

Item 20-18 Proposal to add Figure and Language for Exit Ramp with Enhanced Pavement Markers for Wrong Way Details

Recommendation: Revise the CA MUTCD figures and the text to include additional details for using wrong-way retroreflective pavement markers on exit ramp on limit lines/ stop lines, yield lines, crosswalk markings, right/ left edgelines and Type V Arrow to prevent wrong way driving.

Requesting Agencies/Sponsor: Caltrans/Monica Kress-Wooster, CTCDC member

Background:

On March 3, 2016, the California Traffic Control Devices Committee (CTCDC) approved Caltrans request for experimentation to use wrong-way retroreflective markers for ramp edge lines and ramp directional arrows. As part of an effort to address wrong way collisions, Caltrans' San Diego and Sacramento regions developed pilot projects to test new countermeasures.

The experiment had two main goals:

A reduction in the number of reported incidents or occurrences of wrong way drivers on ramps with the proposed marking enhancements and approval of red on backside pavement markings on edge lines, lane lines, and Type V arrows.

The main objective was to determine if red on backside pavement markings placed along the edge lines and lane lines on ramps in a manner that exceeds traditional left edge line only pavement marker placement could reduce the number of wrong way drivers reported at ramps.

The successful pilot projects demonstrated that additional red-backed retroreflective markers are both low cost and highly effective at reducing wrong way drivers. Since the placement of red reflective markers on the backside of pavement markers has a relative minor cost per ramp over time, and due to the potential to decrease reported incidents of wrong way drivers at ramps by an average 44% or more, it is recommended that that CTCDC approve the use of red reflective markers on ramps and freeways.

Based on successful experimentation and CTCDC's recommendation to adopt the enhancements in the CA MUTCD, Caltrans is proposing the following policy changes:

Enhance exit ramps with wrong way reflective markers at lane lines, edge lines, limit/stop lines, yield lines, crosswalks, and type V arrows. The enhancement also includes pavement marker spacing used at a closely spaced pattern at left and right edge lines.

Proposed Policy Changes

Note: **Red** text is proposed text.

Black ~~strike through~~ text is the text that is not applicable in California

Blue text is the existing California revision

Section 3B.01 Yellow Center Line Pavement Markings and Warrants

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Standard:

19 A left edge line shall consist of a minimum 4 inch wide solid yellow line, yellow **reflective pavement markers, yellow-red** reflective pavement markers or a combination of line and markers as shown in Figure 3A-105(CA).

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Section 3B.04 White Lane Line Pavement Markings and Warrants

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Standard

30 Where crossing the lane line markings is prohibited, the lane line markings shall consist of a solid double white line (see Figure 3B-12).

31 Lane line patterns shall be selected from those shown in Figure 3A-102(CA). Detail 9, **9A** or 10 (40 mph or less) or Detail 12, **12A** or 13 (45 mph or more) shall be used on State freeways, expressways, freeway ramps, freeway to freeway connectors and collector roads, except when used in snow areas, the raised pavement markers, if used, shall be recessed; otherwise, use Detail 8 or 11.

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Section 3B.06 Edge Line Pavement Marking

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Standard:

13 Exit and entrance ramps, including freeway connectors, shall be marked with a yellow edge line supplemented with yellow-**red** reflective pavement markers on the left and a white edge line on the right. See Figure 3A-105(CA).

14 Exit ramps shall be further supplemented with enhanced reflective pavement marker spacings on the right and left edge lines. Enhanced blank-**red** pavement marker spacings shall be used at a closely spaced pattern on white right edge lines and enhanced yellow-**red** reflective pavement marker spacing shall be used at a closely spaced pattern on yellow left edge lines. See Figure 3A-114 (CA)

Guidance:

15 If used, the enhanced spacing retroreflective pavement markers should be placed at a minimum of 120 feet from ramp terminus. The spacing should be 12 feet typical for 240 feet and 6 feet typical for an additional 120 feet. See Figure 3A-114(CA)

Standard:

¹⁶ When the blank-red retroreflective pavement markers are placed along the white right Edge line, the side that is visible to traffic proceeding in the wrong direction should be red and the side visible to approach traffic shall be blank.

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Section 3B.13 Raised Pavement Markers Supplementing Other Markings

Guidance:

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⁰² Raised pavement markers should not supplement right-hand edge lines unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh possible impacts on bicycles using the shoulder, and the spacing of raised pavement markers on the right-hand edge is close enough to avoid misinterpretation as a broken line during wet night conditions.

