TRAFFIC LINE MANUAL

September, 1996

CONTENTS

CONTENTS, continued

CONTENTS, continued

CONTENTS, continued

CONTENTS, continued

OREGON DEPARTMENT OF TRANSPORTATION

Traffic Management Section

MARKING POLICY & GUIDELINES

September, 1996

FOREWORD

The purpose of this manual is to establish a guide for uniformity of traffic line and pavement markings throughout the state highway system. The manual is intended to be used by highway maintenance traffic line crews to assist them in their daily work. It may also be used by other ODOT employees who are involved in the layout or design of traffic lines and pavement markings. The construction plans should be consulted for complex layout or design of traffic lines and pavement markings in construction projects.

To a large extent, the traveling public relies heavily on painted traffic markings for guidance, car positioning, and information. Unless all markings are uniform, motorists may be confused and uncertain of the purpose of the marking. If markings not conforming to this manual are necessary, they should be reviewed and approved by the region traffic operations supervisor or state traffic engineer.

The text and standards for this manual have been adapted from the “Manual on Uniform Traffic Control Devices” (MUTCD), the Oregon Supplements, policies and guidelines. More detailed information may be obtained from these publications.

A. GENERAL PRINCIPLES

A-1 Functions & Limitations (MUTCD 3A-1)

Markings have definite and important functions to perform in a proper scheme of traffic control. In some cases, they are used to supplement the regulations or warnings of other devices such as traffic signs or signals. In other instances, they are used alone and produce results that cannot be obtained by the use of any other device. In such cases they serve as a very effective means of conveying certain regulations and warnings that would not otherwise be understandable.

Pavement markings have definite limitations. They may be covered by snow, may not be clearly visible when wet, and may not be very durable when subjected to heavy traffic. In spite of these limitations, they have the advantage of conveying warnings or other information to drivers without diverting their attention from the roadway.

A-2 Standardization of Application (MUTCD 3A-2)

Each standard marking shall be used only to convey the meaning prescribed for it in this manual. Before any new highway, surfaced detour, or temporary route is opened to traffic, all necessary markings should be in place.

Markings no longer applicable, which may create confusion in the mind of the motorist, shall be removed or obliterated as soon as practicable. Other markings required by road conditions or restrictions should be removed when those conditions cease to exist or the restrictions are withdrawn.

The installation, modification or removal of pavement markings requires the approval of the state traffic engineer in consultation with region manager, on the state highway system (Subdeligation Order TSB-1).

A-3 Materials (MUTCD 3A-3)

The most common method of pavement, curb, and object markings is by means of paint; however, a wide variety of other suitable marking materials are avail- able. Materials used should provide the specified color throughout their useful life.

Raised pavement markers (RPM), generally less than 1 inch (2.54 cm) in height, may be used for pavement marking purposes. They may be placed in continuous contact or separated by spaces, a variation in patterns being used to simulate solid and broken lines, with apparent widths as specified in Sections A-6 and A-7. Markings which must be visible at night shall be reflectorized unless ambient illumination assures adequate visibility. All markings on Interstate highways shall be reflectorized. Marking material used in the vicinity of pedestrian or bicycle traffic should not present tripping or excessive slipping hazards. Acceptable materials are listed by ODOT Materials Section in their Qualified Products Lists.

A-4 Colors (MUTCD 3A-4)

Pavement markings shall be yellow, white, or red in color.

The colors for pavement markings shall conform to the standard highway colors.

A-5 General Principles - Longitudinal Pavement Markings (MUTCD 3A-5)

Longitudinal pavement markings shall conform to the following basic concepts:

1. Yellow lines delineate the separation of traffic flows in opposing directions or mark the left edge of the travel lanes on divided highways and one-way roads.

2. White lines delineate the separation of traffic flows in the same direction or mark the right edge of the travel lanes.

3. Broken lines are permissive in character.

4. Solid lines are restrictive in character.

5. Width of line indicates the degree of emphasis.

6. Double lines indicate maximum restrictions.

7. Red markings delineate roadways that shall not be entered or used by the viewer of those markings.

8. Markings which must be visible at night shall be reflectorized unless ambient illumination assures adequate visibility.

9. Raised pavement markers may serve as position guides for, may supplement, or in some cases may be substituted for other types of markings.

A-6 Widths & Patterns of Longitudinal Lines (MUTCD 3A-6)

The widths and patterns of longitudinal lines shall be as follows:

1. The normal width line is 4” to 6” (100 mm to 150 mm) wide.

2. A wide line (8” or 200 mm) is at least twice the width of a normal line.

3. A double line consists of two normal width lines separated by a discernible space (4” or 100 mm minimum).

4. A broken line (skip line) is formed by 10-foot (3.0 m) segments and 30-foot (9.2m) gaps, usually in the ratio of 1:3. Other dimensions in this ratio may be used as best suit traffic speeds and need for delineation.

5. A dotted line is formed by short segments, normally two feet (600 mm) in length, and gaps, normally four feet (1.2 m) or longer. Lane line extension through intersections may be four inches (100 mm) by one foot (300 mm) at four foot (1.2 m) to 15 foot (4.57 m) centers. An eight inch (200 mm) by three foot (0.91 mm) dotted line at 15 foot (4.5 m) centers may be used on bike lanes through intersections (Figures 38 through 41).

A-7 Traverse Markings (MUTCD 3A-8)

Transverse markings, which include word and symbol markings, stop lines, crosswalk lines, speed measurement markings, parking space markings, and others shall be white except that transverse median markings shall be yellow (Section B-11). Markings visible only to traffic proceeding in the wrong direction on a one-way roadway may be red.

Because of the low approach angle at which pavement markings are viewed, it is necessary that transverse lines be proportioned to give visibility equal to that of longitudinal lines. Pavement marking letters, numerals, and symbols shall be in accordance with the FHWA publication, “Standard Alphabets for Highway Signs and Pavement Markings.”

A-8 Raised Pavement Markers (MUTCD 3A-10)

Raised pavement markers may be used as positioning guides, to supplement, or in some cases substitute for other types of markings. The color of raised pavement markers shall conform to the color of the marking for which they serve as positioning guide, or for which they supplement, or substitute.

Retroflective raised pavement markers are generally preferable for most applications. Non-retroflective raised pavement markers should not be used alone, without supplemental retroflective markers, as a substitute for other types of pavement markings. At the locations where a bicycle lane crosses a line supplemented with Raised Pavement Marker, the spacing should be wide enough to allow safe passage.

The placement of raised pavement markers shall be as shown in Figures 34 through 36b, 42 through 44, and 46.

B. STANDARDS

B-1 General

Deviations from the standards indicated should not be made without approval of the state traffic engineer. Uniformity in the pavement markings throughout the state will help produce smooth and safe traffic movements.

Except for vertical faces of painted curbs, all traffic lines (both white and yellow), and other pavement markings shall contain reflective beads.

If it can be avoided, traffic line stripes should not be painted on the longitudinal joint of a Portland cement concrete (PCC) pavement. Lines painted on the joint are lost when the pavement breaks up or spalls. This rule should also be followed for shoulder lines where the PCC pavement and asphalt shoulder meet.

B-2 Center Lines (MUTCD 3B-1)

A center line separates traffic traveling in opposite directions. It need not be at the geometrical center of the pavement.

In urban areas, center lines normally should not continue through cross-type or T-type intersections with paved highways, roads, or streets, but are ended at the crosswalks. If no crosswalks are present, the center line is ended at the curb or shoulder line of the intersecting roadway. Center lines are normally continued through private accesses and alleys.

On undivided highways of four or more lanes, a double line consisting of two solid yellow lines (4” or 100 mm) should be used as the center line.

On two-lane, two-way highways where passing is permitted, a yellow broken line (4” or 100 mm) shall be used. A double line consisting of a yellow broken line and a yellow solid line is used where passing is permitted for traffic adjacent to the broken line and prohibited for traffic adjacent to the solid line.

B-3 Lane Lines (MUTCD 3B-2)

Lane lines separate lanes of traffic traveling in the same direction. Lane lines shall be a white broken line (4” or 100 mm). Lane widths are to be as shown on the plans for the project or as directed by the project manager, district manager, or region traffic operations supervisor.

Typical lane widths are 12 feet (3.6 m), but the minimum permissible lane width shall be 10 feet unless otherwise approved.

A solid white line may be used as the lane line in critical areas where it is advisable to discourage lane changing. Typical locations for such applications are tunnels or bridges having narrow lane widths and interchange areas where lane changing disrupts traffic flow.

In general, lane lines should not be carried across cross-type or the stem side of T-type intersections with paved highways, streets, or roads.

B-4 No-Passing Zone Markings (MUTCD 3B-3)

No-passing zones shall be established at vertical and horizontal curves and elsewhere on two- and three-lane highways where passing must be prohibited because of inadequate sight distances or other special conditions.

A no-passing zone shall be marked by either a one direction, no-passing marking or a two direction, no-passing marking as illustrated in Figures 1 and 2.

A four inch (100 mm) space shall be used between the solid (barrier) line and a broken line. Double solid (barrier) lines typically have a 12 inch (300 mm) space between lines, but a 4" (100 mm) space may be used on narrow two-lane roads.

A broken line shall not be retraced or painted between the double solid lines.

The ends of no-passing zone barrier lines are usually marked with white reference posts placed on the side of the roadway corresponding to the placement of the barrier line. Arrows on the posts indicate the beginning and ending of the barrier line (Figure 1).

Following construction projects, no-passing zones should not be repainted as a matter of routine using the old white reference posts. Construction projects may realign the road, which can have a noticeable affect on the amount of sight distance. Prior to painting these sections of highway, the traffic line supervisor, region traffic operations supervisor, or the project manager should lay out the no-passing zones (Figures 1 and 2).

B-5 No-Passing Zones (MUTCD 3B-4)

On a three-lane highway where the single lane is being moved from one side of the road to the opposite side, a no-passing buffer zone shall be provided as shown in Figure 3.

Where no-passing zone markings are warranted, they should generally be 500 feet (150 m) or longer. Where necessary, the no passing marking should be extended at the beginning of the zone to obtain the 500 feet (150 m) minimum.

Where the distance between successive no-passing zones is less than 400 feet (120 m), the appropriate no-passing marking (one direction or two direction) should connect the zones.

No-passing markings are also used on approaches to channelized intersections (Figure 17). The barrier line should extend about 500 feet (150 m) in urban areas or 1,000 feet (300 m) in rural areas or in advance of the painted traffic separator. If a minor intersection is located close to 1,000 feet (300 m) from the separator, the barrier line should not extend through the intersection.

The no-passing marking is also used on two-way roadways at lane reduction transitions (Section B-9), on approaches to obstructions which must be passed on the right (Section B-13), on approaches to railroad grade crossings (Section B-20), and other locations where passing should be prohibited.

B-6 Warrants for No-Passing Zones at Curves (MUTCD 3B-5)

Where center lines are painted, a no-passing zone at a horizontal or vertical curve is warranted where the sight distance, as defined below, is less than the minimum necessary for safe passing. Passing sight distance on a vertical curve is the distance at which an object 3.50 feet (1.07 m) above the pavement surface can be seen from a point 3.50 feet (1.07 m) above the pavement (Figure 2). Similarly, passing sight distance on a horizontal curve is the distance measured along the centerline between two points 3.50 feet (1.07 m) above the pavement on a line tangent to the obstruction that cuts off the view (Figure 2). No passing zones should be marked where the sight distance is equal to or less than that listed below:

85th Percentile Speed or Posted Speed, Whichever is Greater	Minimum Passing Sight Distance
30 MPH or 50 KPH	500 feet or 155 meters
40 MPH or 60 KPH	600 feet or 185 meters
50 MPH or 80 KPH	800 feet or 245 meters
55 MPH or 90 KPH	900 feet or 275 meters
65 MPH or 110 KPH	1,100 feet or 335 meters

The beginning of a no-passing zone (Figure 2 point “a”) is that point at which the sight distance first becomes less than that specified in the above table. The end of the zone (point “b”) is that point at which the sight distance again becomes greater than the minimum specified.

B-7 Travel Lane Edge Lines (MUTCD 3B-6)

Edge lines (or shoulder lines) should be a four inch (100 mm) solid line. Bike lanes shall be separated from the travel lanes using an eight inch (200 mm) solid white line.

At approaches to obstructions, the marking should conform to MUTCD Section 3B-13.

Edge lines shall be provided on all interstate highways and on rural multi-lane divided highways. The lines shall be white except that on the left edge of each roadway of divided streets and highways, and one-way roadways in the direction of travel, they shall be yellow.

Freeway Sections - Existing edge lines shall be retraced in place. Any new multi-lane sections shall be striped with 12 foot (3.6 m) lanes (Figures 21 through 25, Figure 45, and Figure 47). The left edge line on freeways shall be a four inch (100 mm) yellow line.

On freeway sections with curb or barrier, the edge line shall be placed where surfaced shoulder areas are wider than four feet (1.2 m).

Edge lines on interchange ramps beyond the neutral area (gore area) shall be painted yellow on the left and white on the right.

Non-freeway Sections - Existing edge lines shall be retraced in place. Any new paved two-way, two-lane roads having a width of 24 feet (7.3 m) or more, with adequate surfaced shoulder, should have an edge line. In general, edge lines should be 12 feet (3.6 m) from the center line or lane line.

Edge lines may be used on roadways with a nominal paved width of 20 feet (6.1 m) or 10 foot (3.0 m) lanes contingent on two or three feet (600 or 900 mm) of existing shoulder on which traffic line equipment can be operated.

Edge lines may also be used on roadways of less than 20 feet (6.1 m) in paved width only after an engineering investigation has been conducted and approved by the state traffic engineer.

On rural sections, the edge line shall be placed on curbed sections where the surfaced shoulder area is wider than four feet (1.2 m) and where parking is prohibited.

Edge lines should not normally be painted in urban sections or in areas that have marked parking stalls.

Edge lines shall not be continued through intersections and should not be broken for driveways or alleys. The line shall begin again across the intersections as shown in Figures 9 and 11. At complex or special intersections, dotted lines may be used to continue shoulder line across a wide intersection (Figure 9).

B-8 Dotted Lines (MUTCD 3B-7)

Dotted lines are used to guide traffic through confusing areas. They are helpful as lane line extensions on multiple turn lanes of a major intersection (Figure 15), or at offset or skewed intersections (Figure 7). They may also be used as extensions of shoulder edge lines at freeway exit ramps (Figures 21 and 24), at turning lanes of intersections (Figures 11 through 14),or where turning lanes are located on horizontal curves and to mark an area where vehicles may be crossing a bike lane.

Where there are multiple turn lanes in an intersections, a greater degree of restriction is usually desirable and solid channelizing lines may be continued through the intersection. They may be continued through a painted crosswalk. It is not necessary for the channelizing line to direct turning traffic into the nearest lane. (Figure 8).

B-9 Lane Width Transitions (MUTCD 3B-8)

Lane width transition lines should normally be laid out by the project manager or region traffic operations supervisor. Where this service is not available, the transition should be laid out by the striping supervisor using Figures 4 and 5, or an approved plan, as a guide.

The traffic line markings for these lane transitions will take various shapes, but should be laid out using standard 4 inch (100 mm) lines.

B-10 Channelizing Lines and Islands (MUTCD 3B-9)

Channelizing lines should be eight inch (200 mm) solid white lines. They are used to limit sideways movement of traffic by discouraging crossing of this painted line. Included in this type of marking are painted islands with transverse lines or chevron markings where the traffic moves in the same direction on each side of the island (Figure 11), gores at freeway ramps (Figures 21 through 25), and any other type marking designed to discourage crossing of the line even though traffic may proceed in the same direction on both sides.

When painted, curbs on raised islands used to channelize traffic should also be white.

Pavement markings for slow moving vehicle turnouts are shown in Figure 6. This striping should only be used when the turnout is at least 350 feet (90m) in length and when it is a minimum of 16 feet (4.8 m) in width.

B-11 Median Islands (MUTCD 3B-10)

All painted median islands four feet (1.2 m) or greater in width are outlined by double yellow lines; islands less than four feet (1.2 m) in width are outlined by single yellow lines (Figure 11).

Where the median width is six feet (1.8 m) or more and the median ends at an intersection, the median shall have their solid yellow stripes joined. The stripes shall be joined as shown in Figures 10 and 19. Median widths less than six feet (1.8 m) shall be painted as shown in Figure 10.

Transverse Median Markings: When a traffic engineering study determines it necessary, yellow transverse markings or bars shall be used in painted medians six feet (1.8 m) or greater [four feet (1.2 meters) inside] in width. The markings are painted at 20 foot (6.1 m) intervals, except that when the distance between left turn refuges exceeds 200 feet (60 m) the spacing may be increased to 40 feet (12.2 m) or the markings may be omitted altogether in areas away from intersections. The width of the painted transverse markings and their slopes should be as shown on Figure 10.

Left Turn Lane Refuges: Normally, left turn lane refuges are laid out by the project manager or region traffic operations supervisor. Where better information is not available and where delay is not possible, the refuges may be laid out using the information in Figures 17 through 19. Median, end, and nose treatment are standard.

Two Way Left Turn Lane: Figure 20 shows the marking pattern for a two-way continuous left turn lane.

B-12 Interchange Ramps on Freeways (MUTCD 3B-11)

Figures 21 through 25 and Figures 44 through 47 show the layout of all traffic lines and pavement markings for exit and entrance ramps. These drawings should be followed as closely as possible and will normally be used as a guide by the project manager to lay out new work.

Two exceptions to the normal interchange ramp design are as follows:

Two Way Ramp Sections: Freeway ramps which carry two way traffic over some of their length shall be painted with edge lines and double yellow center line on the two way portions, and the standard edge lines only on the one way portion.

Lane Drop at Interchanges: Refer to Figures 23, 45, and 47 showing layout for striping exit ramps where the right lane of a multi-lane section is dropped from the freeway.

B-13 Approach to an Obstruction (MUTCD 3B-13)

Fixed Obstructions: On approaches to fixed obstructions in the roadway, such as bridge abutments or handrails, the striping shown in Figure 26 shall be used.

When an obstruction is located in a roadway such that all traffic is required to pass to the right of it, a painted median island shall be used. The island shall be outlined by double yellow lines with transverse yellow striping within the island (Figures 27a and 27b).

If traffic may pass either to the left or right of the obstruction, an island shall be formed by a wide white line or double white line on each side. White bars should be painted within the island (Figure 27c).

Curbed Islands: When painted, solid yellow paint should be placed on the curbs of islands where the curb serves to channel traffic to the right of an obstruction. Solid white paint should be used when traffic may pass on either side of the island. Vertical faces of curbs needs not be reflectorized.

B-14 Stop Lines (MUTCD 3B-17)

Stop lines should be used at “STOP” signs and at traffic signals, except where there is a painted crosswalk. They shall be solid white lines not less than 12 inches (300 mm) nor more than 24 inches (600 mm) wide. In general, stop lines in urban areas will be from 12 inches (300 mm) to 18 inches (450 mm) wide, and stop lines in rural areas where approach speeds are higher will be from 18 inches (450 mm) to 24 inches (600 cm) wide.

Stop lines shall be placed as near as possible to the traveled way of the intersected highway but should not be closer than four feet (1.2 m) to the traveled way or nearest crosswalk line. The stop line will extend across the traveled way of the vehicles to be stopped. In curbed sections, the stop lines should normally be placed on a line

extended from the back edge of the sidewalk or in the case where no sidewalk exists, should be installed as stated above. Figures 9 and 16 show some typical installations.

Stop line should not be used with painted crosswalks unless it is desirable to stop vehicles in advance of the nearest crosswalk line.

Stop lines should be placed perpendicular to the travel lane or parallel to the nearest crosswalk.

B-15 Crosswalk Lines (MUTCD 3B-18)

Crosswalk lines shall be solid white transverse lines marking both edges of the crosswalk. The width of the crosswalk itself shall be a minimum of six feet (1.8 m) from edge to edge. The transverse crosswalk lines shall not be less than 12 inches (300 mm) wide. On state highways with posted speeds of 55 mph or above, the minimum transverse lines shall be 18 inches (460 mm)

Crosswalks should be used at signalized crossings and across intersectional approaches on which traffic stops. Crosswalks shall be used at established school crossings. An engineering study should be required before crosswalks are installed at locations away from traffic signals or STOP signs. Contact the Traffic Management Section for additional information. Change or modification of the above design and installation of additional crosswalks requires the approval of the state traffic engineer in consultation with region manager, on the state highway system (Subdelegation Order TSB-1).

B-16 Words and Symbol Markings (MUTCD 3B-20)

Word and symbol markings on the pavement are used for the purpose of guiding, warning, and regulating traffic. They shall be white in color. Word markings should be centered within the lane to which they apply, and the spacing between markings shall be adjusted for approach speeds or as shown in Figure 29.

