



## TRAFFIC AND SAFETY MANUAL

# Pavement Marking Standards

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### Centerline Markings

For purposes of marking centerlines, a two-lane roadway shall be defined as any roadway with only one traffic lane available for each direction of travel. Any roadway, which is wide enough for four lanes, but where parking is allowed in the outside lanes, shall be considered a two-lane roadway and shall be marked accordingly. A multilane roadway shall be defined as any roadway with two or more traffic lanes for each direction of travel.

The centerline marking for a two-lane roadway where passing is allowed in either direction shall be a 4-inch broken yellow line composed of 10-foot segments separated by 30-foot gaps. It is normally placed 4-inch either to the right or to the left of the geometric center of the roadway. The broken yellow line is normally placed on the south or east side of the roadway except where a no passing zone line is used. See marking Type BCY4 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual for details.

The centerline marking for one-direction no passing zones consists of a 4-inch broken yellow line and a 4-inch solid yellow line separated by a 8-inch space, where passing is prohibited for traffic traveling adjacent to the solid yellow line. See marking Type NPY4 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual for details.

The centerline marking for two-direction no passing zones and multilane undivided roadways shall be composed of two 4-inch solid yellow lines separated by a 8-inch space. See marking Type DCY4 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual for details.

Centerline markings may be placed at a location that is not the geometric center of the roadway when necessitated by conditions such as parking being allowed on one side of the roadway.

All centerline markings shall be continuous with the following exceptions:

1. At one-lane bridges (less than 18-foot roadway) centerline markings shall be terminated 200 feet in advance of each end of the bridge.
2. At a non-channelized intersection of two primary roads, centerline markings shall terminate at the edge of pavement return on the near side of the intersection and resume at the edge of pavement return on the far side of the intersection.
3. At intersections with city streets, centerline markings shall terminate at the property line on the near side of the intersection and resume at the property line on the far side of the intersection.

Various types of intersections and other roadway characteristics may require specific centerline markings to suit individual situations. Some of the commonly encountered situations are covered in Section 3B-2 of the Traffic and Safety Manual. The State Traffic Engineer will provide assistance for individual cases at the request of the District Office.

## No Passing Zone Lines

No passing zone lines shall be placed at vertical and horizontal curves on two-lane roadways where passing must be prohibited because of inadequate sight distance or other special conditions covered in this section. No passing zone locations shall be established by the District on the basis of a field survey (see Section 7A-1 of the Traffic and Safety Manual). The field survey determines locations where the passing sight distance is less than the minimum for the 85<sup>th</sup> percentile speed or the speed limit as shown in Table 1. The passing sight distance is the distance at which an object 3.5 feet above the pavement surface can be seen from a point that is also 3.5 feet above the pavement surface. The no passing zone line shall begin 100 feet in advance of the point where sight distance becomes less than that required. It shall end where a driver with an eye height of 3.5 feet can see enough of the roadway ahead to determine that there is no secondary feature such as a dip that could cause a vehicle to be hidden within the apparent passing sight distance.

Additionally, no passing zone lines shall be extended or special zones placed under certain conditions. Those adjustments are noted below with distances shown for speed limits of 55 mph. Table 1 shows distances for other speed limits as well.

1. When a no passing zone ends at a point 300 feet or less from an at grade intersection, the no passing zone line shall be extended to the intersection.
2. When a no passing zone ends at a point 300 feet or less from the near end of a narrow bridge, the no passing zone line shall be extended to a point 50 feet beyond the far end of the bridge.
3. When a no passing zone ends 400 feet or less in advance of the beginning of another no passing zone in the same direction, the no passing zone lines shall be connected.
4. When a no passing zone as determined by the survey would be less than 500 feet long it shall be extended to 500 feet by adding the extra length to the beginning of the zone.
5. When a no passing zone as determined by the survey would be less than 50 feet long it shall not be marked.
6. For primary road traffic approaching a primary road intersection where a stop is required, a no passing zone line shall begin 600 feet in advance of the stop line.
7. For traffic approaching a partially channelized intersection where a stop is not required, a no passing zone shall be established to discourage traffic from entering a one-way turning roadway. Normally, the channelization consists of an island or barrel, which requires left turning approach traffic to pass to the right of the channelization. The no passing zone line shall begin 600 feet in advance of the intersection and continue to a point adjacent to the channelizing object.
8. When a no passing zone begins at a point 1,000 feet or less past the end of a median, the no passing zone line shall be extended to the end of the median and the no passing zone pennant eliminated.
9. When a no passing zone begins at a point 1,000 feet or less from a stop line for traffic leaving an intersection, the no passing zone line shall be extended back to a point adjacent to the stop line and the no passing pennant eliminated.
10. No passing zones shall be placed in advance of highway-rail grade crossings. For details see Figures 9 and 10 in Section 3B-2 of the Traffic and Safety Manual.