^{02b} One- way blank-red retroreflective raised pavement markers should supplement wrong-way arrows, limit lines/stop lines, yield lines, or crosswalk markings used at freeway exit ramps.

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Standard:

⁰⁵ The widths and patterns of raised pavement markers shall conform to the details shown in Figures 3A-101(CA) through ~~3A-112(CA)~~ 3A-114(CA). See Section 3A.06.

⁰⁶ When the one-way blank-red retroreflective raised pavement markers are placed along the type V arrow, limit lines, yield lines, or crosswalk markings, the side that is visible to traffic proceeding in the wrong direction shall be red and the side visible to approach traffic shall be blank.

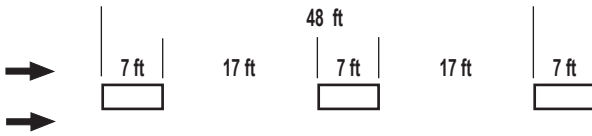
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Figure 3A-102 (CA). Lane Lines - Multilane Highways

FOR SPEEDS 40 mph OR LESS

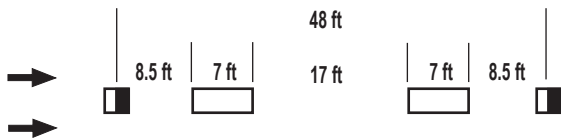
POLICY

DETAIL 8



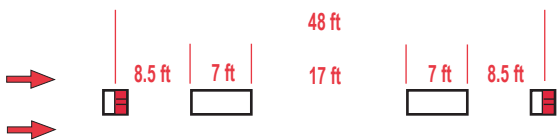
Lane Line pattern for use on multilane streets and highways (normally used on local streets and highways).

DETAIL 9



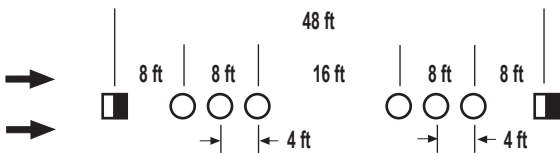
Lane Line pattern with pavement markers for use on multilane streets, and highways ~~and freeway ramps.~~

DETAIL 9A



Lane line pattern with pavement markers for use on freeway ramps

DETAIL 10



Lane Line pattern with pavement markers for use on multilane streets, highways and freeway ramps.

NOT TO SCALE

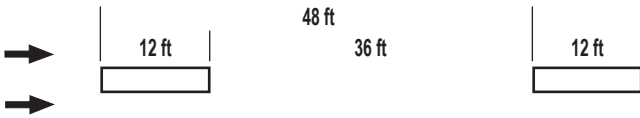
LEGEND

- 4 in White
- One-Way Clear Retroreflective Markers
- Non-Retroreflective White Markers
- Red-Clear Retroreflective Markers
- Direction of Travel

FOR SPEEDS 45 mph OR MORE

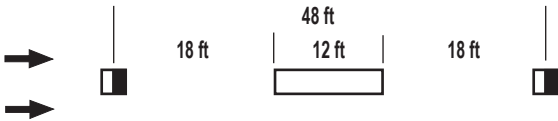
POLICY

DETAIL 11



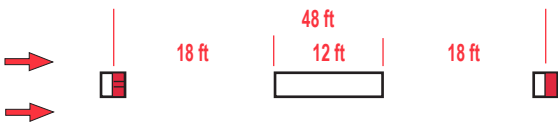
Lane Line pattern for use on multilane streets and highways (normally used on local streets and highways).

DETAIL 12



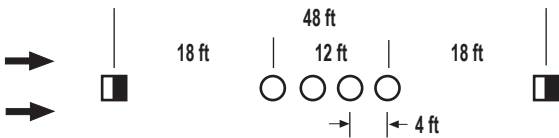
Lane Line pattern with pavement markers for use on multilane conventional streets and highways, ~~State freeways, expressways, freeway ramps, freeway to freeway connectors~~ and collector roads. ~~See Detail 14A.~~

DETAIL 12A



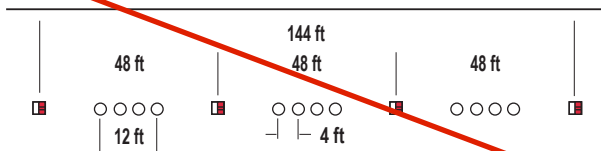
Lane Line pattern with pavement markers for use on multilane conventional streets and highways, freeways, expressways, freeway ramps, and freeway to freeway connectors.