Placement of turn arrows is important. Improperly placed arrows may mislead motorists. The advance arrow should always be painted beyond an alley toward the intersection.

Lane-use arrow pavement marking may be used to convey either guidance or mandatory message. Where lane-use arrows are used to convey a mandatory movement, it must be accompanied by standard sign and the word marking “ONLY.” Signs or markings should be repeated in advance of mandatory turn lanes when necessary to prevent entrapment and to help motorists select the appropriate lane before reaching the end of the line of waiting vehicles.

Messages consisting of more than one word should read “up,” i.e., the first word should be nearest to the driver. All letters, numerals, and symbols should be in conformance with the FHWA publication, “Standard Alphabets for Highway Signs and Pavement Markings”.

B-17 Preferential Lane Markings (MUTCD 3B-22)

The diamond-shaped preferential lane symbol is intended for use on highway facilities where lanes are reserved for full or part time use by a particular class of vehicle except for bicycles. Signs or signals shall be used with the preferential lane marking.

Preferential lane marking shall be formed by white lines at least six inches (150 mm) in width, shall be at least two and one half feet (750 mm) in width and 12 feet long (3.6 m), and shall be placed coincident with the longitudinal center of each restricted lane.

Word markings may be used to supplement, but not replace, the preferential lane marking.

B-18 Cattle Guards

Figure 31 shows the typical pattern for painting cattle guards. Prior to initial painting, the area to receive cattle guard should be paved from shoulder to shoulder as shown in Figure 31 so the painted cattle guard will extend completely across the roadway.

B-19 School Markings (MUTCD 7C-6)

The letter and numeral heights used for school crossing pavement marking shall be eight feet or more. Letters, numerals, and symbols shall be white in color and in accordance with standard alphabets for highway signs and pavement markings.

The proper legends to be used in advance of an established crossing are "SCHOOL CROSSING" and "SCHOOL XING." The marking should be located at the school advance sign (S1-1). Generally, the word "SCHOOL" should be placed adjacent to the school advance sign (S1-1) with the word "CROSSING" or "XING" placed after or furthest from the driver.

Markings are not mandatory for use with the school crossing signs, but if used, the signing must be installed.

B-20 Approaches to Railroad Crossings (MUTCD 8B-4)

The symbols and letters in advance of railroad crossing shall be white in color except for the no-passing markings, which shall be yellow. Pavement markings for approaches to railroad crossings should be painted as shown in Figures 32 and 33. Identical markings shall be placed in each approach lane on all paved approaches to grade crossings . The marking shall also be placed at crossings where an engineering study indicates there is significant potential conflict between vehicles and trains. Markings shall be installed at all crossings unless otherwise authorized, in writing by the state traffic engineer, after an engineering study indicates such installation may be confusing or ineffective.

C. BICYCLE FACILITIES

C-1 General

Definitions: A bike lane is a portion of a roadway that has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists. A bike path is a bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right of way or within an independent right of way. A bikeway is any road, path, or way that in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

All pavement markings for bikeways should be reflectorized.

If a marked bike lane crosses an intersection or a right turn lane, a dotted line may be used to define the lane.

Bikeway markings should conform to the details shown on Figures 38 through 41.

A solid eight inch (200 mm) white barrier line shall be used to delineate a bike lane (Oregon Administrative Rule 734-20-055).

Generally, centerlines are not required on bicycle paths. On two way bike paths where sight distance is restricted, a centerline stripe may be placed to separate opposing traffic. The centerline shall be a double yellow line, two to four inches (50 to 100 mm) in width.

If broken lines are used, a one to three segment-to-gap ratio should be used. Existing broken lines should be retraced using existing spacing. A three foot (900 mm) segment with a nine foot (2.7 m) gap may be used on new installations unless otherwise specified.

Where necessary to stop the bicycle traffic, a stop line may be placed in conjunction with a standard bikeway stop sign (ORB1-1-24 or R1-1-18). The stop line shall be a white, six inch (150 mm) wide line.

Non-slippery durable markings can be used for delineation.

C-2 Markings of Designated Bikeways (MUTCD 9C-4)

Bikeway preferential lane markings shall conform to the detail shown on Figures 38 through 41. The diamond-shaped preferential lane symbol may be used and shall conform to the detail shown on Figure 38-B and 39-B. The pavement markings shall be white and shall be used immediately after an intersection to inform motorists turning of the restricted nature of the lane.

D. APPLICATION

D-1 General

The accurate placement of traffic lines and markings at the recommended application rates is the goal of this section.

Accurate and timely paint application keeps the markings clear and easily understood, aiding in the smooth and efficient flow of traffic. Proper application of traffic line and markings will have a positive effect on uniformity and traffic safety.

D-2 Traffic Lines

Cycle Length: The skip-line cycle length should be checked periodically to maintain the 40 foot (12.2 m) cycle.

Line Length: The length of a standard painted skip-line is 10 feet (3.0 m). This length should be checked and corrected periodically. The length of line is not as critical as the cycle length, but it should be checked to insure standard length and maintain coverage on retrace.

Line Width: The application rates, as shown below, will not give adequate line thickness if the line width is not correct. Thin traffic lines are short-lived and perform poorly. Line widths should be checked frequently.

Application Rates: The application rates for a traffic line are:

4 inch skip- line:	4-1/2 gal./mile or 10.7 liter/km
4 inch solid line:	17 gal./mile or 40 liter/km
Beads:	5 lbs./gal or 0.6 kg/liter

These rates are based on an application thickness of 15 mils (wet) and may be varied according to the conditions of the pavement and the line retraced. For new line on new pavement, the above rates for paint should be increased for the heavy coverage required to offset bleeding of the asphalt through the paint.

Retrace: Care should be taken and every effort made when retracing center line and lane lines to maintain the gap and interval of the old line. Misses of a foot (300 mm) or more are objectionable and should be held to a minimum.

D-3 Pavement Legends (MUTCD 3B-15)

Paint application for pavement legends will vary with the age of the pavement or age of the old legend. The amount of paint applied should never be less than that required to hold and bond the beads to the paint.

The glass beads have proper bond when most of the beads are two-thirds in the paint and one-third out of the paint. Anything less than that will reduce the life of the reflectorized legend.

Application rates for a few pavement legends are as follows:

1’ x 12’ stop bar:	8 bars/gal. or 2 bars per liter
“ONLY”:	3 legends/gal. or 3 legends per 4 liters
“SCHOOL CROSSING”:	1 legend/gal. or 1 legend per 4 liters
Pavement Arrow:	5 arrows/gal. or 4 arrows per 3 liters

These rates are for retrace; on new work the number of legends per gallon or liter will be less.

D-4 Pavement Marking Tapes

Certain heavy traffic areas require a marking material that will last. The use of thermo-plastic or other reflective tape is recommended for stop lines and symbol markings in those areas where its use can be economically justified.

D-5 Raised Pavement Markers (RPM)

The following types of RPM’s are used for delineation of traffic:

1. Mono-directional white (clear) reflectorized (Type I).
2. Bi-directional yellow reflectorized (Type I).
3. White non-reflectorized (Type II).
4. Yellow non-reflectorized (Type II).

RPM’s can provide better visibility over painted lines during wet weather conditions, especially at night. They also provide a tactile and auditory warning when vehicles cross over them.

RPM’s should only be used where an engineering study indicates they are cost effective or are needed to improve traffic safety. RPM’s should not be used within bikeways.

Reflectorized RPM (Type I) are often used to supplement a painted line. They are also used in conjunction with non-reflectorized RPM (Type II) in lieu of a painted lane line or center line. Reflectorized RPM (Type I) should not be used on white edge lines unless an engineering study determines it necessary to guide traffic through a difficult area.

When used, RPM’s shall be installed as shown in Figures 34 through 37, 42 through 44 and 46.

Reflective pavement markers may be recessed in snow zone areas where roads are frequently plowed. Figure 37 shows a typical detail for the groove.

Grooves should be cut using equipment in good working condition to provide a clean cut of proper width and depth without damage to the pavement. Recessed markers

should only be considered on pavements in good condition, not requiring major work for several years.

D-6 Durable Markings

Durable markings are applicable to both traffic lines and pavement legends. Durable markings are products that are thicker, harder, more expensive, and generally more difficult to install. Durable marking's thickness should not be less than 40 mils and not more than 120 mils in snow removal areas. The use of durable marking is recommended for traffic lines and pavement legend where its use can be economically justified.

For mountain areas under new construction, inlaid product should be considered. In the lowlands, profiled markings, which can give a rumble effect, are an excellent way to delineate lane lines and edge lines.

Due to the added costs of these products, durable marking should only be considered on pavements in good condition, not requiring major work for several years.

The following tables should be followed in choosing the type of marking material.

	SNOW ZONE	**NON-SNOW ZONE**		
	(elev. >2500')	**<10,000 ADT[1]**	**10,000 - 30,000 ADT**	**>30,000 ADT**
GOOD ALIGNMENT	PAINT	PAINT	PAINT/RAISED	RAISED
POOR ALIGNMENT[2]	PAINT	RAISED/PAINT	RAISED/PAINT	RAISED

Material	**Durability (years)**	**Wet Mil Thickness**	**No-Track Times (minutes)**
Alkyd Thermoplastic[3, 4]	2 - 6	Spray: 40 - 60 Extruded: 90 - 120	Spray: 1 - 5 Extruded: 15
Hydrocarbon Thermoplastic[3, 4]	2 - 6	Spray: 40 - 60 Extruded: 90 - 120	Spray: 1 - 5 Extruded: 15
Alkyd Paint	1 - 1½	15	½ - 1
Waterborn Paint	1 - 1½	15	½ - 1
Perform Tape[3]	1½ - 4	60 - 90	N/A
Epoxy[5]	3 -6	15 - 40	5 - 20
Methacrylate[4]	3 - 10	Spray: 50 - 60 Extruded: 90 - 120 Profiled: 90 / 500 x 4	18 - 20
Reflective Markers with Buttons[6]	2 -6	750	Bituminous: 2 - 5 Epoxy: 20 - 60

[1] Raised marker should be considered for high seasonal traffic volumes and for heavy rain and fog zones.
[2] Consider durable markings for special applications.
[3] Rainy weather version available.
[4] Rumble version available.
[5] Skip stripes only.
[6] May require substantial surface preparation.

E. OPERATION

E-1 Duties of Crew Members

In general, the crew should work as a team to paint traffic lines accurately, safely, and efficiently -- with accuracy to produce an easily understood, uniform guide to the motorist; with safety to protect the traveling public and striping crew; and with efficiency to reduce the interference with traffic.

Traffic Line Supervisor: It is the responsibility of the traffic line supervisor to plan the operation of the crew so that work will progress smoothly and safely. The supervisor will see that paint materials are ordered well before they are needed. He/she will have their crew properly outfitted with the equipment necessary to perform the work and to perform it in a safe manner. The supervisor will check to insure that all equipment is properly maintained, and that all preventive maintenance measures are followed.

The supervisor is responsible for painting traffic line and pavement markings according to the standards written in this manual. Initial layout on new roadways shall be done according to an approved plan. The layout marking should be done by the project manager or region traffic operations engineer/supervisor. Variations in standard layouts can be made only after careful review of the conditions on the ground. Unusual conditions which do not fit a standard should be laid out as directed by the district manager or the region traffic operations engineer/supervisor.

Layouts should be checked by the supervisor prior to painting as mentioned in a later paragraph. Layouts made by relatively new head lineman should always be checked by the supervisor, and difficult layouts should be made by the supervisor. When striping detours, the supervisor should avoid painting traffic lines which will confuse the public either while the detour is operating or after the detour is closed and traffic is traveling normally through the section. All lines which would confuse the public should be removed.

The supervisor is responsible for the safety and training of the crew.

Paint Machine Operator: The paint machine operator (PMO) is a key person on the crew. The results of his work will be in full view of traffic for months to come. This reason alone is enough to expect first quality work by a PMO.

The PMO will be expected to paint a traffic line with accuracy. The basic measure of this accuracy will be made during retrace, especially retrace of skip lines. The PMO will keep a constant check on the operation of the paint guns and the beaders.

The PMO will keep the paint guns, pumps, etc., in good working order, will perform preventive maintenance, and make minor repairs necessary for full-time operation of the equipment.

The senior PMO is expected to know the complete operation of the paint crew, so that in the absence of the supervisor, the PMO can effectively run the crew. The PMO will have complete knowledge of the painting standards.

Head Lineman: The head lineman will work ahead of the paint machine to assure the road is in condition for painting. The head lineman will lay out the spot center lines, shoulder lines, or pavement markings. He/she will have a full and complete working knowledge of all standards so that the layouts are correct. The head lineman will check his layouts and line spotting to make sure traffic can maneuver in the desired way, and that the markings can be easily understood.

E-2 Crew Operation

General: Operation of the crew should be carried out in a manner that is both safe and efficient. Generally, this can be done by using pilot vehicles to both warn the traveling public and to protect the paint machine, and also by keeping the crew in the equipment and moving. One or more shadow vehicles will protect the wet line and warn the traveling public. Warning signs shall be on vehicles. Legends may require cones to protect the wet paint.

Where appropriate, all painting operations should be performed in the direction of traffic.

Cones should be picked up as soon as the paint dries.

Public relations can be improved or destroyed by the actions of the traffic line crew. Good flagging operations will create good public relations. During operations of the traffic line crew, the public should be treated with courtesy at all times under all situations.

Large Crews: Normally, large crews operate to restripe all the center lines, shoulder lines, and lane lines on the state highway system. They are called upon to stripe long sections of newly constructed highways. These crews may also paint pavement legends, especially in high traffic volume areas.

When traffic lines are being striped, the pilot vehicle (carrying the head lineman) will normally work in advance of the paint machine to do any spotting, marking, cleaning, etc., required to permit the paint machine to continue operation without any stops. In two-way traffic, the pilot vehicle will, at all times, be in advance of the paint machine to warn oncoming traffic and to protect the paint machine.

The service truck with two workers will carry extra paint, beads, thinner, etc. The mopping operation may be made from this truck.

The mopping operation will be performed from the last truck in line. A second pickup truck may be used in the line, if needed.

Small Crews: Small crews paint traffic lines and pavement legends, and sections of new construction.

Operation of this size crew will vary according to the work; however, certain basic procedures are followed. A pilot vehicle will always precede the paint machine when striping center lines under two-way traffic. Normally, a vehicle will follow the paint machine to mop. The number of workers in the pilot vehicle and service truck will vary according to the need.

During the painting of pavement legends, etc., two or three workers shall work together. Line removal operations shall be performed in the direction of traffic, with a flagger to protect the operation.

In general, the operation should be such as to protect the slow moving paint machine, to warn traffic, and to perform the work as efficiently as possible.

Layout: Layout of new work should be done by the project manager, district manager or region traffic operations engineer/supervisor. To be sure layout is accomplished prior to arrival of the crew at the job, the supervisor should ask the project manager requesting the work to lay out the striping. The project manager should provide the crew supervisor with a copy of the approved plan. On bikeways, the bicycle/pedestrian program manager should be contacted.

Unless the work laid out is simple, such as a centerline or edge line, the layout should be checked by the supervisor. Layouts of left turn refuges, divided highway medians, etc., must not be made in a manner hazardous to traffic. These layouts should be checked by outlining them with cones. If minor adjustments in layout can improve conditions, these adjustments should be made. If some major problem is brought out by the cone outline, the problem should be pointed out to the project manager for correction. A major problem would be a complete revision of alignment, the relocation of a turn refuge lane and the like. Examples of minor revisions would be in adjusting the reverse curves at a left turn refuge to better fit traffic patterns, adjusting the beginning of the left turn refuge to fit approach traffic, moving slightly the nose of a median or left turn slot to fit traffic, etc.

F. SERVICE AND SUPPLY

F-1 Equipment

Preventive maintenance consists of the proper operation and systematic service, inspection, detection, and correction of potential equipment failures before they develop into major and costly breakdowns.

The operator and supervisor are responsible for providing preventive maintenance and for securing needed non-routine maintenance and repair. This includes, but is not limited to, daily maintenance inspections, proper operation, care, use, adjusting, cleaning, preserving, and lubricating equipment.

Records of all maintenance and field repairs are the responsibility of the traffic line supervisor. These records should be kept with the equipment.

Rental equipment will not be altered, modified, or experimentally changed without the concurrence of the appropriate shop superintendent or the equipment superintendent.

Field charges to rented equipment for fuel, filters, lubricants, tires, and other parts shall be correctly charged to units where actually used. No consumable supplies should be charged to the equipment number.

The traffic line/maintenance supervisor of the Equipment & Services Unit will assist in coordinating and directing equipment maintenance and repairs, and with the ordering of parts and shipment in the event emergency repairs are required.

Shop superintendents of the Equipment & Services Unit are responsible for administering all non-routine repairs in their area.

F-2 Materials

The supply operation, within the Equipment & Services Unit, purchases, warehouses, issues, and delivers statewide the equipment parts, supplies, and materials required to support the traffic line crews, such as traffic line paint, beads, thinner, stripper, etc., and picks up the empty drums and containers.

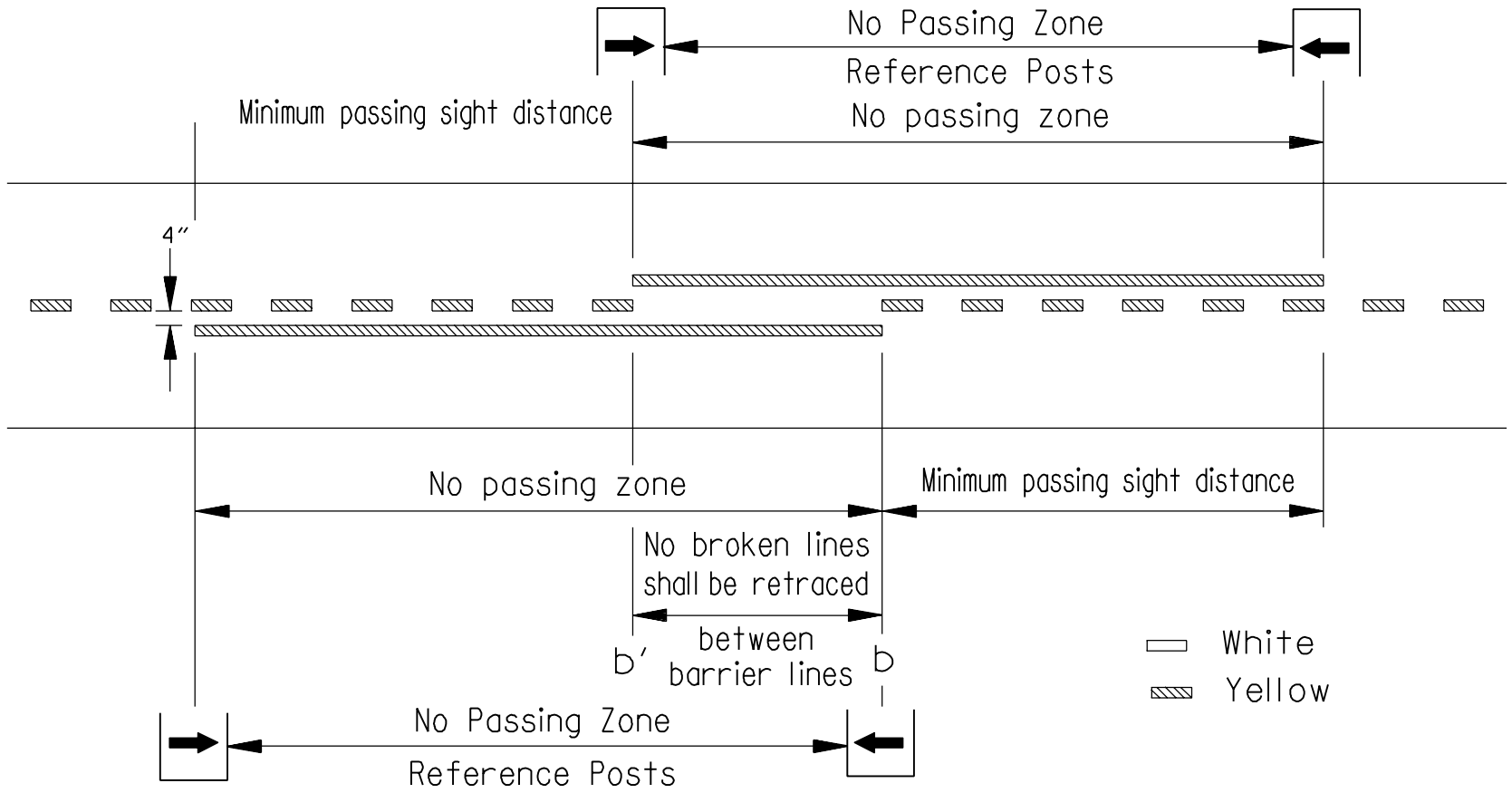
The storeroom at Salem stocks general supplies and materials utilized in most operational areas of the department (signs, traffic signals, traffic line paint, guardrail, small tools, safety items, etc.) in addition to equipment parts. The storerooms in Bend and La Grande stock mainly equipment parts.

