs) are raised pavement markers (RPMs) installed in a groove ground into the pavement in accordance with the *Standard Plans*. RRPMs provide guidance similar to RPMs in ice chisel and steel blade snow-removal areas. RRPMs can also be used in rubber or Cooper-style blade snow-removal areas in accordance with region policy.

Designers should be aware that the performance of RRPMs can be compromised, especially on curves, because the groove can block motorists' view of the markers. Also, the groove for RRPMs installed on flat grades can fill with water during rain events and cause the RRPM to be non-reflective.

RRPMs, when specified, are installed at the locations shown in the *Standard Plans* for Type 2W RPMs on multilane one-way roadways and Type 2YY RPMs on two-lane two-way roadways.

Do not recess side-to-side RPMs on wide dotted lane lines. For recessed pavement marker application details, see the *Standard Plans*.

1030.04 Guideposts

1030.04(1) General

Guideposts are retroreflective devices installed at the side of the roadway to indicate alignment. They are guidance devices rather than warning devices. Guideposts are used as an aid to nighttime driving primarily on horizontal curves; multilane divided highways; ramps; tangent sections where they can be justified due to snow, fog, or other reduced-visibility conditions; and at intersections without illumination.

1030.04(1)(a) Types of Guideposts

The retroreflective device may be mounted on either a white or brown post. The types of guideposts and their application are as follows:

1030.04(1)(a)(i) Type W

Type W guideposts have silver-white reflective sheeting, are facing traffic, and are used on the right side of divided highways, ramps, right-hand acceleration and deceleration lanes, intersections, and ramp terminals.

1030.04(1)(a)(ii) Type WW

Type WW guideposts have silver-white reflective sheeting on both sides and are used on the outside of horizontal curves on two-way undivided highways.

1030.04(1)(a)(iii) Type Y

Type Y guideposts have yellow reflective sheeting, are facing traffic, and are used on the left side of ramps, left-hand acceleration and deceleration lanes, ramp terminals, intersections on divided highways, median crossovers, and horizontal curves on divided highways.

1030.04(1)(a)(iv) Type YY

Type YY guideposts have yellow reflective sheeting on both sides and are used in the median on divided highways.

1030.04(1)(a)(v) Type IC1

Type IC1 guideposts have silver-white reflective sheeting on both sides and an additional silver-white piece of reflective sheeting below the standard silver-white sheeting on the side facing traffic. They are used at intersections of undivided highways without illumination.

1030.04(1)(a)(vi) Type IC2

Type IC2 guideposts have silver-white reflective sheeting on both sides and an additional silver-white piece of reflective sheeting below the standard silver-white reflective sheeting on the back side. They are used at intersections of undivided highways without illumination.

1030.04(2) Placement and Spacing

Guideposts are placed not less than 2 feet and not more than 8 feet outside the outer edge of the shoulder. Place guideposts at a constant distance from the edge of the roadway. When an obstruction intrudes into this space, position the guideposts to smoothly transition to the inside of the obstruction.

Guideposts are not required along continuously illuminated divided or undivided highways. (See Exhibit 1030-2 for guidepost placement requirements and the *Standard Plans* for information on the different types and placement of guideposts.)

1030.05 Barrier Delineation

Traffic barriers are delineated where guideposts are required, such as bridge approaches, ramps, and other locations on non-illuminated roadways (see Exhibit 1030-2). At these locations, the barrier delineation has the same spacing distance as guideposts or less if approved by the Region Traffic Engineer. Barrier delineation is also required when the traffic barrier is 4 feet or less from the traveled way. Use a delineator spacing of no more than 40 feet at these locations. For linear delineation panels, use no more than one unit per 12 foot 5 inch section of barrier unless the curve radius is less than 1,500 feet where two devices 12 foot 5 inch section of barrier can be used on the inside of the curve. The Region Traffic Engineer can approve an even tighter spacing where needed.

Beam guardrail can be delineated by either mounting flexible guideposts behind the rail or by attaching shorter flexible guideposts to the wood guardrail posts.

Concrete barrier can be delineated by placing linear or non-linear retroreflective devices on the face of the barrier about 6 inches down from the top. Consider mounting non-linear delineation devices on the top of the barrier at locations where mud or snow accumulates against the face of the barrier.

Example of linear delineation

1030.06 Object Markers

Object markers are used to mark obstructions within or adjacent to the roadway. The MUTCD details three types of object markers. The Type 3 object marker with yellow and black sloping stripes is the most commonly used object marker.

The MUTCD contains criteria for the use of object markers to mark objects in and/or adjacent to the roadway. Follow these criteria in project design.

The terminal ends of impact attenuators are delineated with modified Type 3 object markers. These are the impact attenuator markers in the *Sign Fabrication Manual*. When the impact attenuator is used in a roadside condition, the marker with diagonal stripes pointing downward toward the roadway is used. When the attenuator is used in a gore where traffic will pass on either side, the marker with chevron stripes is used.

End of Roadway markers are similar to Type 1 object markers and are detailed in the MUTCD. They are used to alert users about the end of the roadway. Follow the MUTCD criteria in project design.