Typical pavement marking layouts including no passing zone markings can be found in Section 3B-2 of the Traffic and Safety Manual. Procedures for conducting the no passing zone survey using the pulled rope method are found in Section 7A-2 and the procedures for conducting a no passing zone survey using the distance method are found in Section 7A-3. Safety and Equipment are discussed in Section 7A-4.

**Table 1**

**Minimum Passing Sight Distances And Conditional Adjustments**

Speed	Min. Passing Sight Dist	Notes: 1,2	Length of Extensions and Special Zones			
			3	4	6,7	8,9
55	1000	300	400	500	600	1000
50	1000	300	400	500	600	1000
45	800	240	320	400	480	800
40	800	240	320	400	480	800
35	600	180	240	300	360	600
30	600	180	240	300	360	600
25	500	150	200	250	300	500
20	500	150	200	250	300	500

**Lane Lines**

Lane lines are normally 4-inch broken white lines composed of 10-foot segments separated by 30-foot gaps. See marking Type BLW4 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual for details. Lane lines are used to separate two or more lanes of traffic traveling in the same direction on multilane roadways, ramps or one-way streets. Only those lanes that are open to traffic at all times shall be marked. Lane lines shall be terminated and resumed at the same location as centerline markings at primary junctions and city street intersections.

Where two or more traffic lanes in the same direction are provided, but conditions make lane changing undesirable, a 4-inch solid white line may be used. See marking Type SLW4 in Figure SLW4 of Section 3B-2 of the Traffic and Safety Manual for details. A solid lane line shall be used to separate right and left turning lanes from through lanes at intersections and in advance of lane drops on one-way streets, ramps and multilane highways.

Various types of intersections and other roadway characteristics may require specific lane line markings to suit individual situations. Some of the commonly encountered situations are covered in Section 3B-2 of the Traffic and Safety Manual. The State Traffic Engineer will provide assistance for individual cases at the request of the District Office.

Suggested minimum lane widths for various widths of roadways are provided in Table 2.

**Table 2**

**Transverse Spacing Of Lane Lines On Multilane Roadways**

Pavement width	Number of lanes	Width of lane
Less than 44 feet	4	10 feet minimum
44 feet	4	11 feet
48 feet	4	12 feet
Over 48 feet	4 or more*	12 feet minimum
*For roads with more than 4 lanes of traffic, the minimum lane width shall be 10 feet. If this requirement cannot be met, special instructions will be provided by the State Traffic Engineer.		

## Edge Lines

Edge lines shall consist of a 4-inch solid line, normally placed 3 inches from the edge of the pavement. For lane widths of 12 feet or more, the edge line is placed 11 feet, 9 inches from the center of the roadway to the outside of the line. White lines are used to mark the right edge of the pavement and yellow lines are used to mark the left edge of the pavement on divided roadways, one-way streets, and ramps. For details, see marking Types ELW4 and ELY4 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual.

Continuous edge lines shall be painted on all primary routes regardless of traffic volume or pavement width. Edge lines shall be painted through driveways and entrances, but shall not be painted through intersections with other highways, local roads or city streets. Edge lines shall not be placed through median crossovers for public roads, but shall be continuous through crossovers constructed for emergency and authorized vehicle use only. Examples of edge line treatment for various types of intersections are shown in several of the Figures in Section 3B-2 of the Traffic and Safety Manual.

Edge line markings shall stop where a curbed section or parking begins. In the absence of curbed sections or parking, edge lines shall be continuous through cities. Edge lines shall not be painted on continuously curbed roadways. The edge line shall terminate at the beginning of the curbed roadway and resume at the end of the curbed roadway. Edge lines shall be painted on roadways with curbs on the outside of the shoulder. Edge lines may be painted on rural roadways with curbs when the curbs are not continuous, i.e., on hills where the curb is for drainage, in roundabouts, bike lanes, etc.