Items may be ordered from the storerooms by submitting a Storeroom Order & Invoice (No. 734-1327) to the appropriate storeroom.

SAFETY IS EVERYBODY'S JOB

The safety of a crew is always dependent upon each individual of that crew. You should not use, or allow others to use, unsafe practices. Suggestions or ideas to improve our traffic line operations will be very much appreciated. We should continue, as in the past, to improve upon our operations to make these crews safer and more efficient.

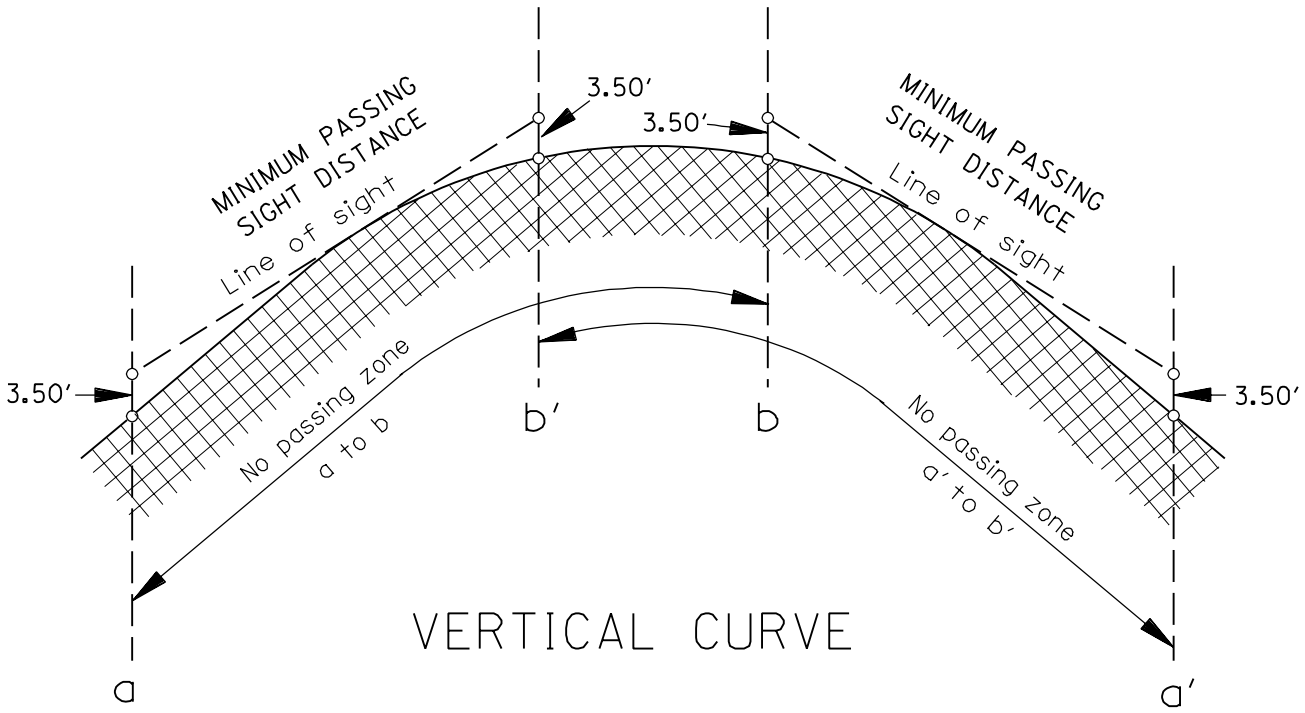
THINK SAFETY - ACT SAFELY



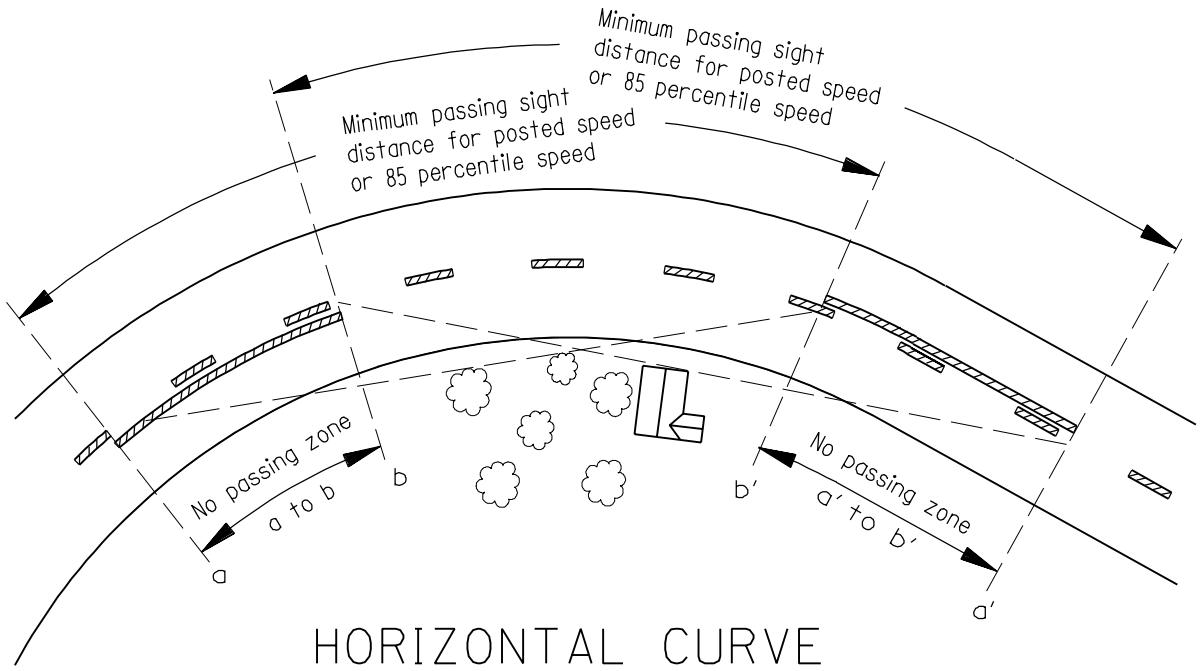
TYPICAL NO-PASSING ZONE MARKERS

Figure 1

TLMANUAL.DGN 9-13-96 VIEW=FIG2



VERTICAL CURVE



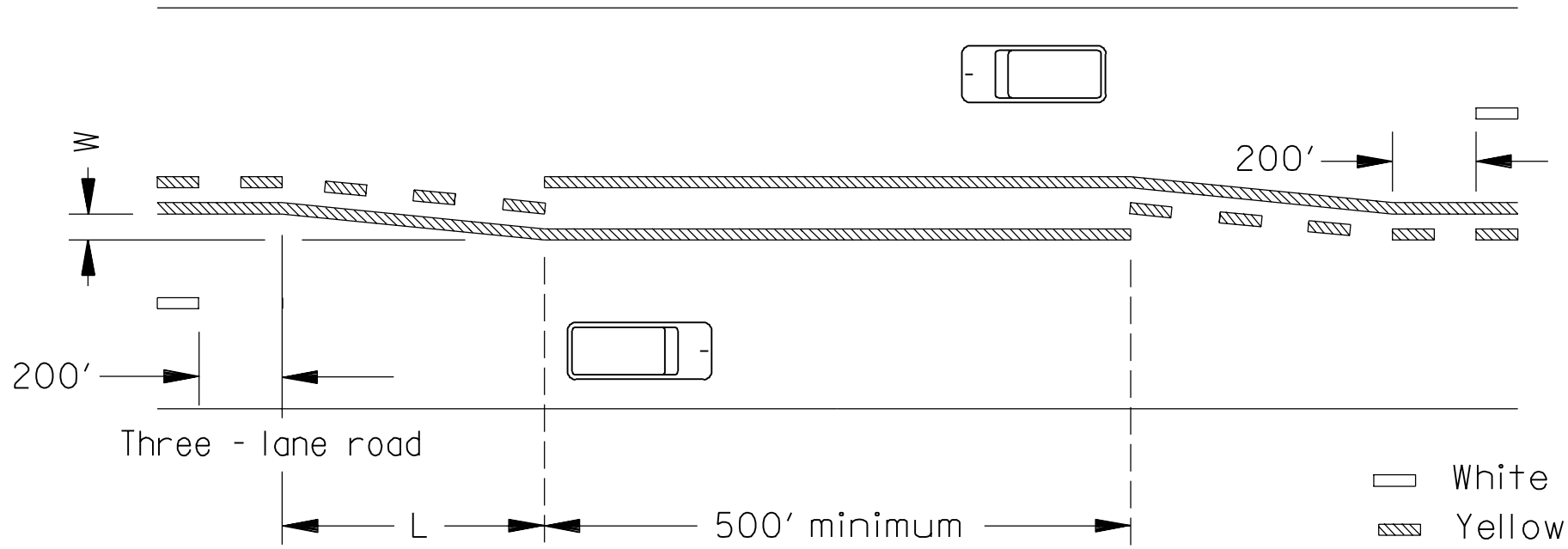
HORIZONTAL CURVE

Yellow

METHOD OF DETERMINING NO-PASSING ZONE LIMITS

(See paragraph B-4)

Figure 2



For speeds 45 M.P.H. or more

$L = W \times S$

For speeds 40 M.P.H. or less

$L = \frac{WS^2}{60}$

L = taper length in feet

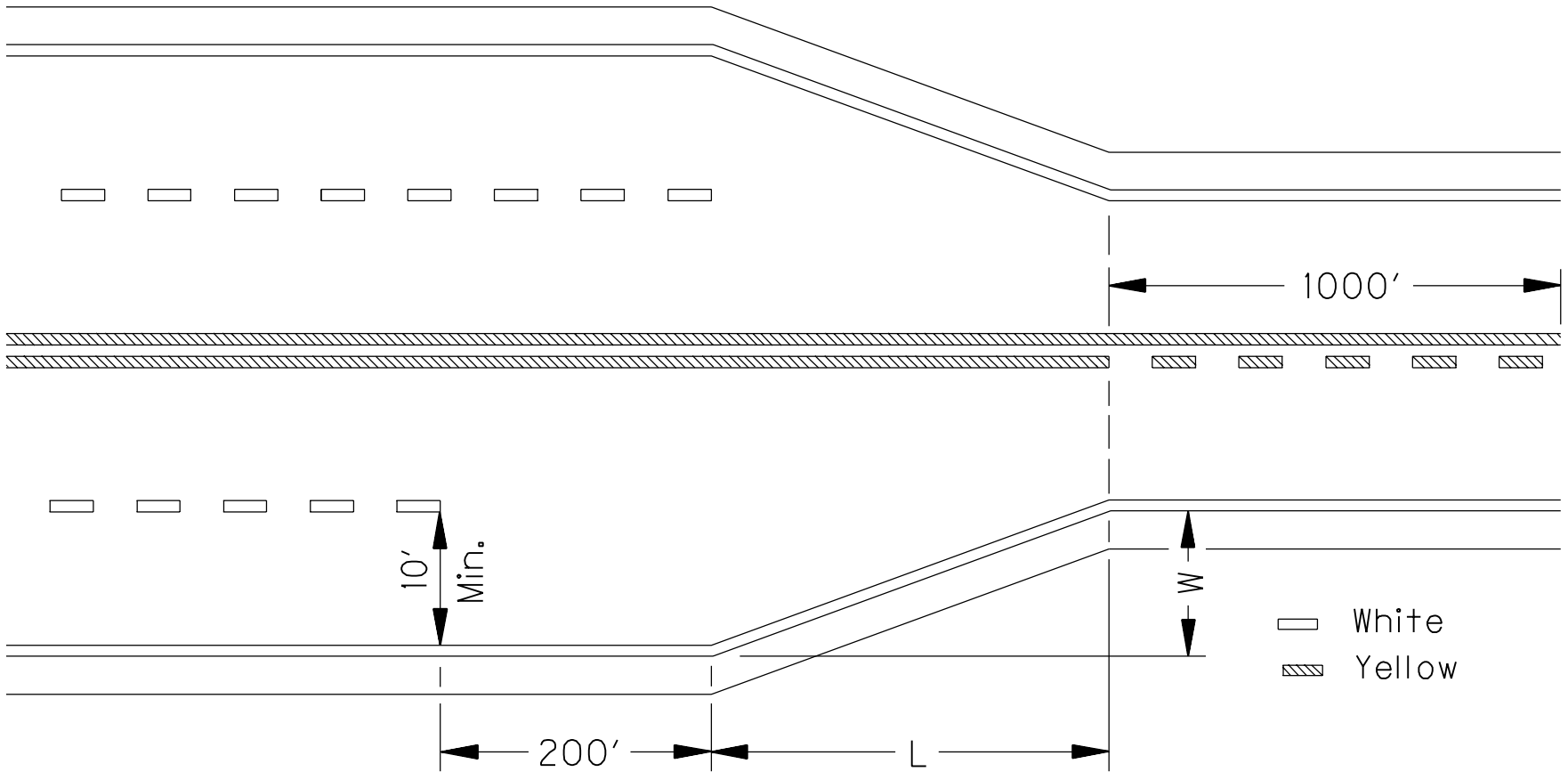
W = offset in feet

S = Posted or 85th percentile speed in M.P.H.

TYPICAL CLIMBING LANE NO-PASSING ZONE

Figure 3

TLMANUAL.DGN 9-13-96 VIEW=FIG4



For speeds 45 M.P.H. or more

$L = WxS$

For speeds 40 M.P.H. or less

$L = \frac{WS^2}{60}$

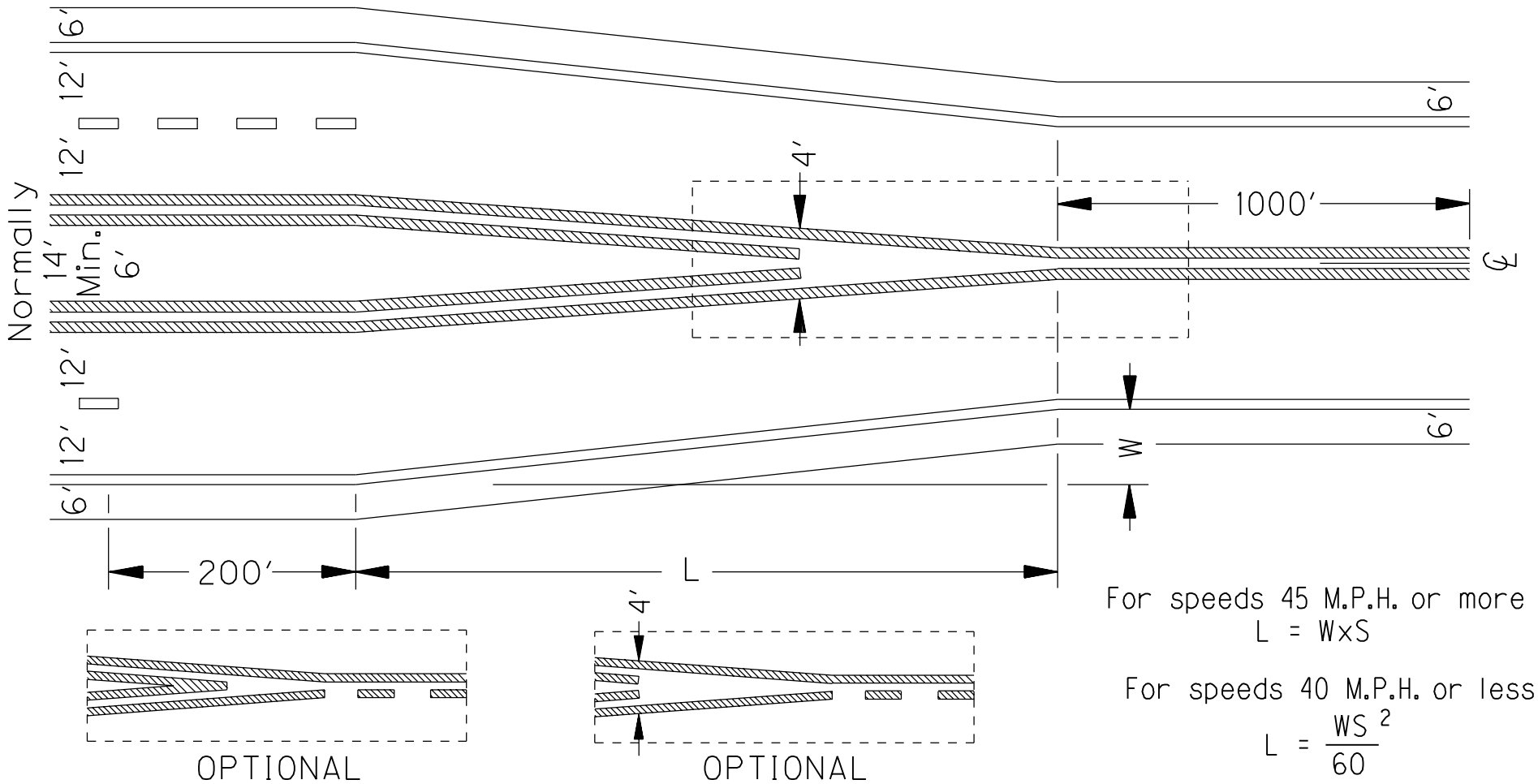
L = taper length in feet

W = offset in feet

S = Posted or 85th percentile speed in M.P.H.