DETAIL 13



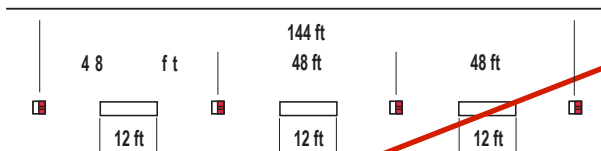
Lane Line pattern with pavement markers for use on ~~State freeways, expressways, freeway ramps, freeway to freeway connectors~~ and collector roads. ~~See Detail 14.~~

~~**DETAIL 14**~~

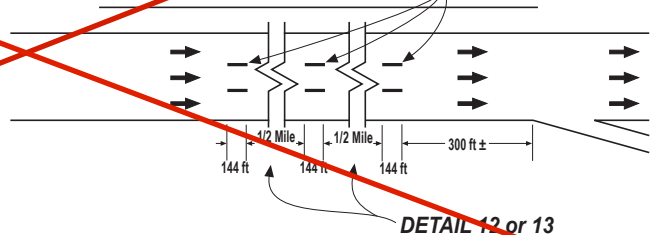


Lane Line pattern with red-clear pavement markers shall be used on freeways approaching exit ramps. Detail 14 is used with Detail 13 and Detail 14A is used with Detail 12, in a pattern of four red-clear pavement markers, at intervals as shown.

~~**DETAIL 14A**~~



~~**DETAIL 14 or 14A**
RED-CLEAR MARKER PATTERN~~



~~DETAIL 12 or 13~~

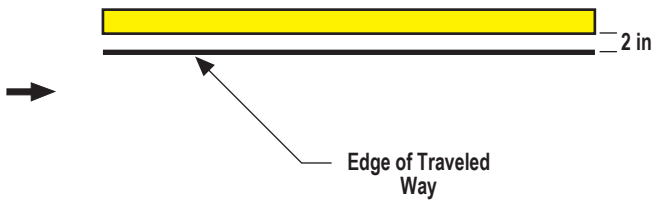
LEGEND

- 4 in White
- One-Way Clear Retroreflective Markers
- Non-Retroreflective White Markers
- Red-Clear Retroreflective Markers
- Direction of Travel

NOT TO SCALE

Figure 3A-105 (CA). Left Edge Lines for Divided Highways

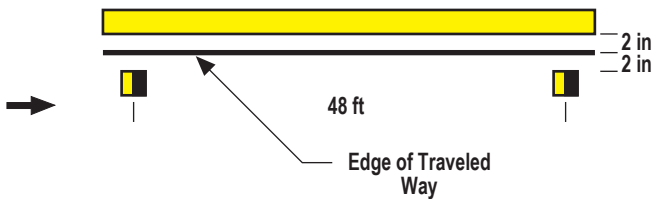
DETAIL 24



POLICY

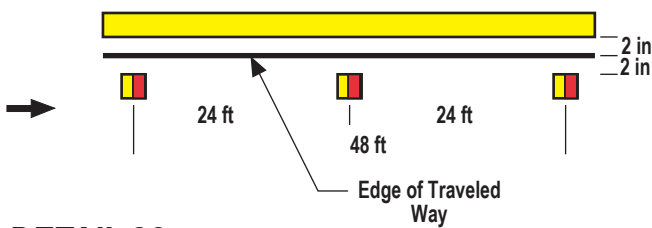
Left Edge Line pattern for use on streets and highways (normally used on local streets and highways).

DETAIL 25



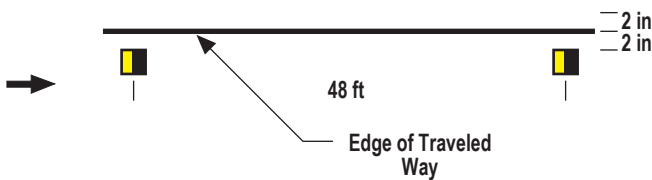
Left Edge Line for use on State highways.

DETAIL 25A



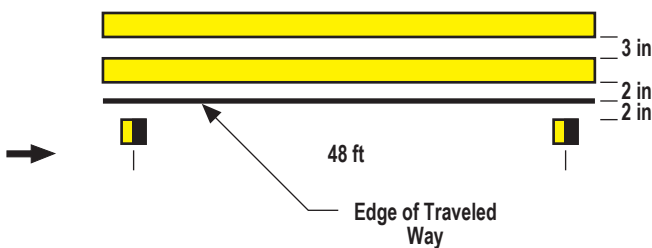
Left Edge Line for use on **freeway**, freeway ramps and connectors.

DETAIL 26



Alternate to Details 24 and 25 when there is adequate contrast between travelled way and shoulder.