### Edge Lines at Interchanges

The right edge line on the mainline shall connect with off-ramp and on-ramp taper edge lines. The right edge line on the mainline shall continue from the end of the 8-inch exit channelizing line at an off-ramp to the point where the 8-inch channelizing line for the on-ramp begins. Dotted line extensions of the right edge line shall be placed from the taper point of off ramps to the 8-inch channelizing line for tapered deceleration lanes and to the dashed lane line for parallel deceleration lanes.

1. Edge lines shall be placed on both sides of all ramps except those with urban cross-section (with curbs and without shoulders). The right edge line shall be white and the left edge line shall be yellow.
2. For off-ramps, the edge line on the right side shall begin where the taper joins the mainline and end at the end of the return for the intersected road or connect with the edge line of the intersected road if it has continuous edge lines. The edge line on the left side shall begin at the end of the curb or channelizing line and end at the end of the return for the intersected road or connect with the edge line of the intersected road if it has continuous edge lines. For details see Figure 11 in Section 3 B-2 in of the Traffic and Safety Manual.
3. For on-ramps, the edge line on the right side shall begin at the beginning of the return on the intersected road or connect with the edge line of the intersected road if it has continuous edge lines and continue along the ramp to join with the edge line on the mainline at the end of the on-ramp taper. The edge line on the left side shall begin at the beginning of the return for the intersected road or connect with the edge line of the intersected road if it has continuous edge lines and continue along the ramp to the beginning of the curb or channelizing line. For details, see Figure 11 in Section 3 B-2 of the Traffic and Safety Manual.

Due to variations in the physical design of exit and entrance ramps and tapers, field conditions may differ from these descriptions and figures, which are based primarily on diamond interchanges. The State Traffic Engineer will provide assistance for individual cases at the request of the District Office.

### Edge Lines on Undivided Roads

1. On the approach to a bridge narrower than the pavement, edge lines shall be placed on a diagonal from a point 300 feet from the bridge to the gutter line of the bridge. For details, see Figure 8 in Section 3B-2 of the Traffic and Safety Manual. On a bridge wider than the pavement, edge lines shall continue through the bridge at the normal pavement width.
2. At locations where there is an abrupt change in the pavement width, a diagonal edge line shall be placed from the point where the width changes to a point on the edge of the wider pavement 300 feet from the point where the width changes. For details, see Figure 8 in Section 3B-2 of the Traffic and Safety Manual.
3. At points where there is a change in width because of a climbing lane, the edge line shall follow the pavement edge. For details, see Figure 7 in Section 3B-2 of the Traffic and Safety Manual.
4. At locations where there is a change in the width because of a transition from four-lane undivided to a two-lane section, the edge line shall follow the edge of the pavement. For details, see Figure 6 in Section 3B-2 of the Traffic and Safety Manual.

A dotted line is used as an extension of the edge line at intersections where a primary route follows a curved section at the intersection. A dotted line shall be a 4-inch line composed of 2-foot segments separated by 4-foot gaps. It shall be the same color and at least as wide as the edge line it extends. See marking Type DLW4 in Figure 1 Section 3B-2 of the Traffic and Safety Manual for details. For the Standard Road Plan details of dotted line application, see Figures 25 and 26 in Section 3B-2 of the Traffic and Safety Manual.

### Channelizing Lines

A channelizing line is an 8-inch solid white or yellow line. For details, see Marking Types CHY8 and CHW8 in Figure 1 in Section 3B-2 of the Traffic and Safety Manual.

White channelizing lines are used to separate traffic traveling in the same direction. A common use is at interchanges to mark the gore area on exit ramps and to separate ramp traffic from mainline traffic on the entrance ramps. At exit ramps, a channelizing line shall be placed along both sides of the gore area. At entrance ramps with tapered acceleration lanes a channelizing line shall be placed along the ramp side of the gore area only. At entrance ramps with parallel acceleration lanes, channelizing lines shall be placed along both sides of the gore area. For details on use of white channelizing lines at ramps, see Figure 11 in Section 3B-2 of the Traffic and Safety Manual.

Yellow channelizing lines are used to separate traffic traveling in opposite directions. A typical application is at a transition area from a four-lane divided roadway to a two-lane roadway. A yellow channelizing line is used on both sides of the tapered area between the two-lane roadway and the median nose. Also a yellow channelizing line is used to taper traffic from two lanes to a single lane leaving the divided section. For details on the use of yellow channelizing lines at transitions, see Figure 23 in Section 3B-2 of the Traffic and Safety Manual.