TYPICAL LANE WIDTH TRANSITION

Figure 4



For speeds 45 M.P.H. or more

$L = WxS$

For speeds 40 M.P.H. or less

$$L = \frac{WS^2}{60}$$

White

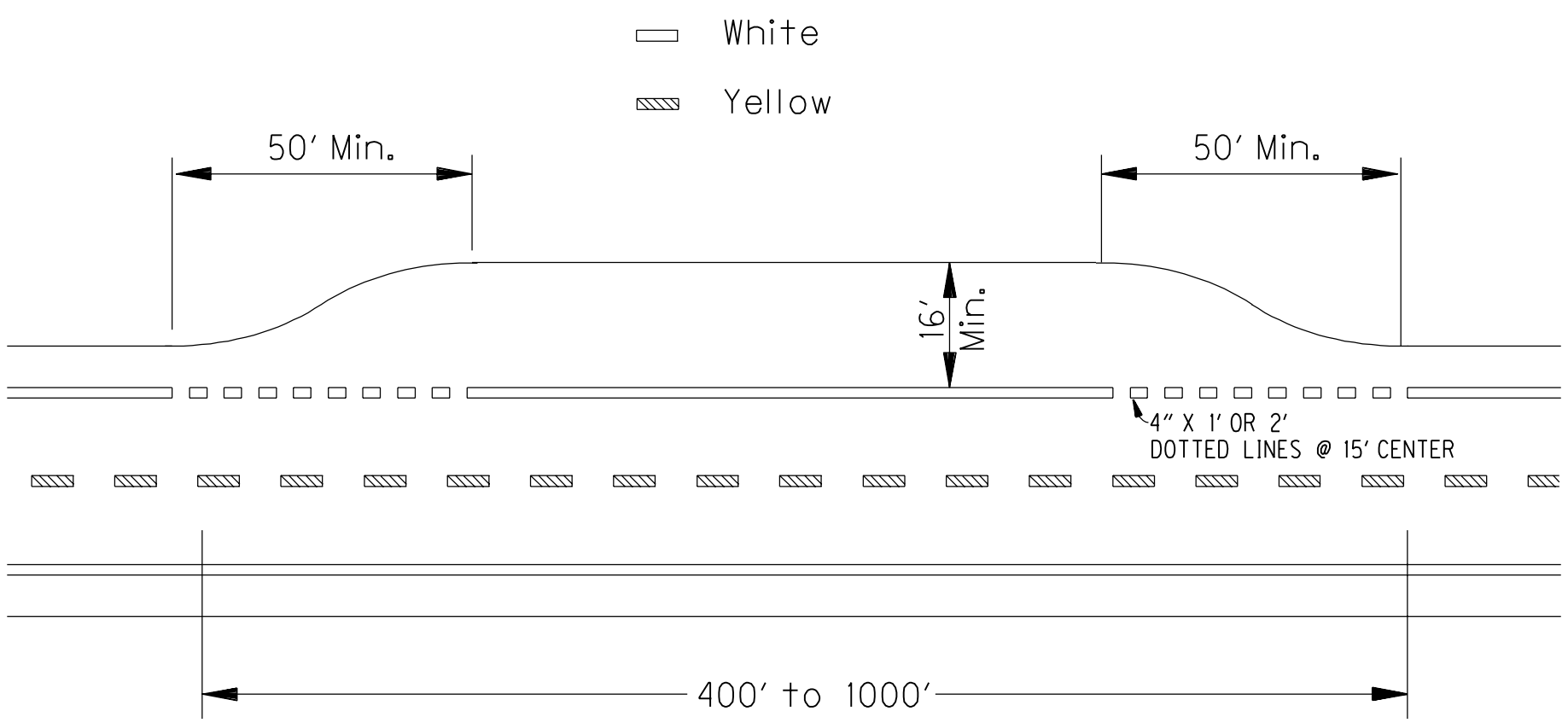
Yellow

TYPICAL LANE WIDTH TRANSITION

WITH / MEDIAN

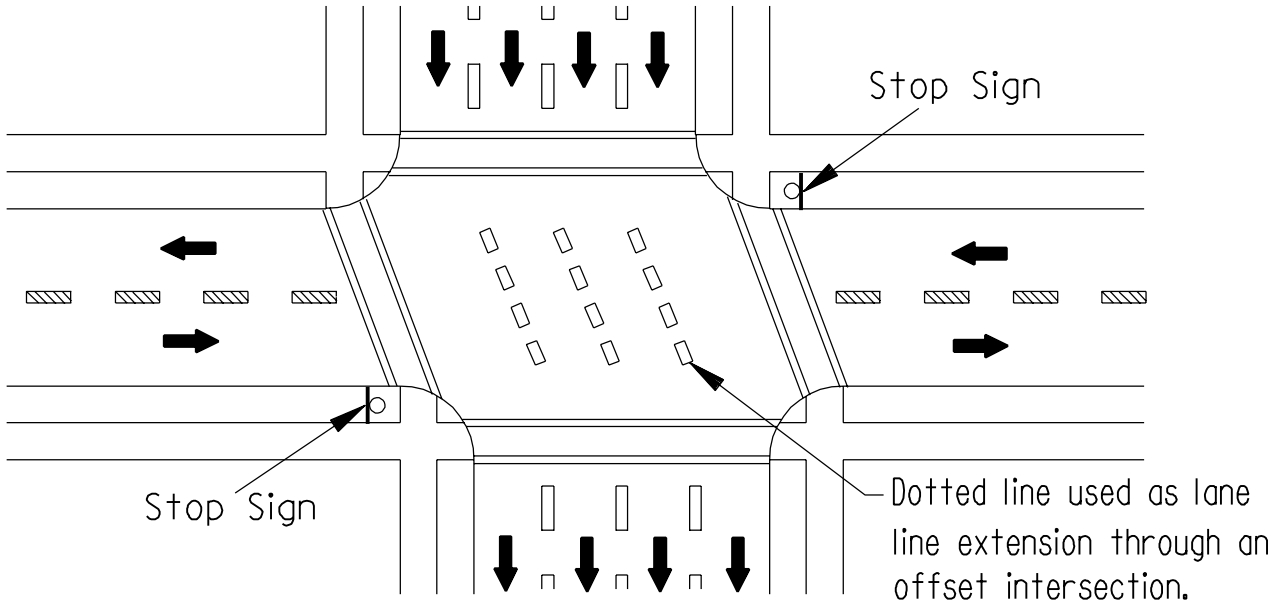
L = taper length in feet
W = offset in feet
S = Posted or 85th percentile in M.P.H.

Figure 5



SLOW-MOVING VEHICLE TURNOUT

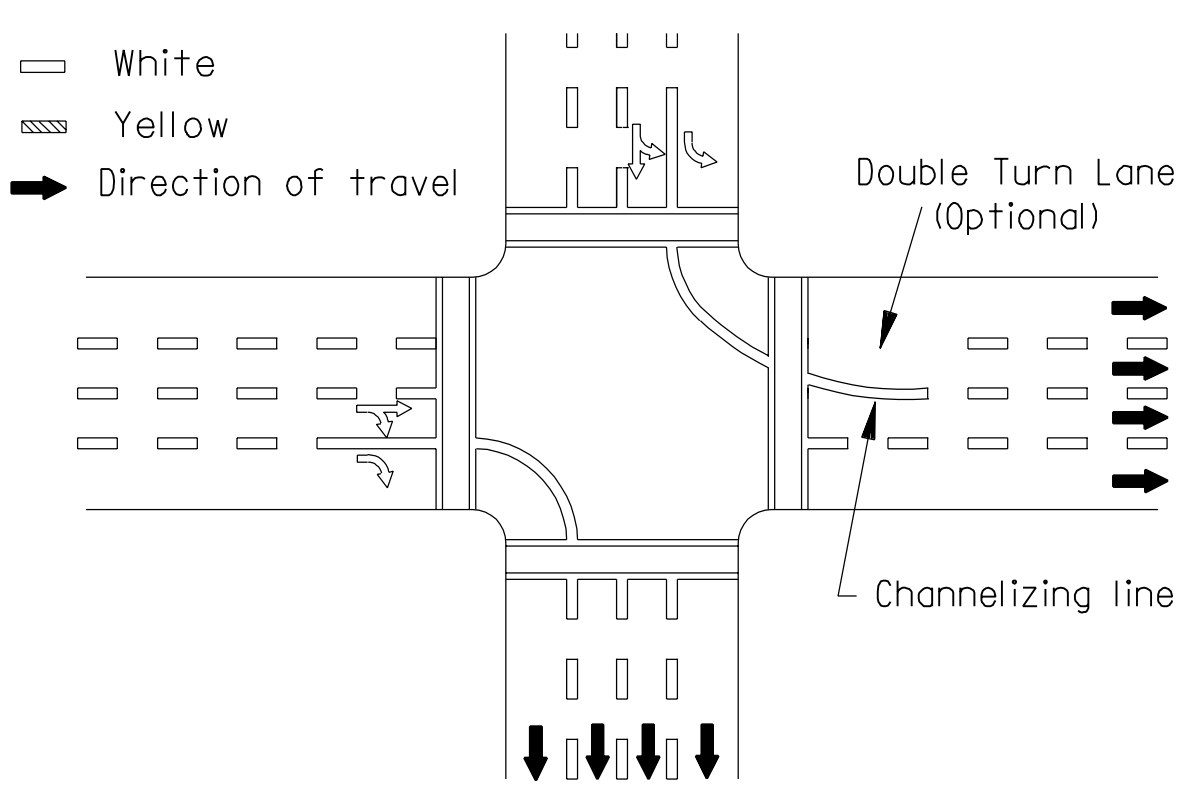
Figure 6



TYPICAL PAVEMENT MARKINGS

WITH OFFSET LANES

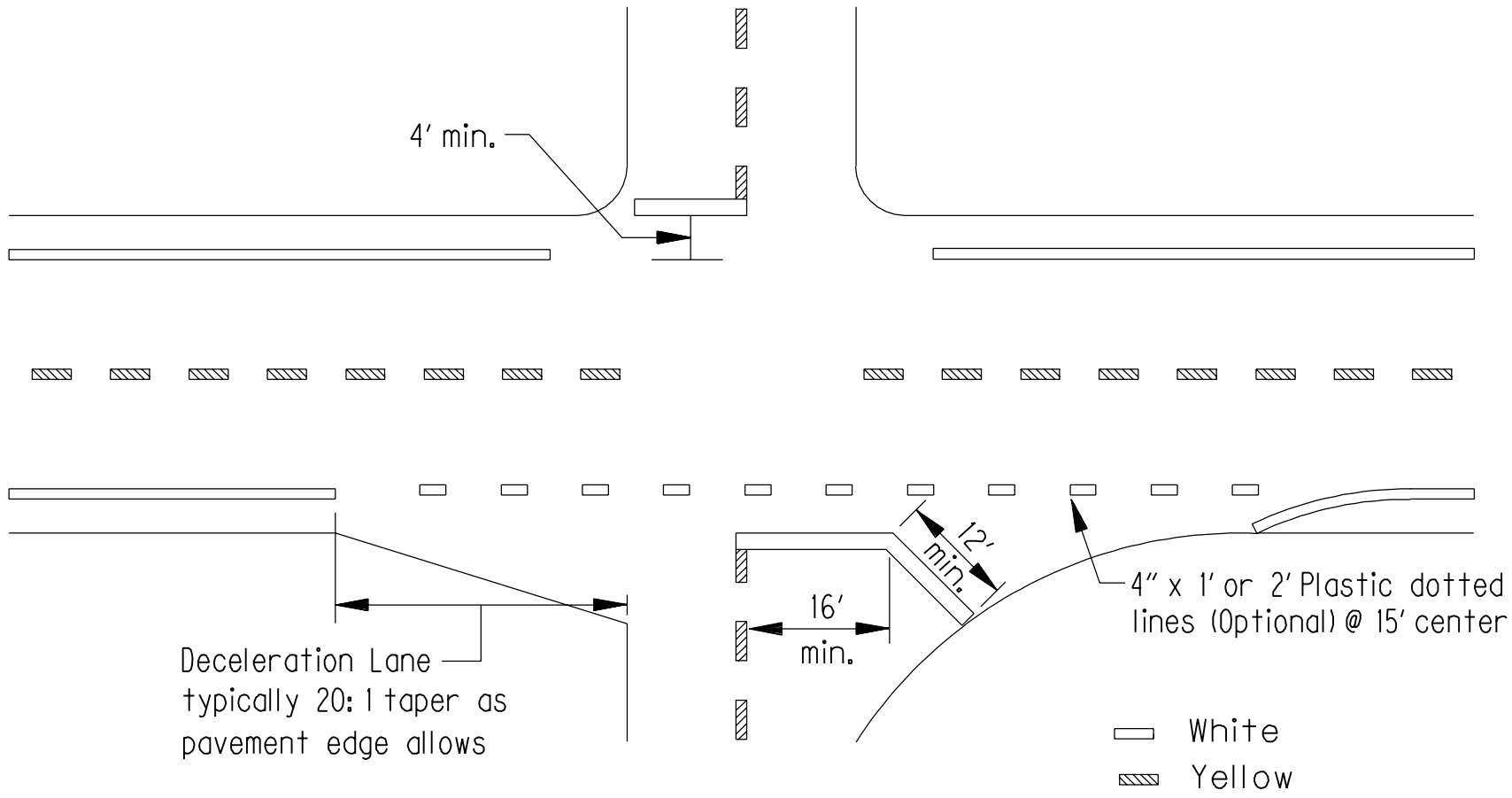
Figure 7



TYPICAL PAVEMENT MARKINGS

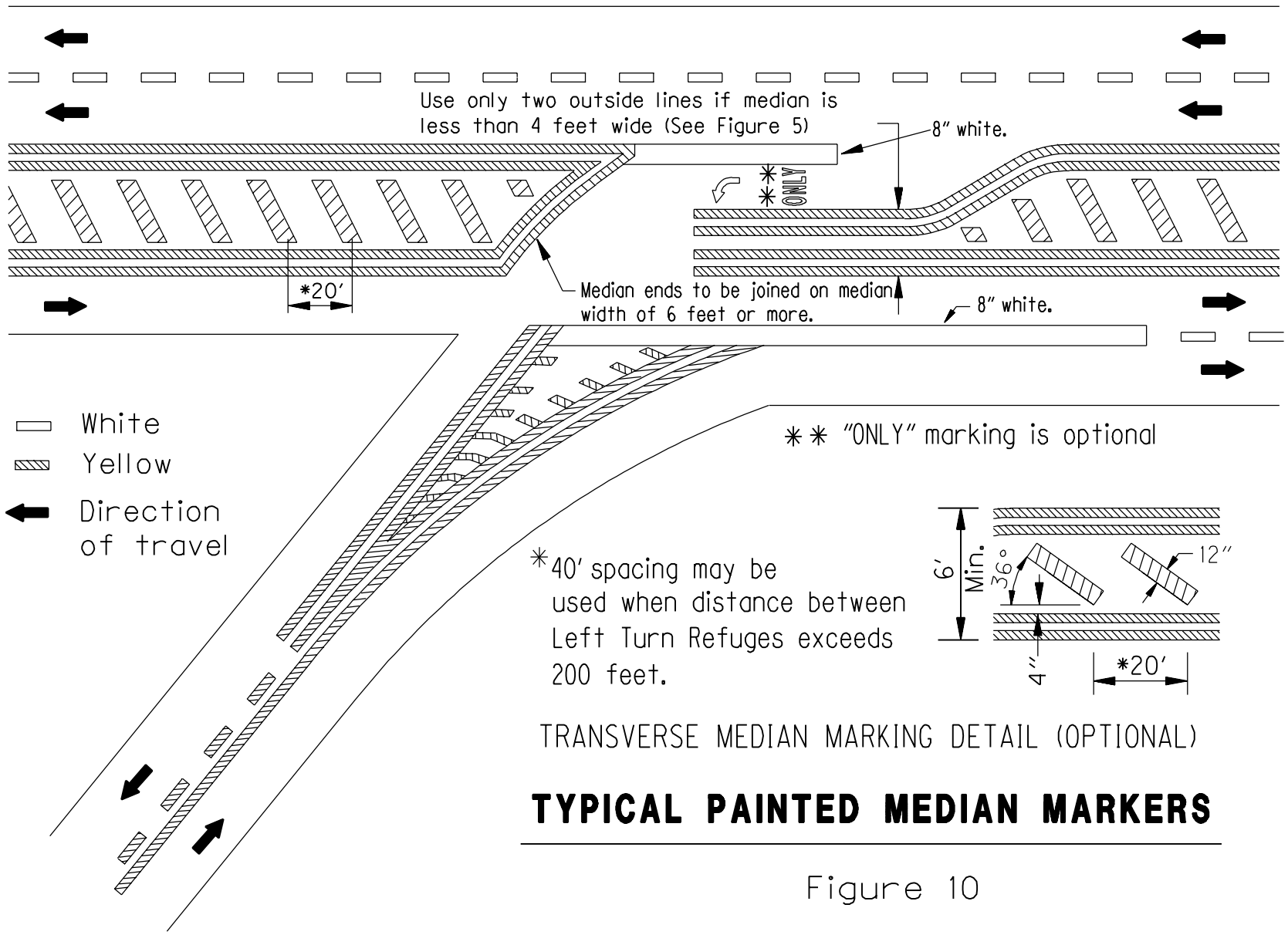
WITH OPTIONAL DOUBLE TURN LANES

Figure 8



PAVEMENT MARKINGS FOR TYPICAL INTERSECTION

Figure 9

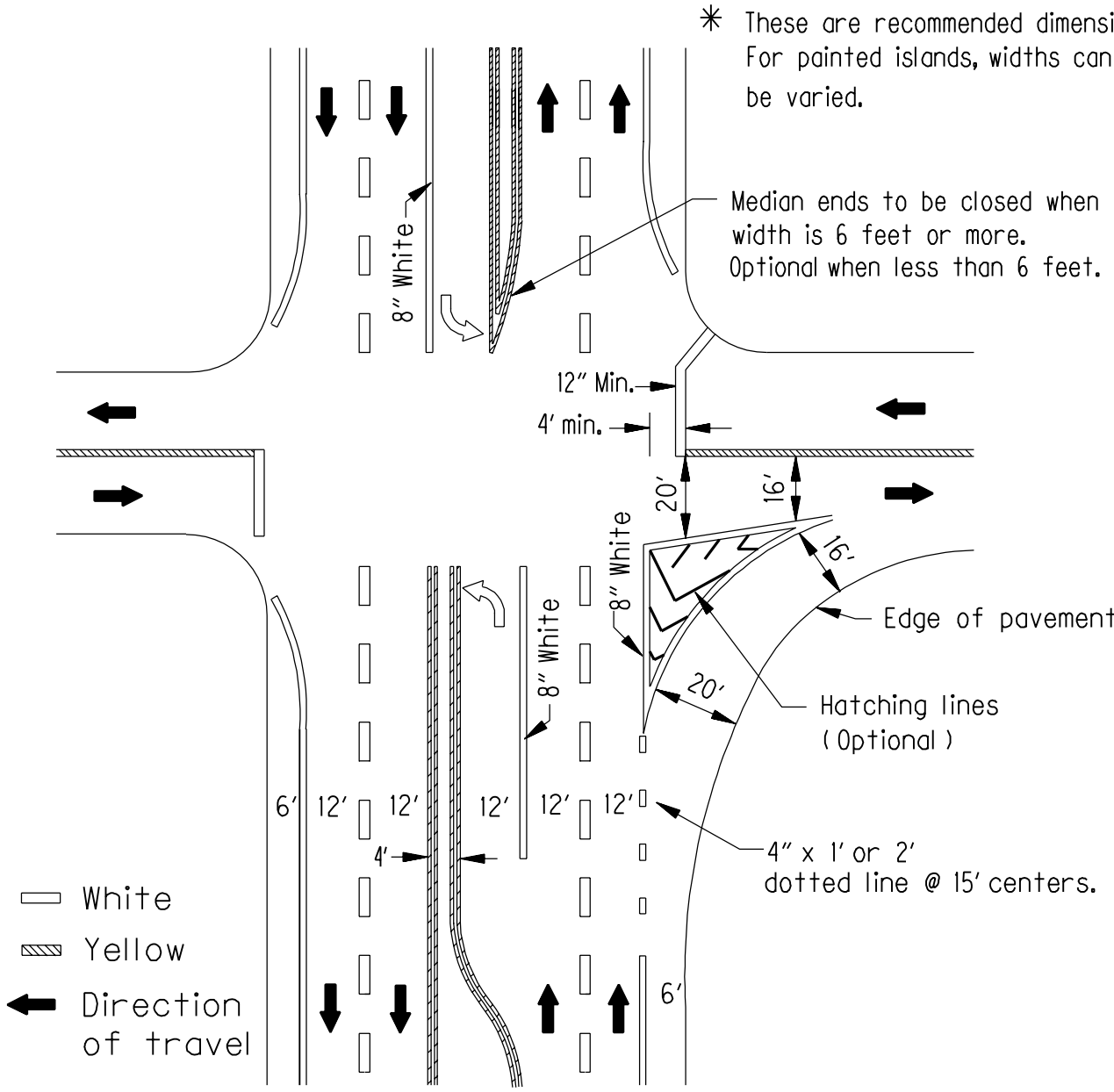


TRANSVERSE MEDIAN MARKING DETAIL (OPTIONAL)

TYPICAL PAINTED MEDIAN MARKERS

Figure 10

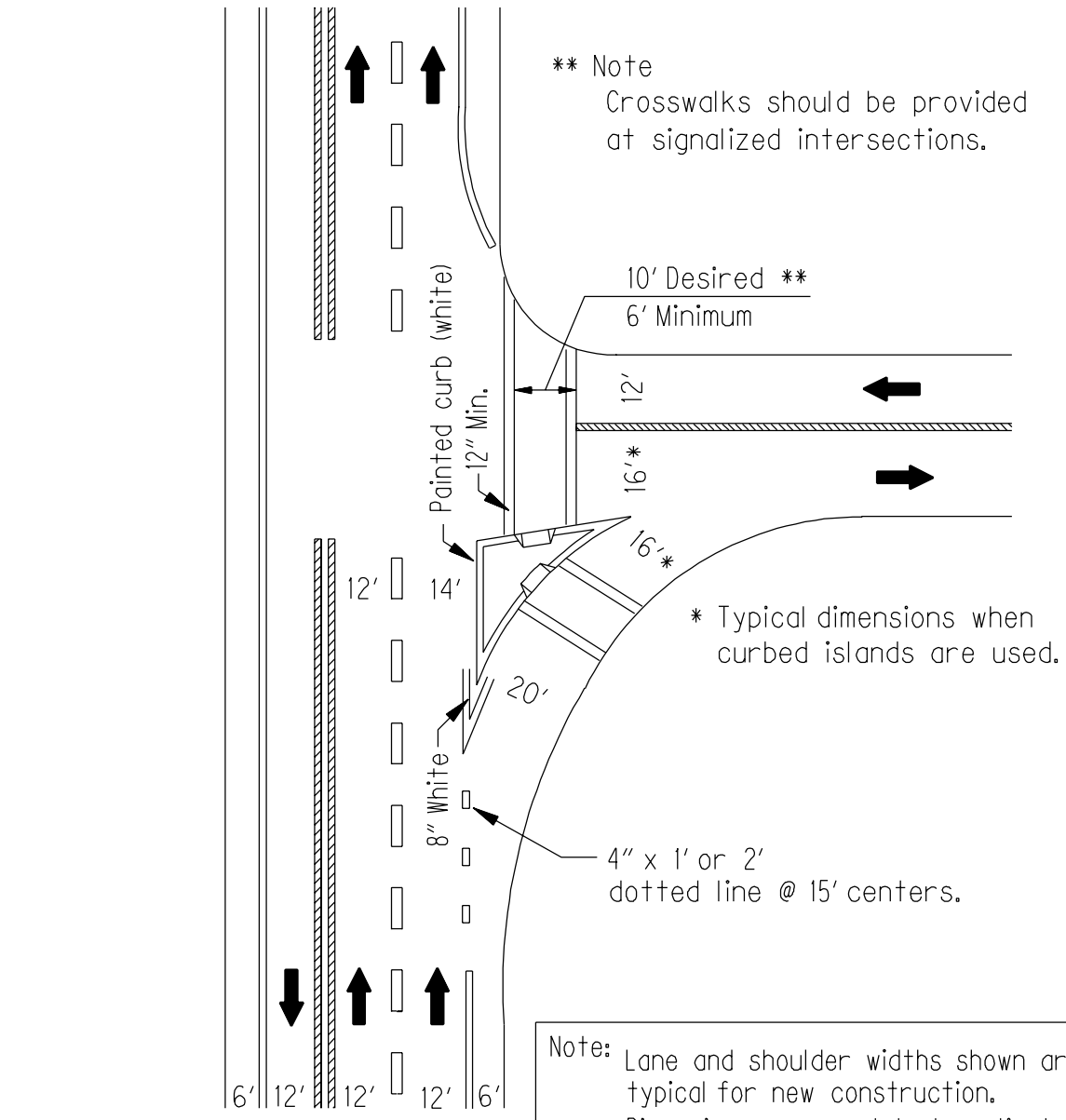
TLMANUAL.DGN 5-18-98 VIEW=FIG11



Note: Lane and shoulder widths shown are typical for new construction.
Dimensions may need to be adjusted to conform with other roadway designs.