1030.07 References

1030.07(1) Federal/State Laws and Codes

Manual on Uniform Traffic Control Devices for Streets and Highways, USDOT, FHWA; as adopted and modified by Chapter 468-95 WAC "Manual on uniform traffic control devices for streets and highways" (MUTCD)

1030.07(2) Design Guidance

Roadway Delineation Practices Handbook, FHWA report, Washington, DC, 1994

Standard Plans for Road, Bridge, and Municipal Construction (*Standard Plans*), M 21-01, WSDOT

Standard Specifications for Road, Bridge, and Municipal Construction (*Standard Specifications*), M 41-10, WSDOT

Exhibit 1030-1 Pavement Marking Material Guide – Consult Region Striping Policy

Roadway Classification	Marking Type [3]				
	Centerlines [5]	Lane Lines [5]	Edge Lines	Wide Lines	Transverse Markings
Ice Chisel Snow Removal Areas					
Interstate	N.A.	Grooved Plastic [1]	Paint	Paint	Paint
Major Arterial	Paint & RRPMs[4] or Plastic[2] & RRPMs[4]	Paint	Paint	Paint	Paint
Minor Arterial	Paint	Paint	Paint	Paint	Paint
Collector	Paint	Paint	Paint	Paint	Paint
Steel Blade Snow Removal Areas					
Interstate-Urban	N.A.	Plastic [2]	Paint or Plastic[2]	Paint or Plastic[2]	Paint or Plastic[2]
Interstate-Rural	N.A.	Paint	Paint or Plastic[2]	Paint or Plastic[2]	Paint or Plastic[2]
Major Arterial	Paint & RRPMs[4] or Plastic[2] & RRPMs[4]	Paint	Paint or Plastic[2]	Paint or Plastic[2]	Paint or Plastic[2]
Minor Arterial	Paint	Paint	Paint	Paint or Plastic[2]	Paint or Plastic[2]
Collector	Paint	Paint	Paint	Paint or Plastic[2]	Paint or Plastic[2]
Rubber Blade Snow Removal Areas					
Interstate-Urban	N/A	PMMA [6] only or PMMA & RPMs	Paint or Plastic[2]	Plastic	FMMA [7]
Interstate-Rural	N/A	PMMA [6] only or PMMA & RPMs	Paint	Plastic [2]	FMMA [7]
Major Arterial	Paint & RPMs or Plastic [2] & RPMs		Paint	Plastic [2]	Plastic [2]
Minor Arterial	Paint & RPMs	Paint & RPMs	Paint	Plastic [2]	Plastic [2]
Collector	Paint & RPMs	Paint	Paint	Plastic [2]	Plastic [2]

Notes:

[1] Grooved Plastic is a line constructed by cutting a groove into the pavement surface and spraying, extruding, or gluing pavement marking material into the groove.

[2] Plastic refers to methyl methacrylate (MMA), thermoplastic, or preformed tape.

[3] For RPM substitute applications and RPM applications supplementing paint or plastic, see the *Standard Plans*, Section M.

[4] RRPMs refer to RPMs installed in a groove ground into the pavement. RRPMs are identified as "Recessed Pavement Markers" in the *Standard Specifications* and the *Standard Plans*.

[5] Type 2 RPMs are not required with painted or plastic centerline or lane line in continuously illuminated sections.

[6] PMMA refers to profiled methyl methacrylate.

[7] FMMA refers to flat methyl methacrylate.

Exhibit 1030-2 Guidepost Placement

Location	Guideposts on Tangents [1][3]	Guideposts on Horizontal curves [1][3]
Divided Highways with Continuous Illumination		
Main Line	None	None
Bridge Approaches	None	None
Intersections	None	None
Lane Reductions	[4]	[4]
Median Crossovers	None	None
Ramps	[4]	[4]
Divided Highways Without Continuous Illumination		
Main Line with RPMs	None	[4]
Main Line without RPMs	Right Side Only (0.10 mile spacing)	[4]
Bridge Approaches	[4]	[4]
Intersections	[4]	[4]
Lane Reductions	[4]	[4]
Median Crossovers	[4]	[4]
Ramps	[4]	[4]
Undivided Highways with Continuous Illumination		
Main Line	None	None
Bridge Approaches	None	None
Intersections	None	None
Lane Reductions	[4]	[4]
Undivided Highways Without Continuous Illumination		
Main Line	[2]	*Standard Plans*, Section M[2]
Bridge Approaches	[4]	[4]
Intersections with Illumination	None	None
Intersections without Illumination	[4]	[4]
Lane Reductions	[4]	[4]

Notes:

[1] For lateral placement of guideposts, see the *Standard Plans*, Section M.

[2] Installation of guideposts on tangents and on the inside of horizontal curves is allowed at locations approved by the Region Traffic Engineer.

[3] Barrier delineation is required when the traffic barrier is 4 feet or less from the traveled way. Use delineator spacing of 40 feet or less.

[4] See *Standard Plan*, Section M-40.10 for Guidepost and Barrier Delineator details and Standard Plan M-40.20 to M-40.60 for Guidepost and Barrier Delineator Placement.