### Stop Lines

A stop line is a 24-inch solid white line extending across all approach lanes to indicate the point at which the stop is intended or required to be made. See marking Type SLW2 in Figure 1 in Section 3B-2 of the Traffic and Safety Manual for details. Stop lines should be used at all stop signs and traffic signals on primary highways to indicate the point behind which vehicles are required to stop.

If the stop line is to be used with a STOP sign, it should ordinarily be placed in line with the STOP sign. However, if the STOP sign is not located exactly where vehicles are expected to stop, the

stop line should be placed at the stopping point. At locations with crosswalk markings, the stop line should be placed 4 feet in advance of the crosswalk. Where crosswalk markings do not exist, the stop line should typically be placed 10 feet from the edge of the intersected road. Stop lines should be placed to allow sufficient sight distance for all approaches to an intersection, no more than 30 feet nor less than 4 feet from the nearest edge of traveled way.

Stop lines shall be placed by the DOT on all approaches at primary junctions in rural areas and all paved county road approaches to primary highways. Stop lines on street approaches within the corporate limits are a city responsibility. Stop lines on primary road extensions with urban cross sections (curbed) are the responsibility of the city to place and maintain. In rural areas and on primary road extensions constructed with a rural cross section (no curb) the Iowa DOT is responsible for the stop lines. For details on the placement of stop lines, see Figures 3 and 28 of Section 3B-2 of the Traffic and Safety Manual. The State Traffic Engineer will provide assistance for individual cases where a special type of stop line is required, such as a stepped or skewed line, or where a stop line is used at a yield condition.

## **Crosswalk Markings**

Crosswalk lines are solid white lines, not less than 6 inches and not greater than 24 inches in width marking both edges of the crosswalk. See marking Type CLW6 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual for details. Marked crosswalks should not be less than 6 feet wide. Crosswalk markings should extend across the full width of the pavement.

For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45-degree angle to the line of the crosswalk or with white longitudinal lines parallel to traffic flow. When diagonal or longitudinal lines are used to mark the crosswalk, the transverse lines may be omitted. If used, the diagonal or longitudinal lines should be 12 inches to 24 inches wide and spaced 12 inches to 24 inches apart. The spacing should avoid the wheel paths. This type of marking may be used where substantial numbers of pedestrians cross without any other traffic control device, at locations where physical conditions are such that added visibility of the crosswalk is desired or at places where a pedestrian crosswalk might not be expected. Care should be taken to insure that crosswalks with diagonal or longitudinal lines used at some locations do not weaken or detract from other crosswalks (where special emphasis markings are not used). Most crosswalk lines are located within the corporate limits of a city and are the responsibility of the city to place and maintain. In rural areas and on primary road extensions constructed with a rural cross section (no curb) the Iowa DOT is responsible for crosswalk markings. For details on crosswalk lines, see Figure 28 in Section 3B-2 of the Traffic and Safety Manual.

## **Two-Way Left Turn Lanes**

A two-way left-turn lane is a lane reserved in the center of the highway or street for the exclusive use of left turning vehicles. It shall not be used for passing. The lane may be used for making left turns in either direction as part of a left-turn maneuver. The markings on each side of the lane shall consist of a 4-inch broken yellow line and a 4-inch solid yellow line. For details see marking Type NPY4 in Figure 1 of Section 3B-2 of the Traffic and Safety Manual.

These markings shall be placed with the broken line toward the two-way left-turn lane and the solid line toward the adjacent traffic lane. For details, see Figure 16 of Section 3B-2 of the Traffic and Safety Manual.

## **Approach to Obstructions**

Pavement markings shall be used to guide traffic on the approach to obstructions within the roadway. An obstruction may be located so that all traffic must keep to the right of it or it may be between two lanes of traffic moving in the same direction. In either case, markings must be designed

to guide traffic away from the obstruction. The use of channelizing lines or no passing markings is generally appropriate. Obstruction approach markings shall consist of a diagonal line or lines extending from the centerline or the lane line to a point 1 to 2 feet to the right, or to both sides, of the approach end of the obstruction.

If traffic is required to pass only to the right of the obstruction, the marking shall consist of a yellow no passing zone line the length of the taper shown in Table 3. Yellow diagonal markings may be placed in the triangular area so formed.

If traffic may pass either to the right or left of the obstruction, the marking shall consist of two white channelizing lines diverging from the lane line, one to either side of the obstruction for a length equal to the taper shown in Table 3. In advance of the point of divergence, a white channelizing line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines. Additional white markings may be placed in the triangular area between the channelizing lines.