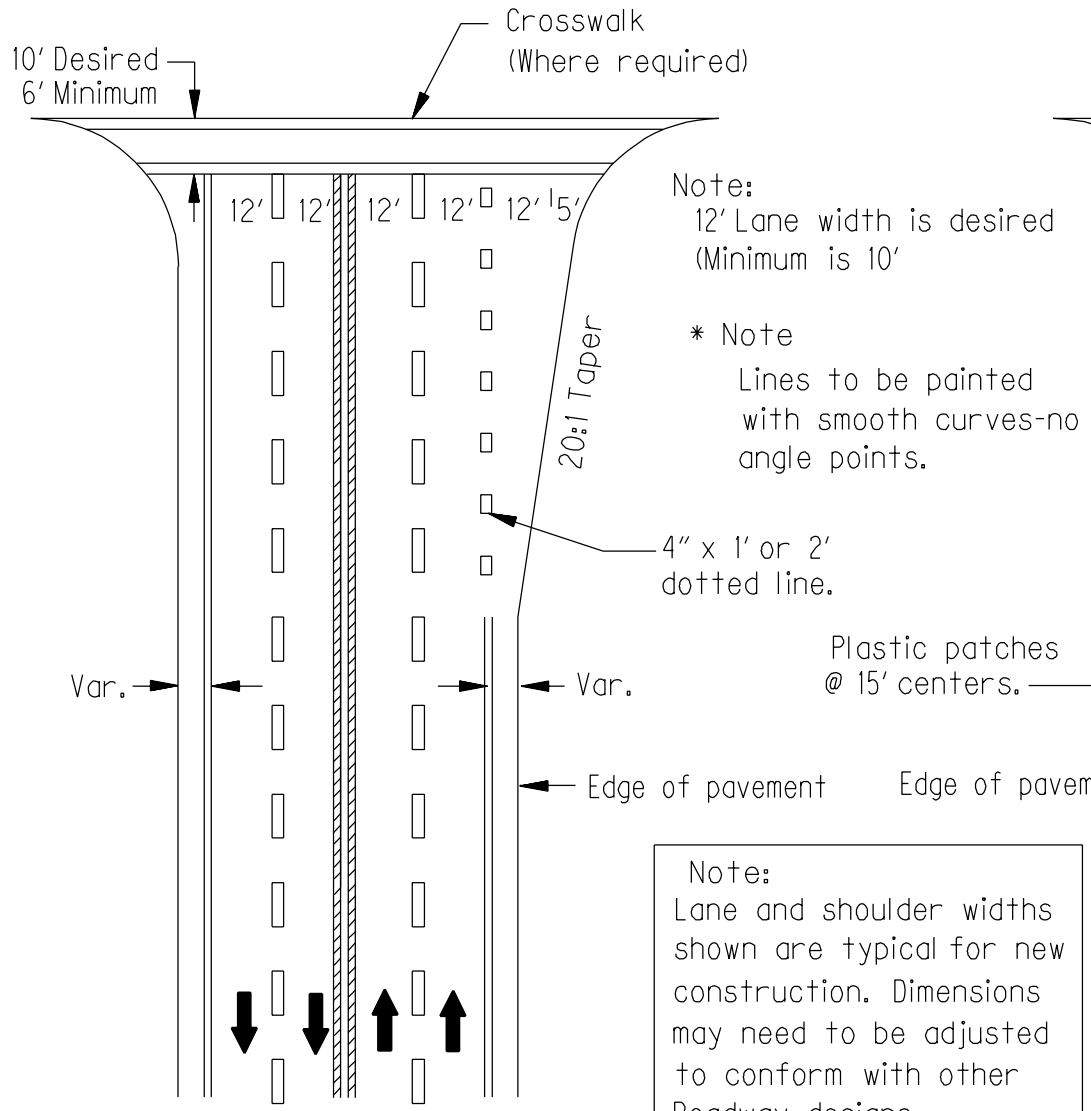
RIGHT TURN LANE WITH PAINTED ISLAND

Figure 11



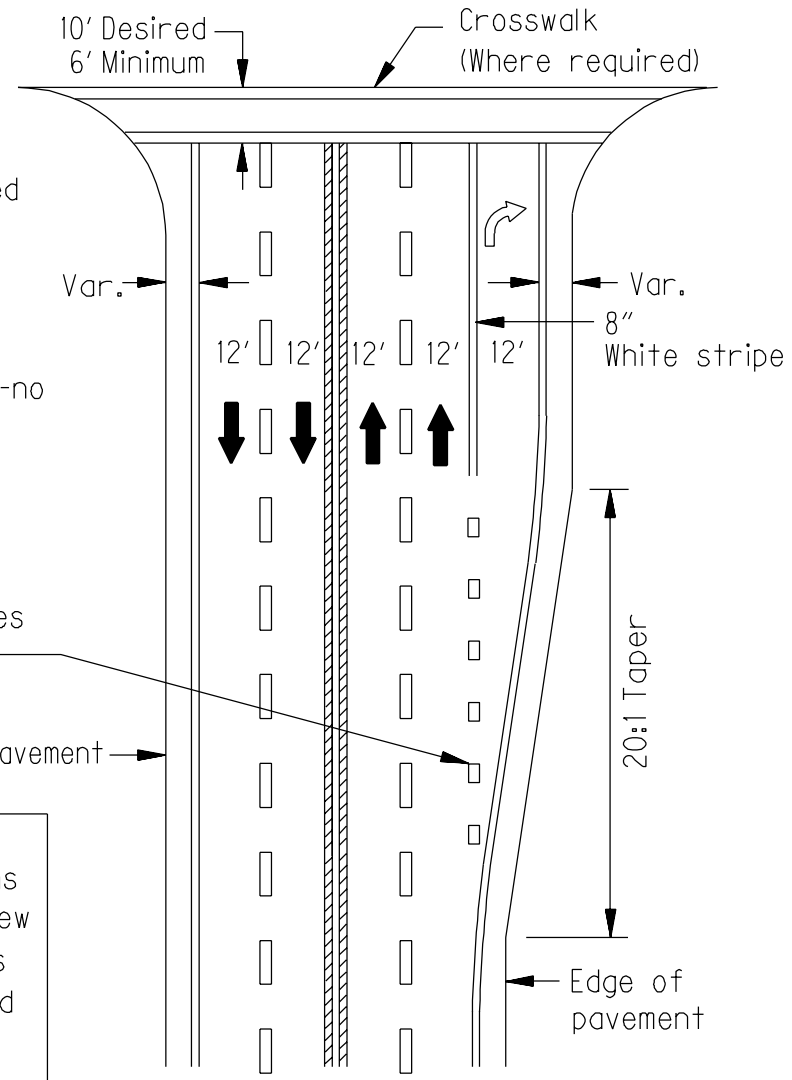
RIGHT TURN CHANNEL WITH CURBED ISLAND

Figure 12



TYPICAL
TAPERED RIGHT TURN WIDENING

Figure 13



TYPICAL
CHANNELIZED RIGHT TURN LANE

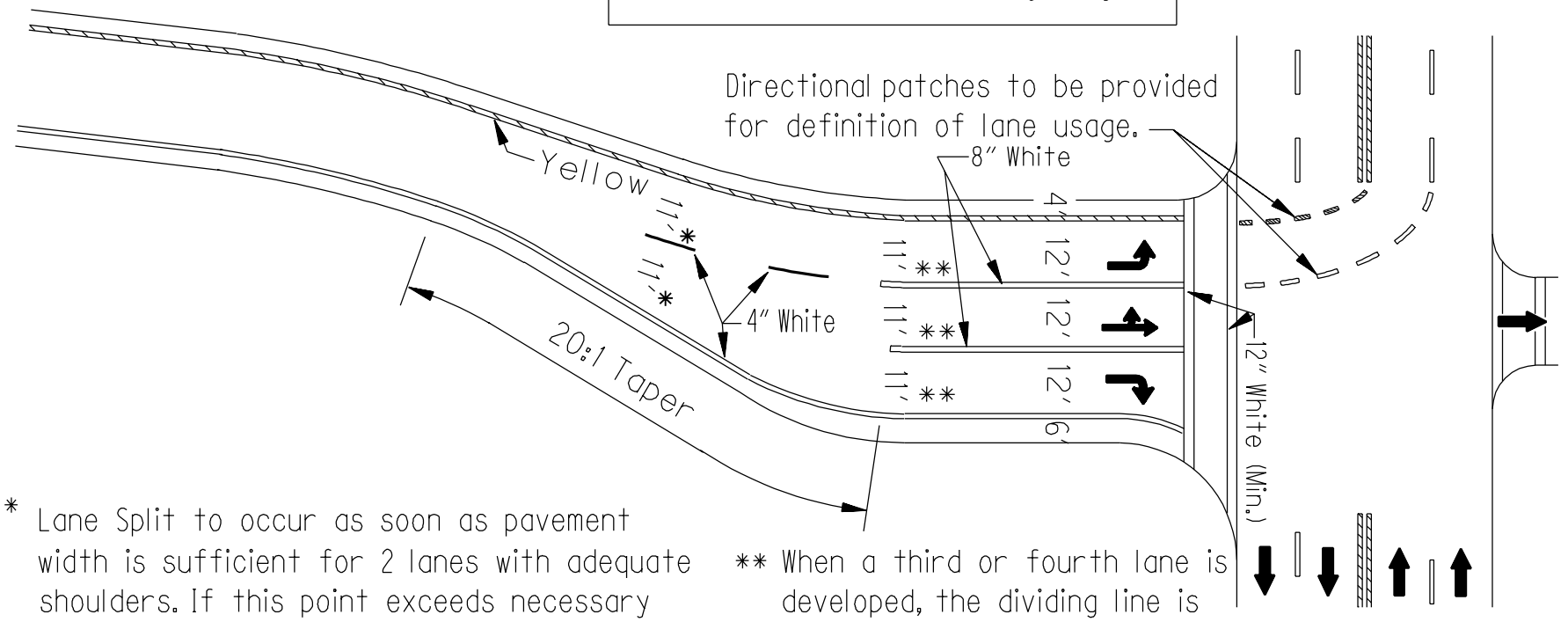
Figure 14

White

Yellow

Direction of travel

Note: Lane and shoulder widths shown are typical for new construction. Dimensions may need to be adjusted to conform with other roadway designs.



* Lane Split to occur as soon as pavement width is sufficient for 2 lanes with adequate shoulders. If this point exceeds necessary storage, Broken Lines shall be provided. The Broken line shall lead into the lanes containing the heaviest movement (for 3 or more lanes)

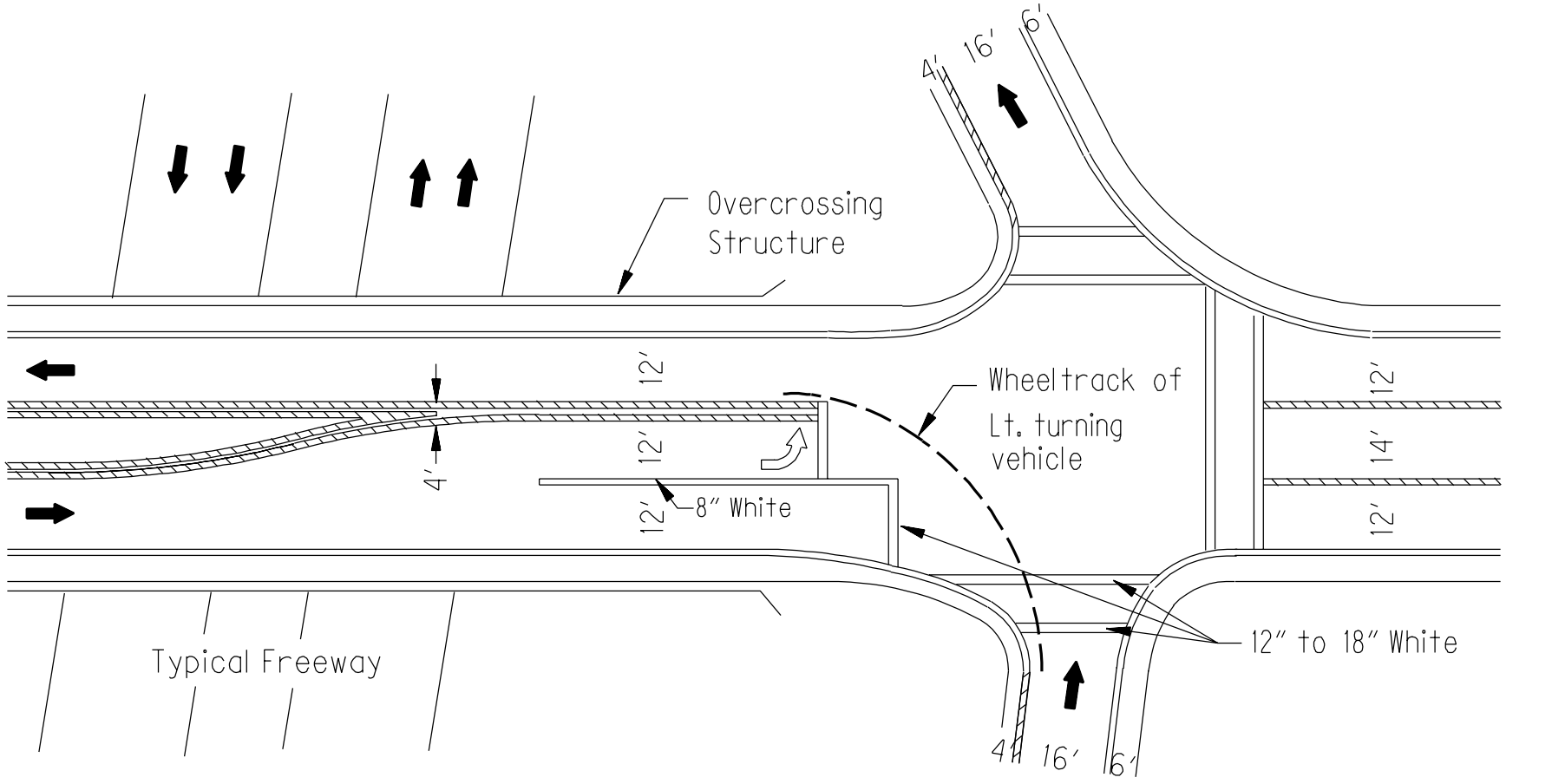
** When a third or fourth lane is developed, the dividing line is generally a Storage Bar only normally placed at the minor movement position.

White
Yellow
Direction of travel

RAMP TERMINAL WIDENING

(TO DEVELOP ADDITIONAL LANES)

Figure 15

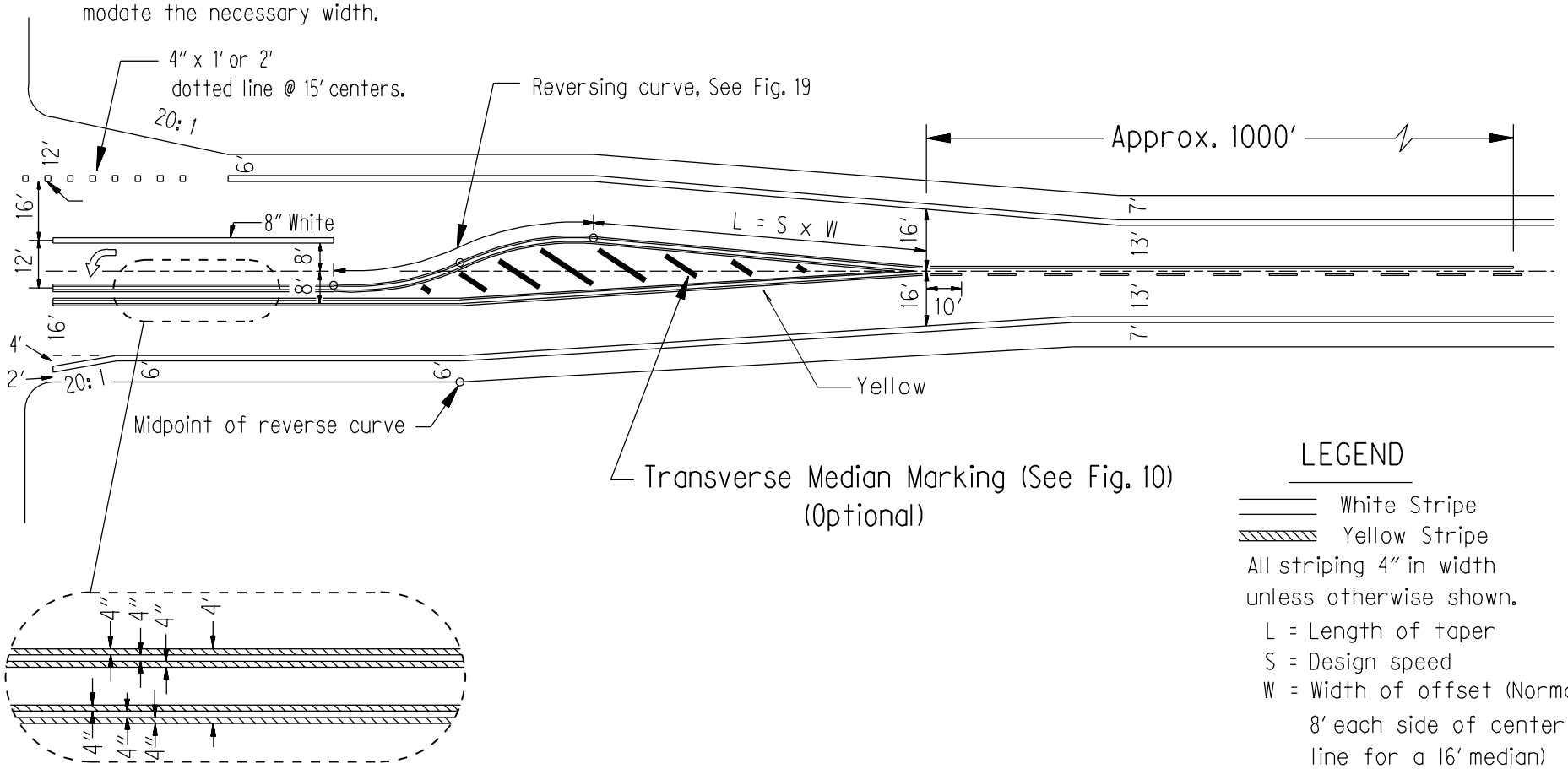


OFFSET STOP LINE

Figure 16

Note:

If there is a designated bike lane, shoulder should be adjusted to accommodate the necessary width.



LEGEND

White Stripe

Yellow Stripe

All striping 4" in width unless otherwise shown.