DETAIL 27



Alternate to Detail 25. A double solid yellow line may be used for more emphasis when motorists tend to use the shoulder for a through lane, or where encroachments onto the shoulder occasionally occur. See Note 1.

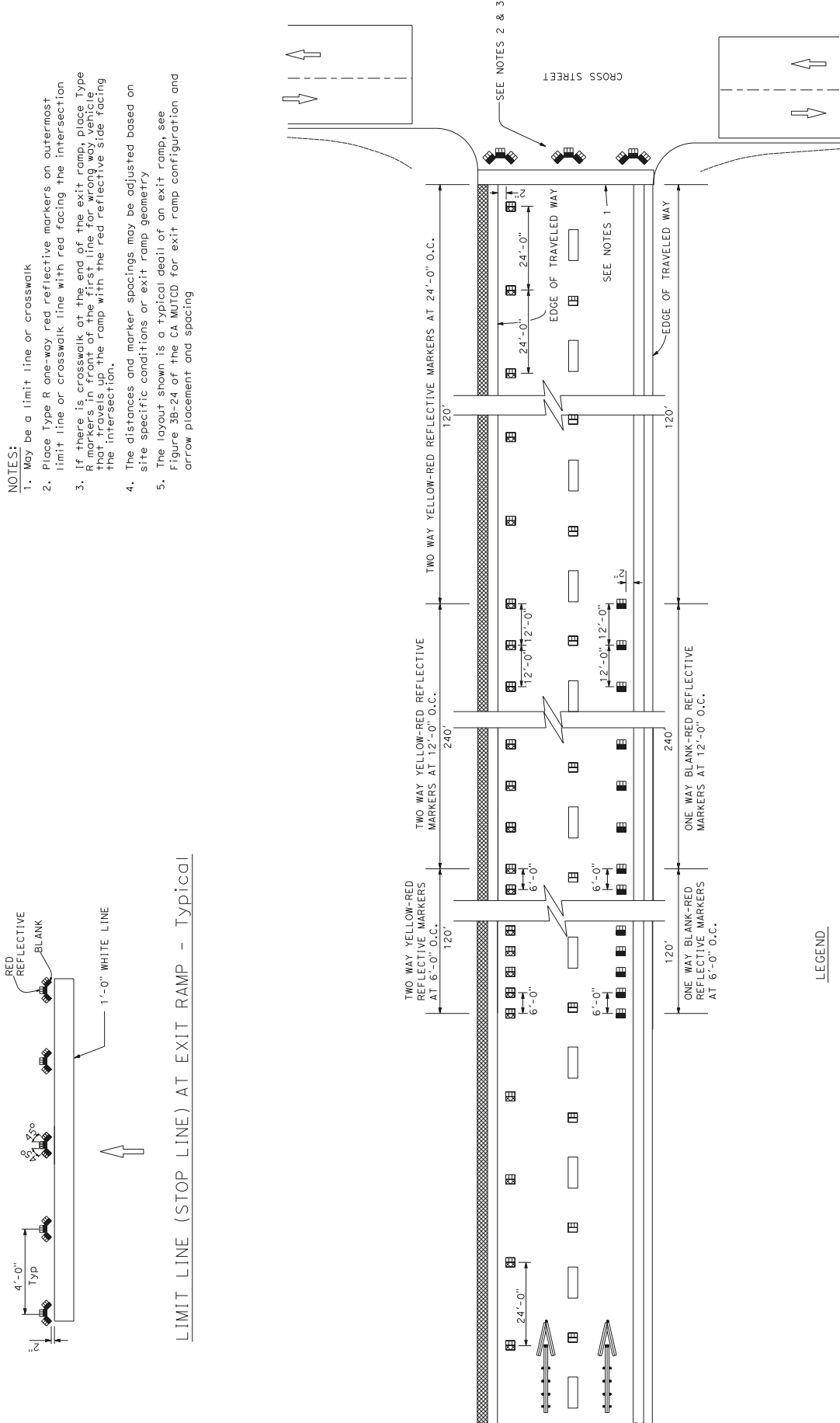
NOTE: 1. If the material used for centerline marking is paint, a 3 in black line shall be placed between the 4 in yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

LEGEND

-  4 in Yellow
 Direction of Travel
-  One-Way Yellow
 Retroreflective Markers
-  Red- Yellow
 Retroreflective Markers

NOT TO SCALE

Figure 3A-114 (CA). Exit Ramp with Enhanced Pavement Markers for Wrong Way Details



NOTES:

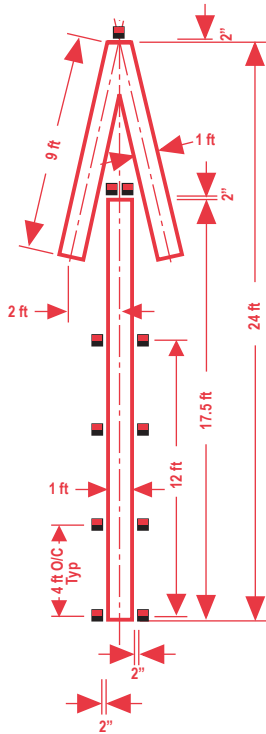
1. May be a limit line or crosswalk
2. Place Type R one-way red reflective markers on outermost limit line or crosswalk line with red facing the intersection
3. If there is crosswalk at the end of the exit ramp, place Type R markers in front of the first line for wrong way vehicle that travels up the ramp with the red reflective side facing the intersection.
4. The distances and marker spacings may be adjusted based on site specific conditions or exit ramp geometry
5. The layout shown is a typical detail of an exit ramp, see Figure 3B-24 of the CA MUTCD for exit ramp configuration and arrow placement and spacing

LIMIT LINE (STOP LINE) AT EXIT RAMP - TYPICAL

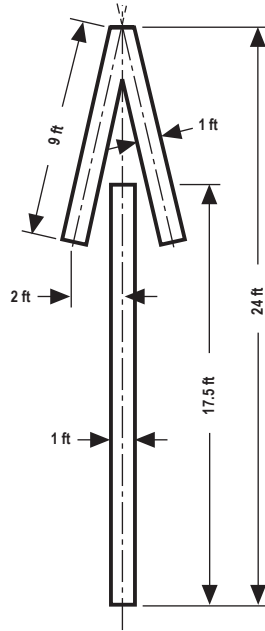
LEGEND

- TYPE C TWO-WAY RED-CLEAR RETROREFLECTIVE
- TYPE RY TWO-WAY RED-YELLOW RETROREFLECTIVE
- TYPE R ONE-WAY RED RETROREFLECTIVE
- 4" WHITE MIN
- 4" YELLOW MIN

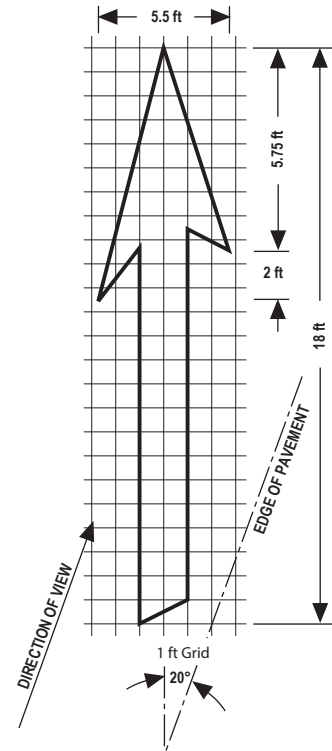
Figure 3B-24 (CA). Examples of Standard Arrows for Pavement Markings (Sheet 2 of 8)



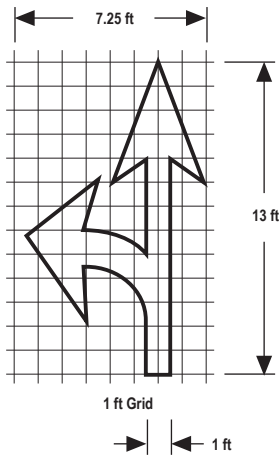
**TYPE V ARROW
AT EXIT RAMP**



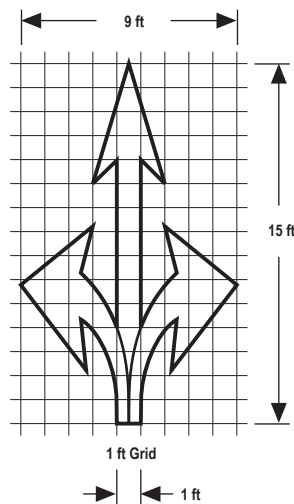
TYPE V ARROW



**TYPE VI ARROW
RIGHT LANE DROP ARROW
(FOR LEFT LANE,
USE MIRROR IMAGE)**



**TYPE VII (L) ARROW
(FOR TYPE (R) ARROW, USE MIRROR IMAGE)**



TYPE VIII ARROW

LEGEND

- One-Way Blank-Red
Retroreflective Pavement Markers**

NOT TO SCALE

NOTE: The design details for various arrows are also shown in Department of Transportation's Standard Plans.