For roadways having a posted speed limit of 45 mph or greater, the taper length should be computed by the formula  $L = WS$ . For roadways where the posted speed is less than 45 mph, the formula  $L = WS^2 / 60$  should be used to compute the taper length. Under both formulas, L equals the taper length, W equals the width of the offset and S equals the 85<sup>th</sup> percentile speed or posted speed limit, whichever is greater. The minimum taper length shall be 100 feet in urban areas and 200 feet in rural areas.

**Table 3**

**Obstruction Approach Taper Length**

W/FT.	S - SPEED MPH							
	20	25	30	35	40	45	50	55
1	100	100	100	100	100	100	100	100
2	100	100	100	100	100	100	10	110
3	100	100	100	100	100	135	150	165
4	100	100	100	100	107	180	200	220
5	100	100	100	103	135	225	250	275
6	100	100	100	125	160	270	300	330
8	100	100	120	165	215	360	400	440
10	100	105	150	205	270	450	500	550
12	100	125	180	245	320	540	600	660

 Minimum 200 feet in rural areas

### Island and Median Curb Markings

The curb of islands in the line of traffic flow where the curb serves to channel traffic to the right of the island shall be painted yellow. When approaching traffic may pass on either side of an island, the island curbs shall be painted white. Standard 6-inch integral curbs and all sloped curbs shall be painted from the back of the curb to just above the gutter line. Painting of 9-inch barrier curbs shall be from the back of the curb to a point approximately 3 inches above the gutter line using the same width of band as for a 6-inch curb.

The entire length of long sections of continuous curb parallel to normal traffic flow should not be painted. The nose shall be painted yellow. A painted edge line shall be painted along the taper plus 50 feet of the parallel portion of the curb. If the ends of the edge lines described above are 100 feet or less apart, the entire length shall be painted with an edge line.

The Iowa DOT will not paint street curbs in urban areas where such markings define a zone in which parking has been restricted by local ordinance.

## **Parking Space Markings**

Parking space markings shall be white. For details on the type of marking to be used, refer to special pavement marking layouts furnished by the Office of Traffic and Safety, the construction plans when a street has been rebuilt, or the Manual on Uniform Traffic Control Devices. Marking of parking spaces shall be in conformance with an agreement between the City and the Iowa DOT or a city ordinance. On new projects, the Iowa DOT may mark parking spaces the first time by contract. Normally, further maintenance of parking space markings is a city responsibility.

## **Word and Symbol Markings**

Word and symbol markings shall be white. They should read up in the direction of travel and be limited to not more than a total of three lines of message. The longitudinal space between word or symbol messages including arrows should be at least four times the height of the word or symbol for low speed roads but not more than ten times the height of the word or symbol under any conditions. These markings are elongated and shall be placed by template on the pavement. Word messages should be no more than one lane width, except the word “SCHOOL” may extend across two lanes.

In situations where entrapment is encountered (where through lanes become mandatory turn lanes) lane-use arrows shall be used and accompanied by standard signs and the word marking “ONLY”. Where a separate turn lane (left or right) is provided no lane-use markings are required.

Word and symbol markings should be placed only as shown on special pavement marking layouts or as illustrated by the Figures in this Manual. No others shall be used. For details on the design of word and symbol markings, see appropriate figures in Section 3B-2 of the Traffic and Safety Manual.

## **Highway-Rail Grade Crossing Markings**

Pavement markings in advance of a highway-rail grade crossing shall consist of an X, the letters RR, a no passing zone marking (2-lane highways), and certain transverse lines. All markings shall be white except for the no passing zone marking, which shall be yellow. They shall be placed in each lane on all paved approaches to crossings where highway-rail grade crossing signals or automatic gates are located and at all other highway-rail grade crossings where the prevailing speed of highway traffic is 40 mph or greater. When used, a portion of the pavement-marking symbol should be directly opposite the advance warning sign. It is appropriate to place supplemental markings on the approach between a nearby intersection and the crossing if there is a distance of at least 100 feet between the intersection and the crossing. Where the posted speed is less than 40 mph or in urban areas, markings may be omitted if an engineering study indicates that other devices installed provide suitable warning and control. For details on the design of railroad crossing pavement markings see Figures 9 and 10 in Section 3B-2 of the Traffic and Safety Manual.

### **Abandoned Highway-Rail Grade Crossing Markings**

Pavement markings should be placed if continuous rails are in place, regardless of whether the railroad is operating or not. If any portion of the rails at the crossing or on both approaches has been removed or the crossing covered with asphalt, markings need not be placed.