L = Length of taper

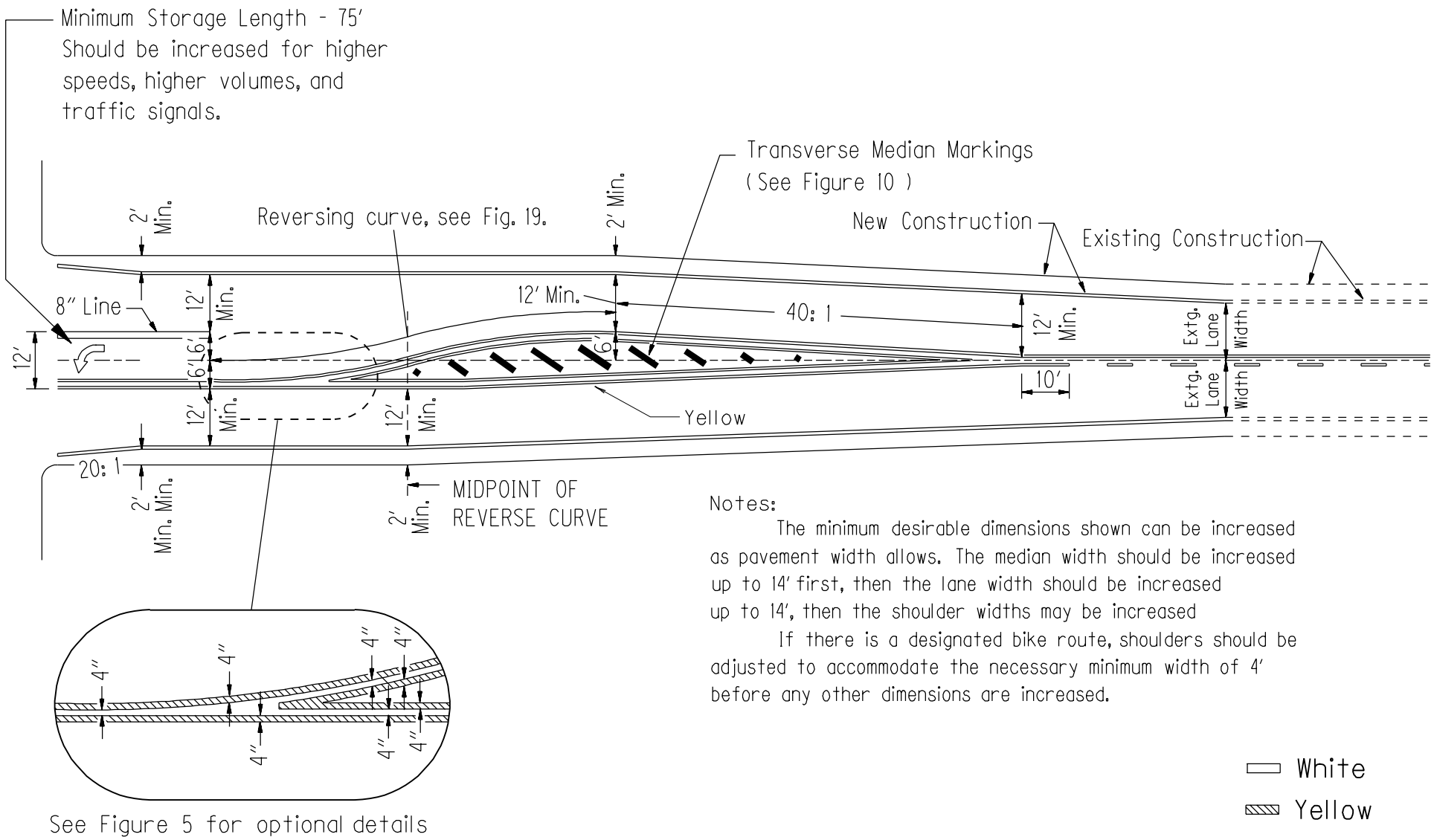
S = Design speed

W = Width of offset (Normally 8' each side of center line for a 16' median)

STANDARD LEFT TURN LANE FOR NEW CONSTRUCTION

Figure 17

TLMANUAL.DGN 6-23-98 VIEW=FIG17



Notes:

The minimum desirable dimensions shown can be increased as pavement width allows. The median width should be increased up to 14' first, then the lane width should be increased up to 14', then the shoulder widths may be increased

If there is a designated bike route, shoulders should be adjusted to accommodate the necessary minimum width of 4' before any other dimensions are increased.

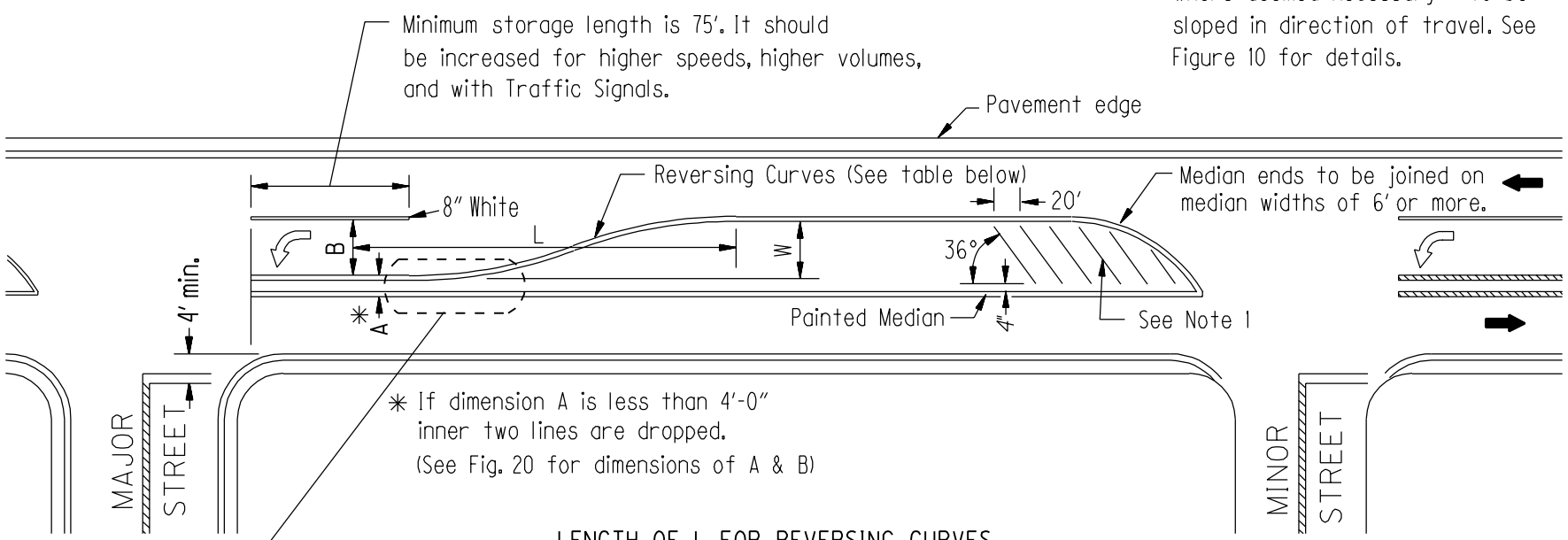
White

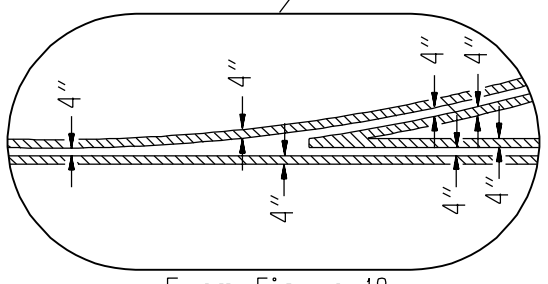
Yellow

MINIMUM DESIRABLE STANDARDS FOR LOCATIONS WITH DESIGN CONSTRAINTS

Figure 18

NOTE 1:
Optional transverse median markers to be used only at median termini where deemed necessary - to be sloped in direction of travel. See Figure 10 for details.





From Figure 18

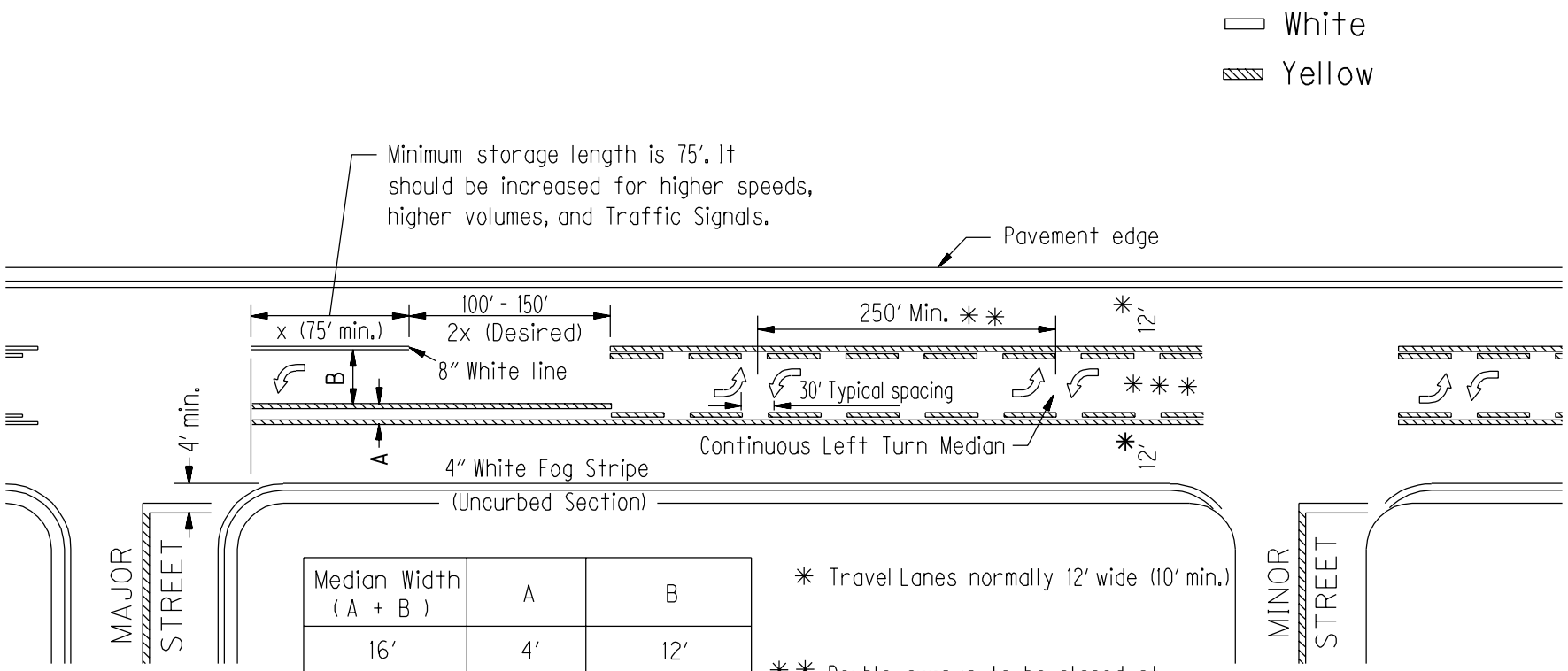
LENGTH OF L FOR REVERSING CURVES

	10' (W)	11' (W)	12' (W)	14' (W)	16' (W)	
6°	195'	205'	214'	231'	247'	RURAL STD.
10°	152'	159'	165'	179'	191'	URBAN STD.
12°	138'	144'	149'	163'	174'	OPT. (LOW SPEEDS)

White
Yellow

TYPICAL LEFT TURN LANE WITH PAINTED MEDIAN

Figure 19



Median Width (A + B)	A	B
16'	4'	12'
14'	2'	12'
12'	2'	10' min.
11' min.	1'	10' min.

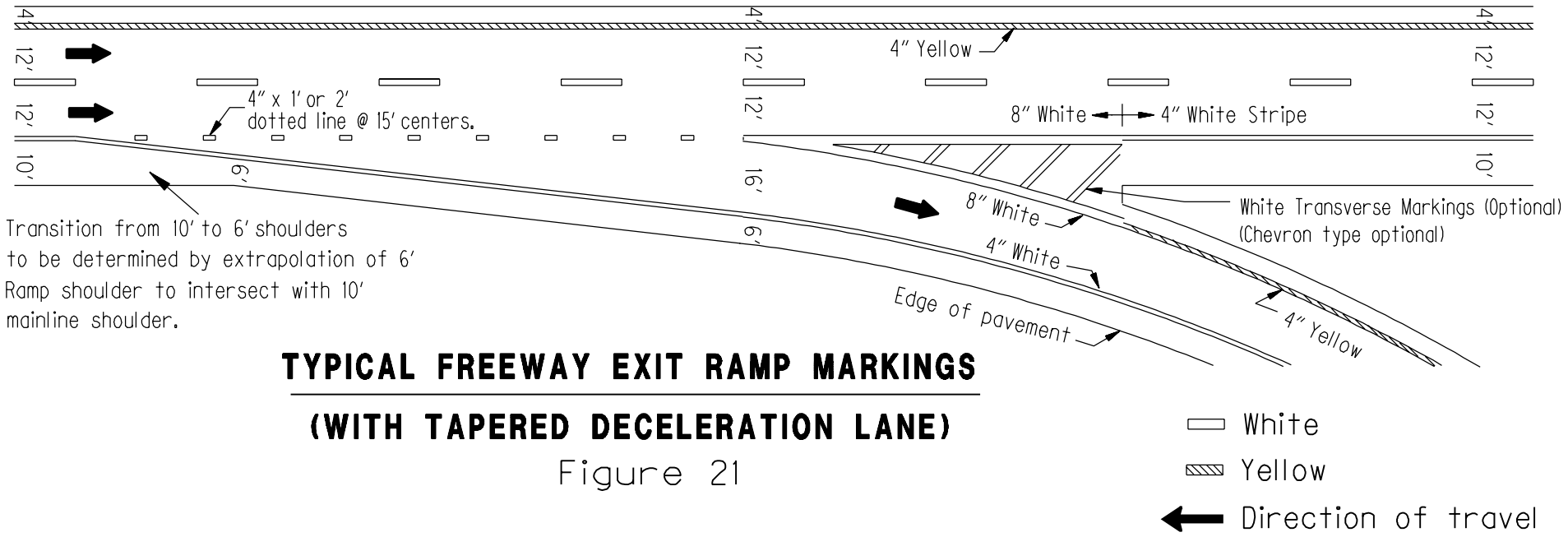
* Travel Lanes normally 12' wide (10' min.)

** Double arrows to be placed at even intervals, proportioned within Block - Approximate distance (Ft.) between set = 10x posted speed in M.P.H. (Optional)

*** Arrows not required, optional

TYPICAL LEFT TURN LANES AND CONTINUOUS LEFT TURN MEDIAN

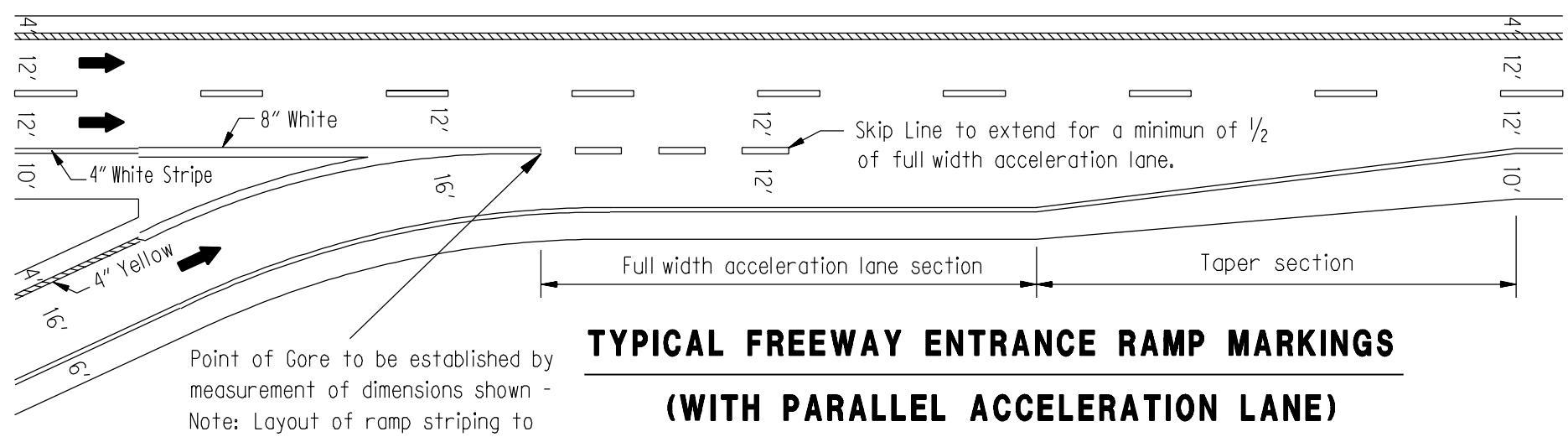
Figure 20



TYPICAL FREEWAY EXIT RAMP MARKINGS

(WITH TAPERED DECELERATION LANE)

Figure 21

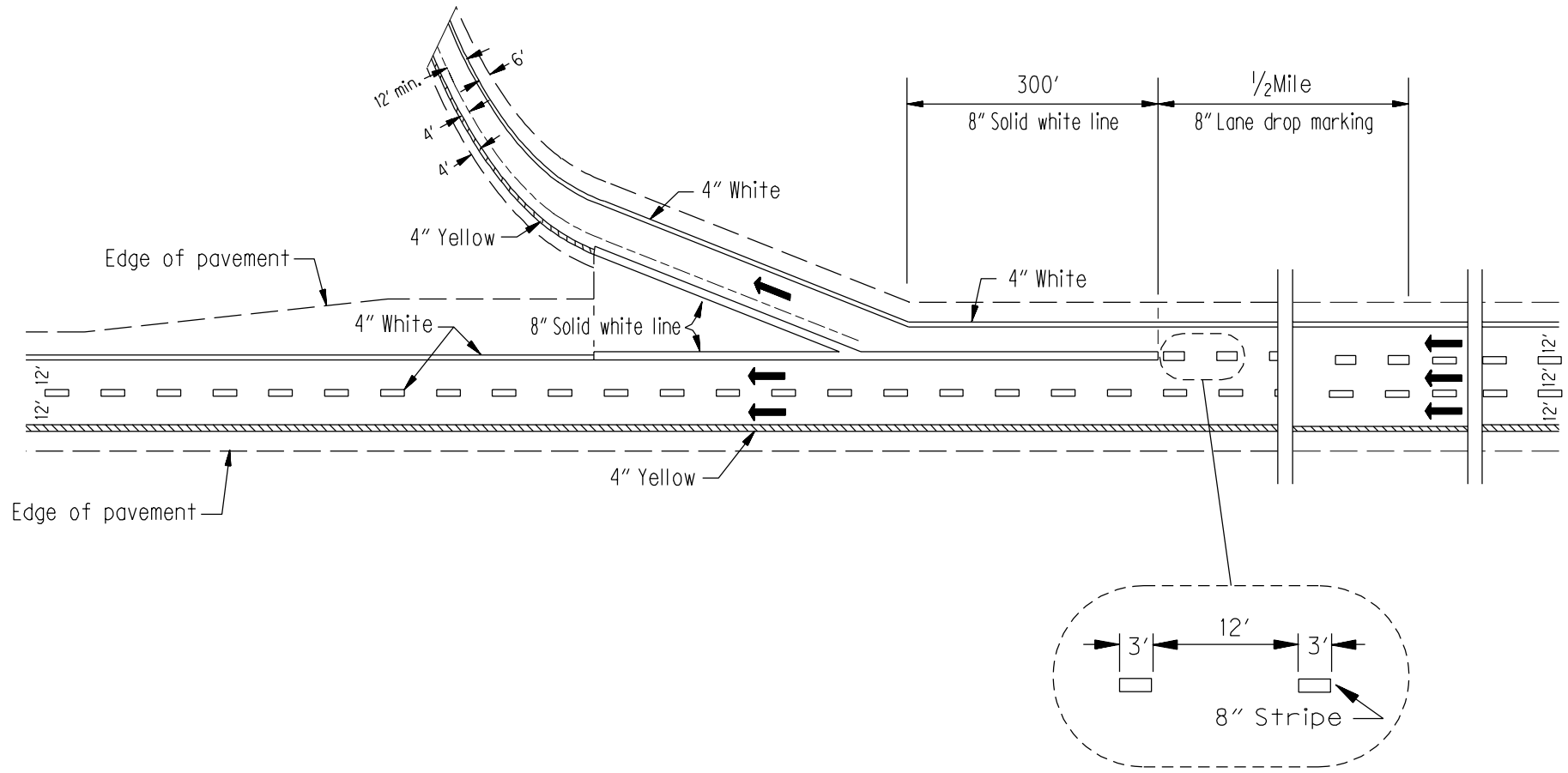


TYPICAL FREEWAY ENTRANCE RAMP MARKINGS

(WITH PARALLEL ACCELERATION LANE)

Figure 22

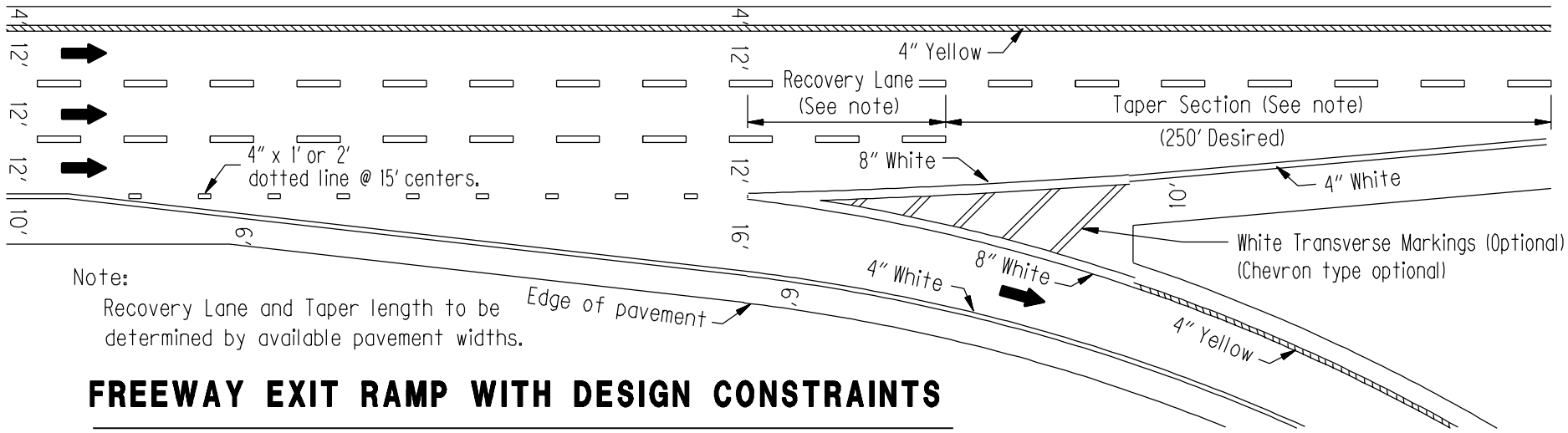
TLMANUAL.DGN 9-13-96 VIEW=FIG22



PAINTED MARKINGS FOR EXIT RAMP WITH LANE DROP

Figure 23

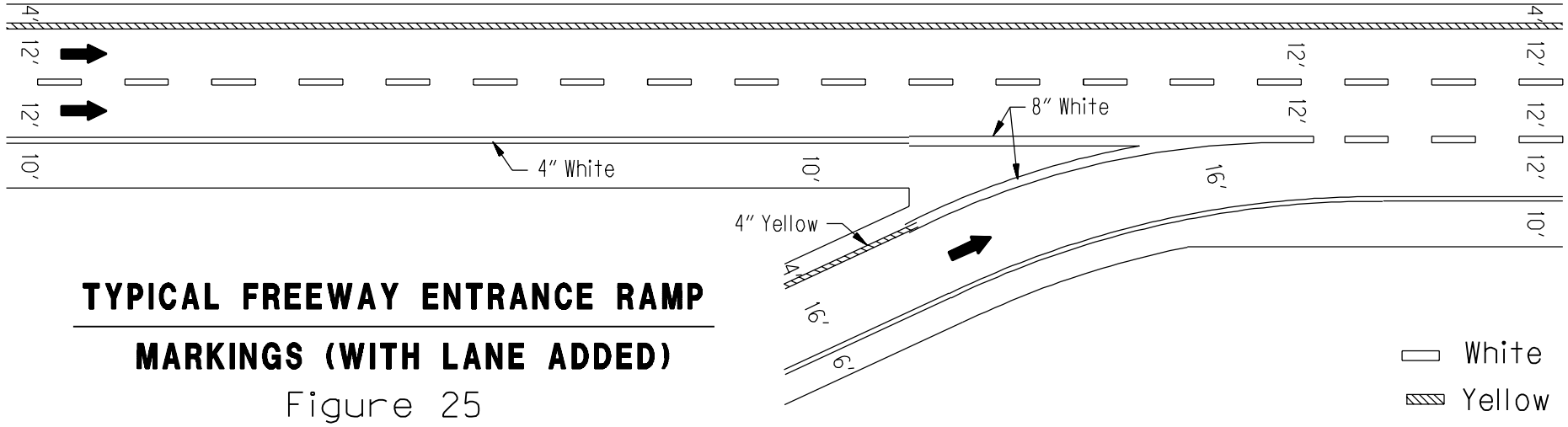
White
Yellow
Direction of travel



FREEWAY EXIT RAMP WITH DESIGN CONSTRAINTS

(LANE DROP WITH RECOVERY LANE)

Figure 24

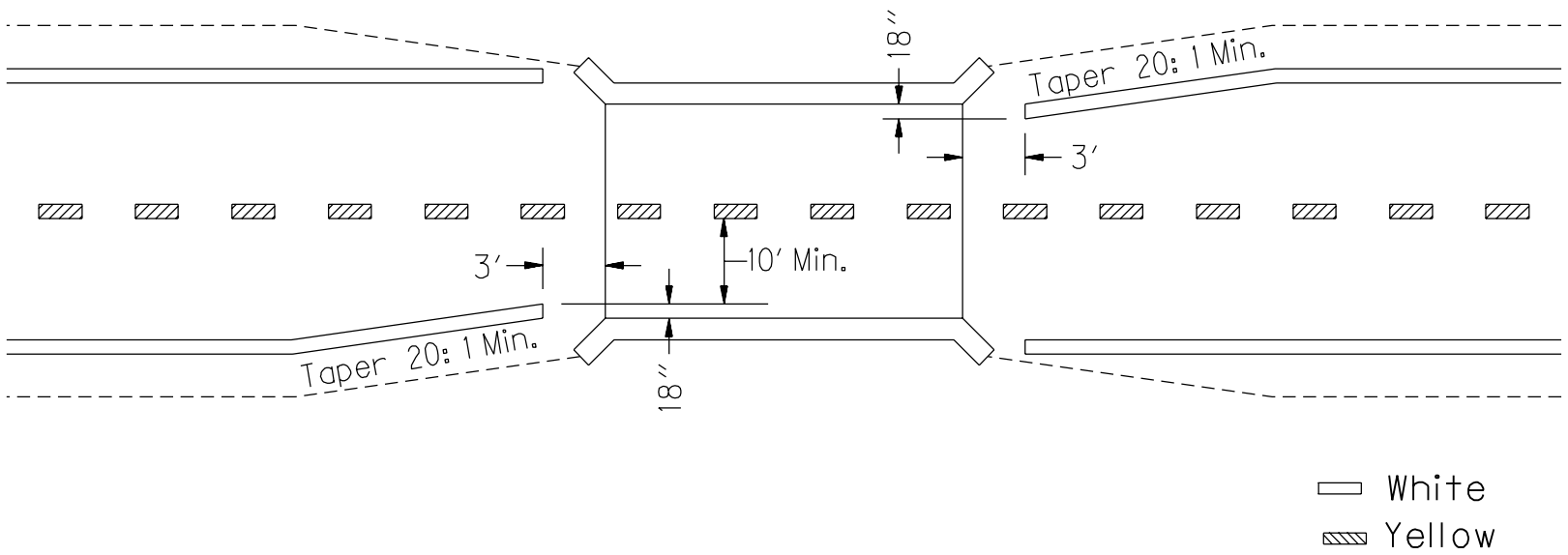


TYPICAL FREEWAY ENTRANCE RAMP

MARKINGS (WITH LANE ADDED)

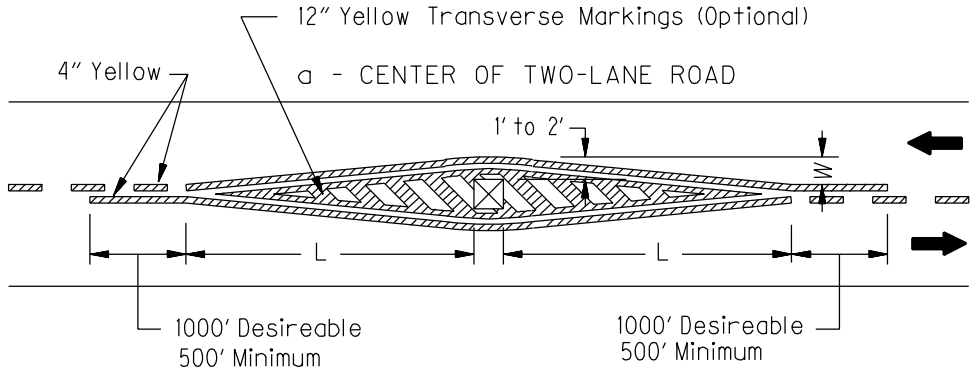
Figure 25

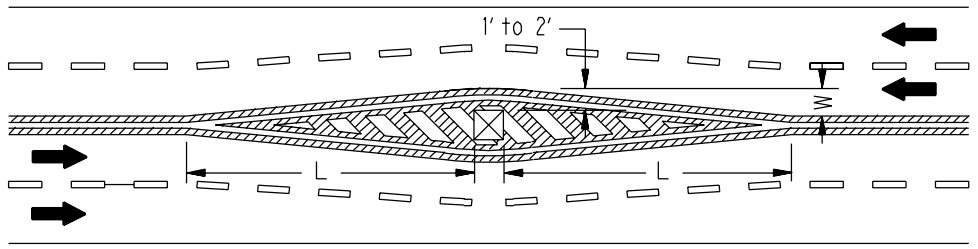
TLMANUAL.DGN 9-13-96 VIEW=FIG25

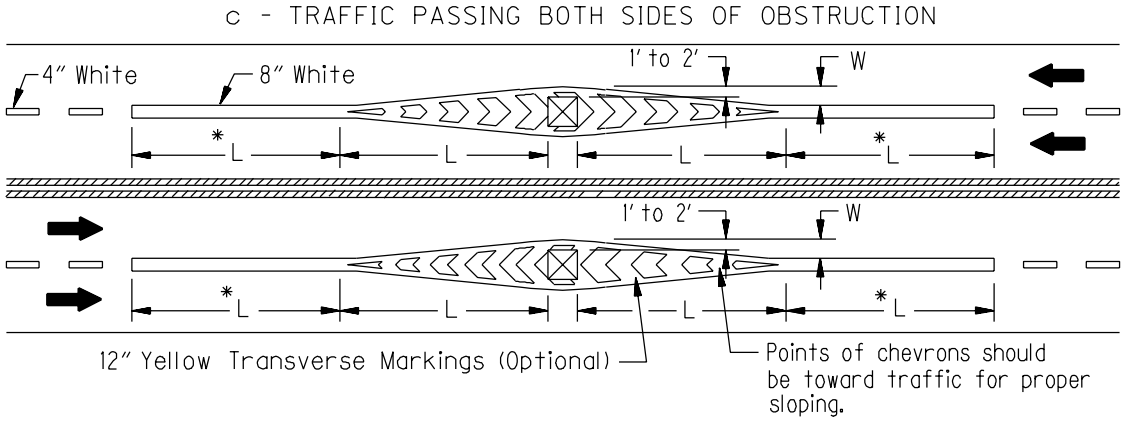


TYPICAL PAVEMENT EDGE LINE AT NARROW BRIDGE

Figure 26







White

Yellow

Direction of travel

For speeds 40 MPH or less $L(FEET) = \frac{WS^2}{60}$

For speeds 45 MPH or more L(FEET) = S x W

S = 85th percentile speed or posted speed in miles per hour

W = Offset distance in feet

Minimum length of L = 100 feet in urban areas
L = 200 feet in rural areas

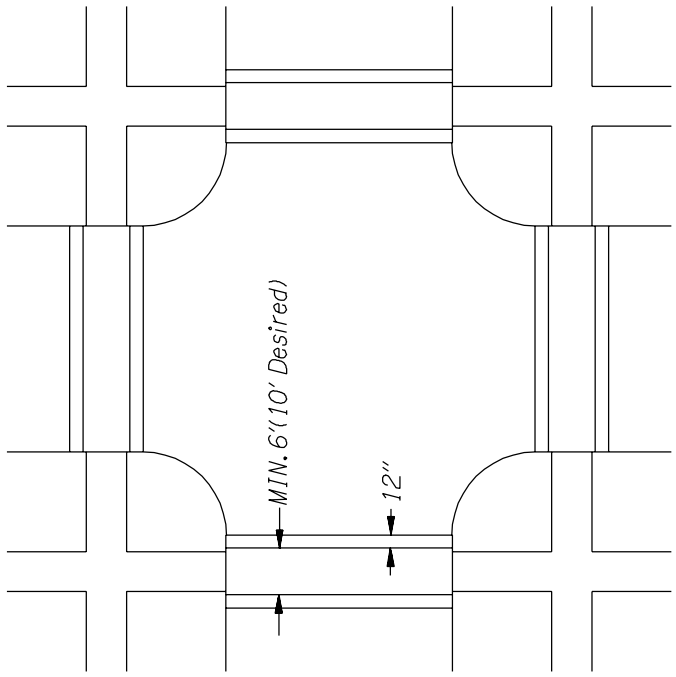
* Length "L" should be extended as required by sight distance conditions.

TYPICAL APPROACH MARKINGS FOR OBSTRUCTIONS IN THE ROADWAY

Figure 27

TLMANUAL.DGN 9-13-96 VIEW=FIG28

A. STANDARD CROSSWALK LINES



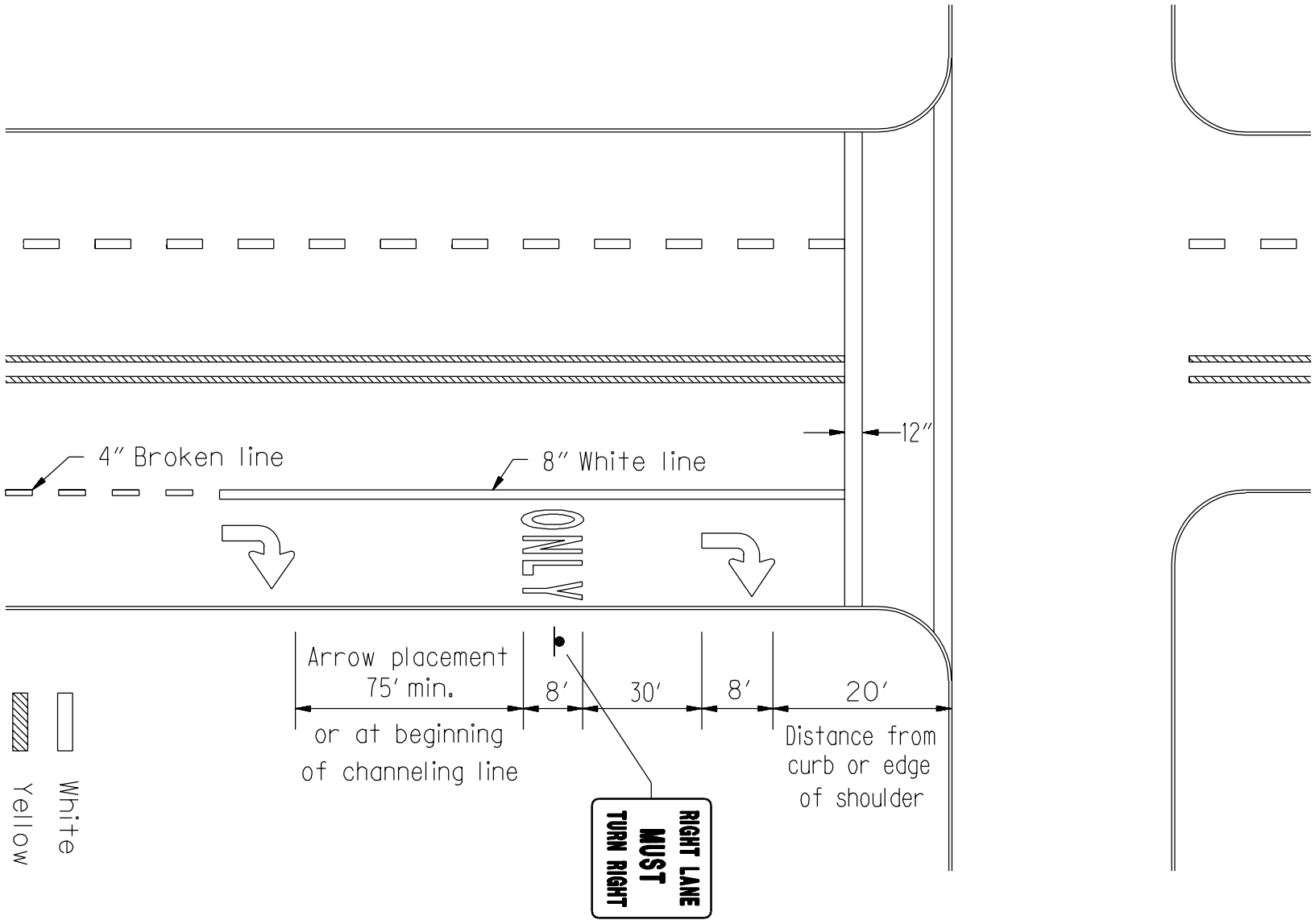
White

CROSSWALK MARKINGS

Figure 28

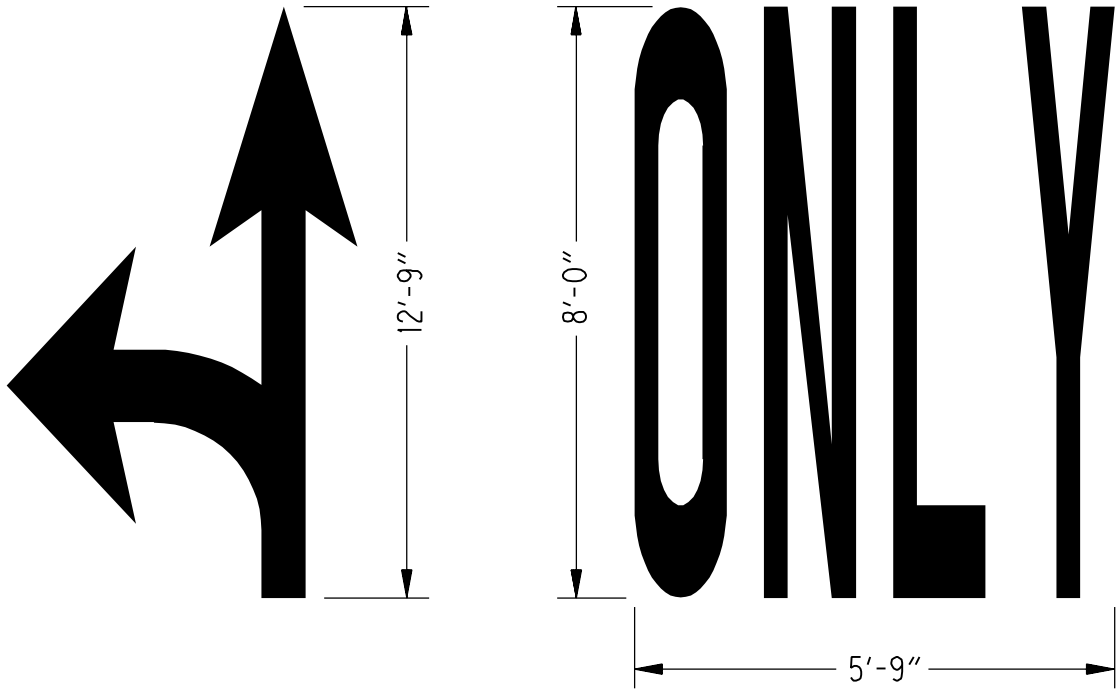
PAVEMENT LEGENDS

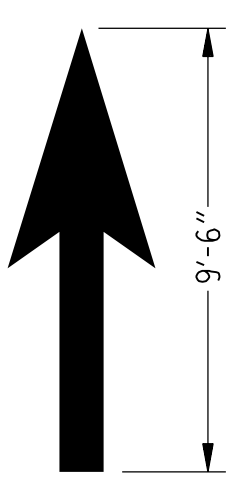
Figure 29

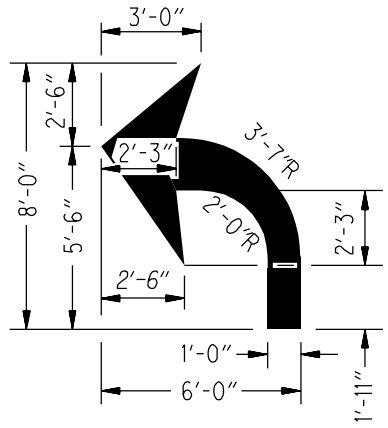


TLMANUAL.DGN 5-19-98 VIEW=FIG29

TLMANUAL.DGN

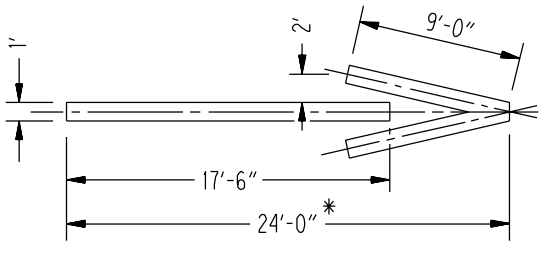






PAVEMENT MARKING
LEFT-RIGHT TURN ARROW

* Minimum sizes for normal installation. Larger sizes may be needed for freeways, above average speeds, and other critical conditions.



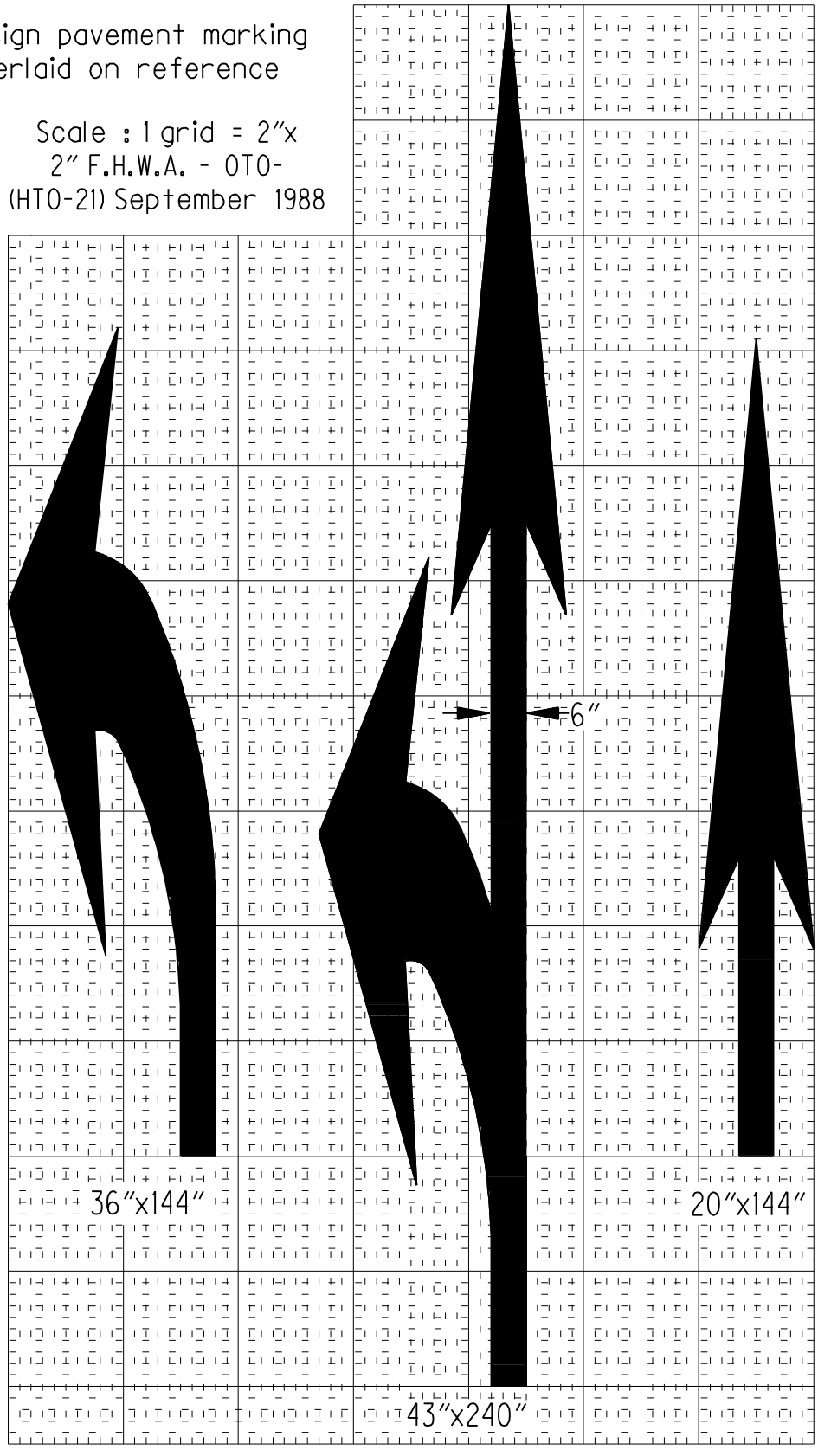
THERMOPLASTIC PAVEMENT ARROW DETAIL

PAVEMENT WORD AND SYMBOL MARKINGS

Figure 30

Narrow-design pavement marking arrows, overlaid on reference grid.

Scale : 1 grid = 2″x 2″ F.H.W.A. - 0TO- (HTO-21) September 1988



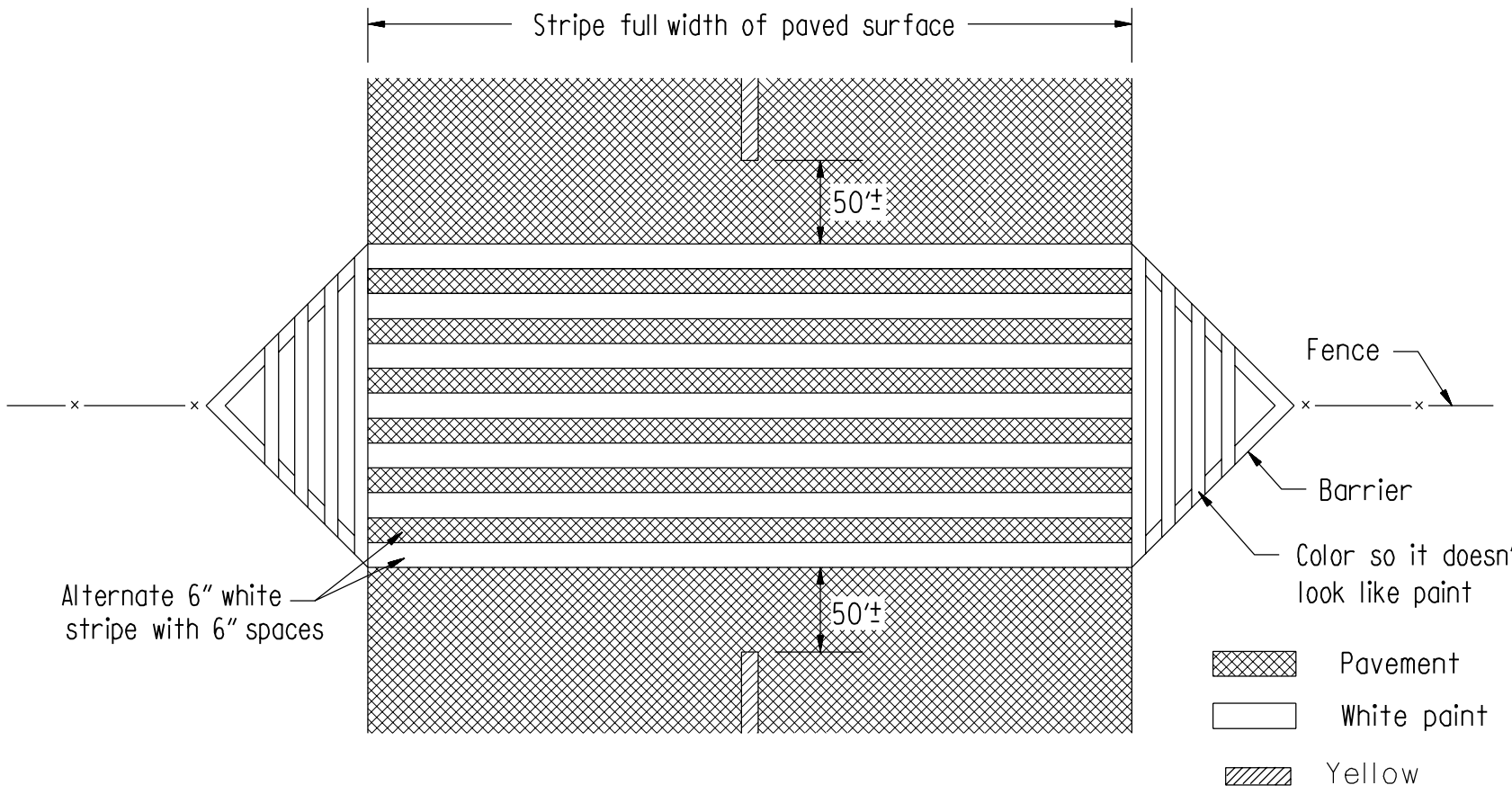
M.U.T.C.D.

ELONGATED PAVEMENT MARKING ARROWS

ALTERNATE DESIGN

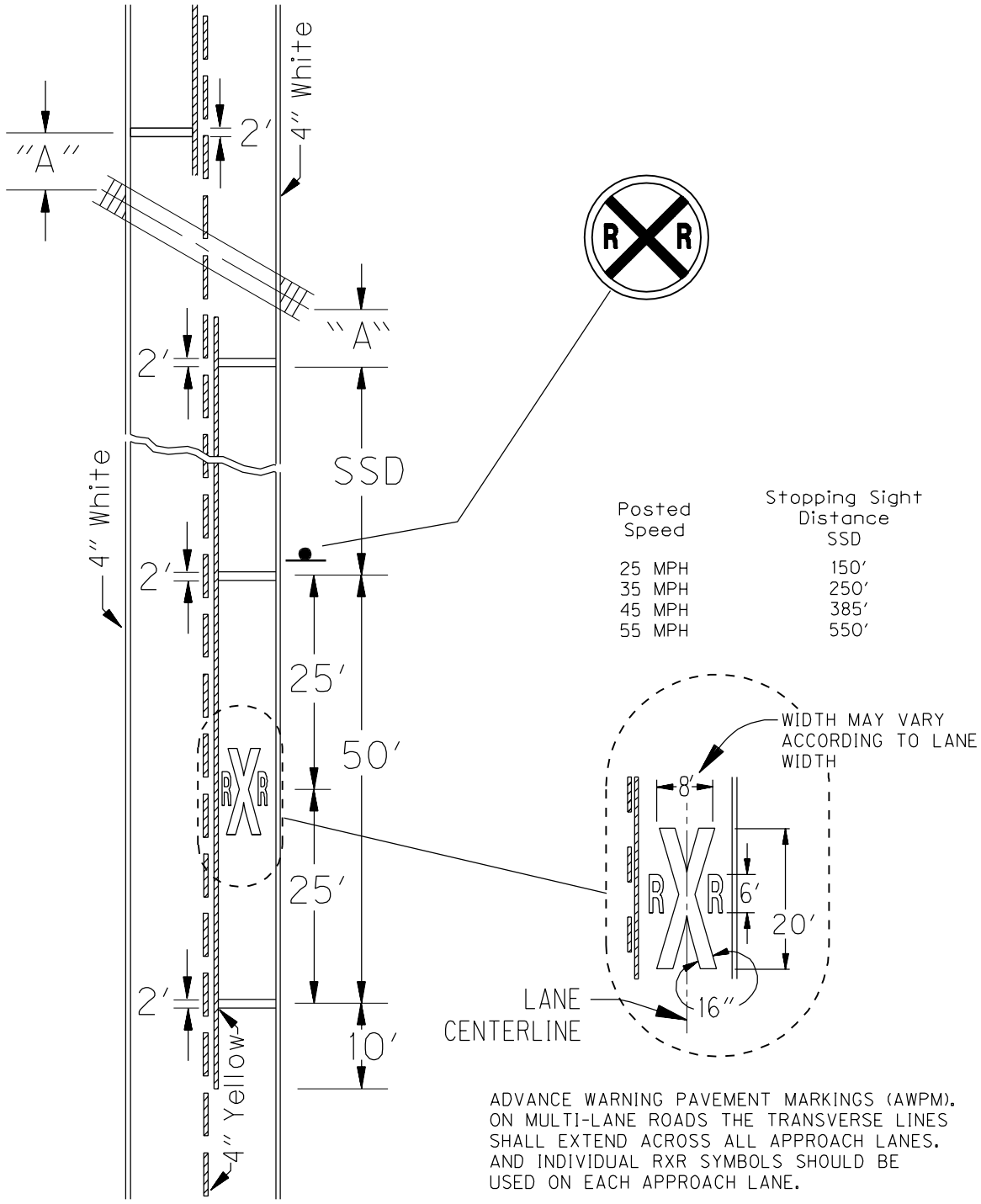
Figure 30a

TLMANUAL.DGN 9-13-96 VIEW=FIG30A



STANDARD PAINTED CATTLE GUARD

Figure 31



"A" STOP LINE APPROXIMATELY 15' or (12' MIN.) FROM NEAREST RAIL OR 1' IN ADVANCE OF LOCATION WHERE GATE ARM CROSSES THE ROADWAY.

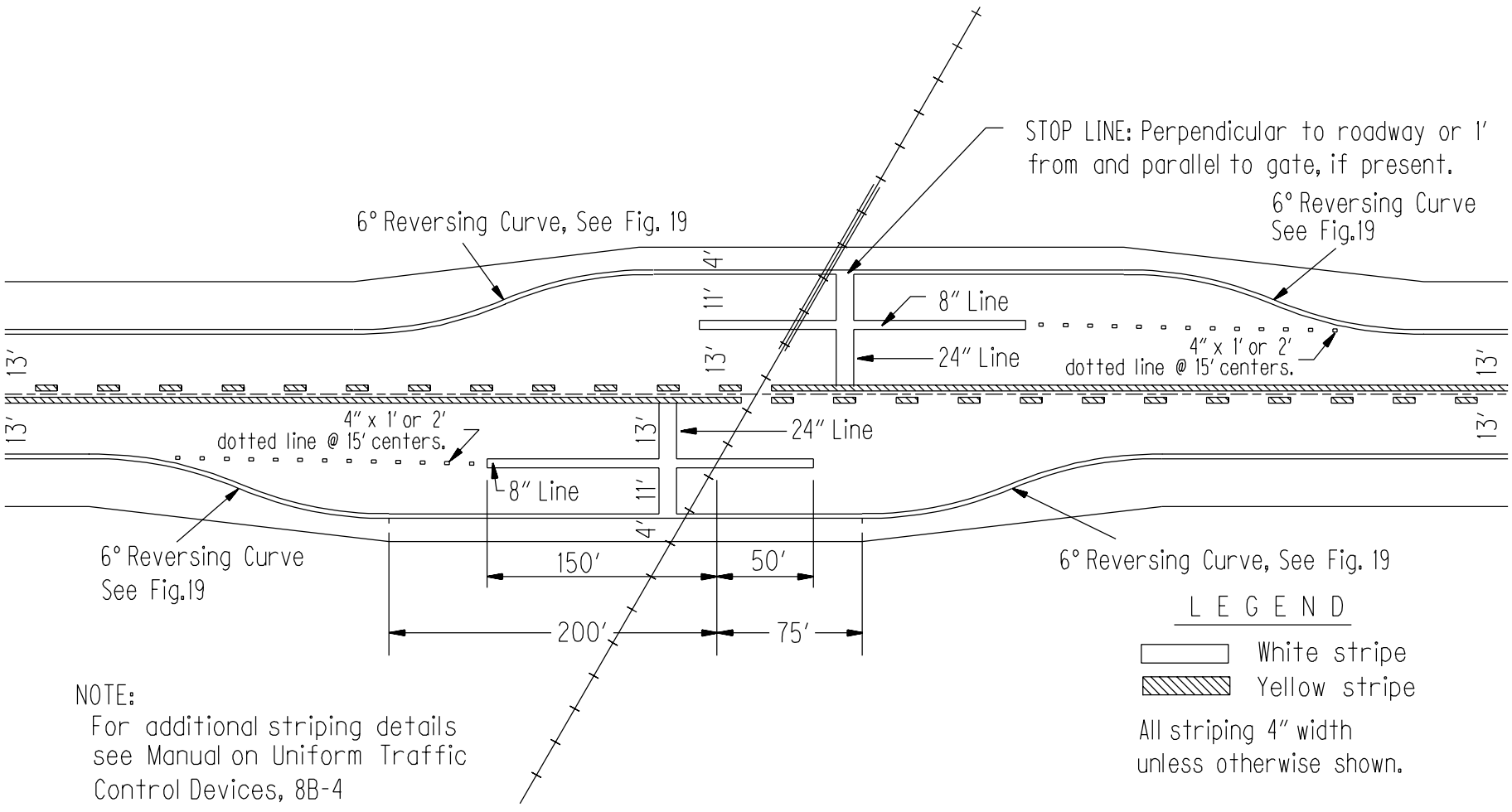
ADVANCE WARNING PAVEMENT MARKINGS (AWPM). ON MULTI-LANE ROADS THE TRANSVERSE LINES SHALL EXTEND ACROSS ALL APPROACH LANES. AND INDIVIDUAL RXR SYMBOLS SHOULD BE USED ON EACH APPROACH LANE.

TYPICAL RAILROAD GRADE CROSSING MARKINGS

Figure 32

TLMANUAL.DGN 9-13-96 VIEW=FIG32

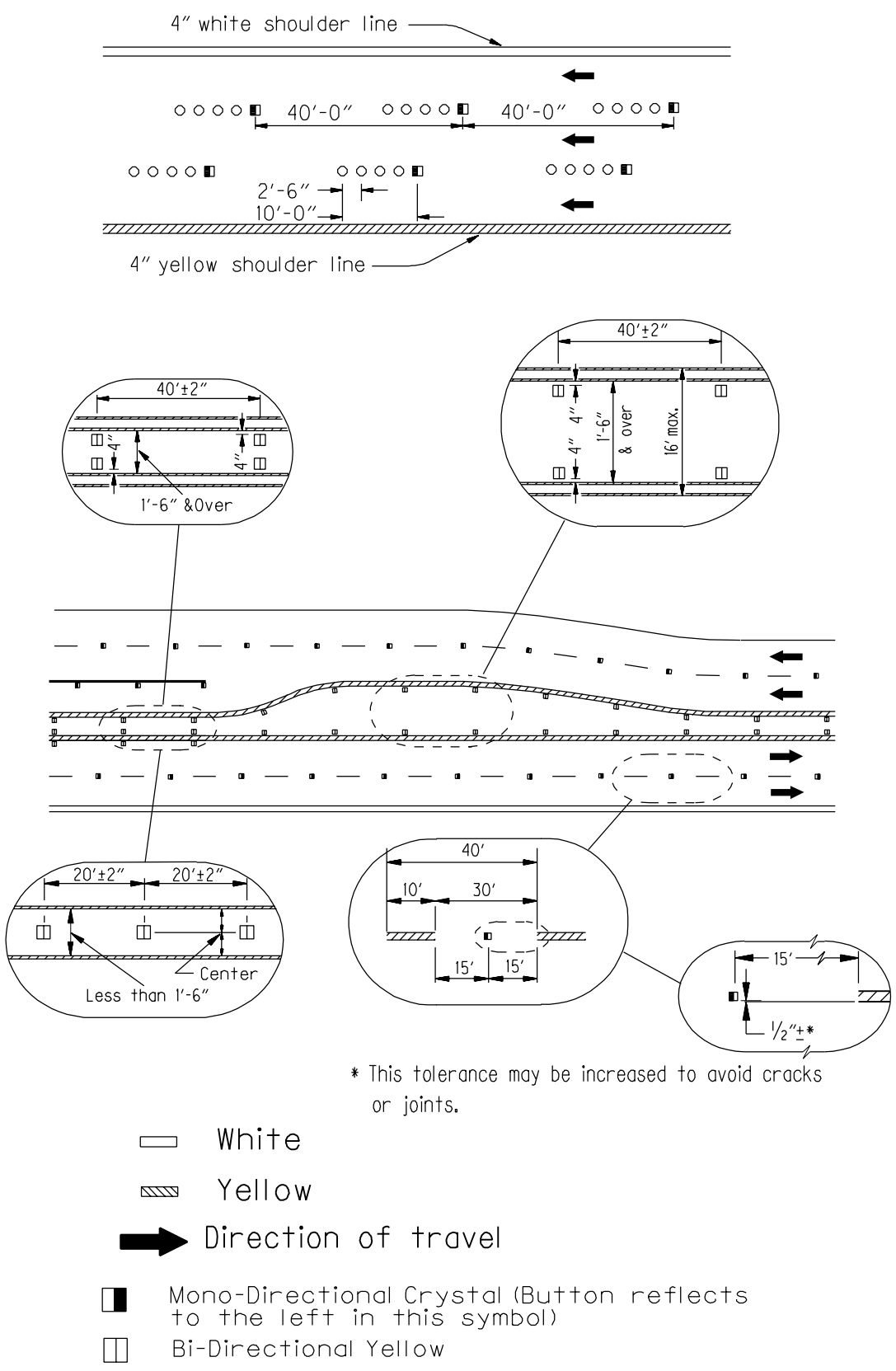
TLMANUAL.DGN 9-13-96 VIEW=FIG33



STANDARD PAVEMENT MARKINGS AT RAILROAD CROSSINGS

WITH TRUCK & BUS STOP LANES

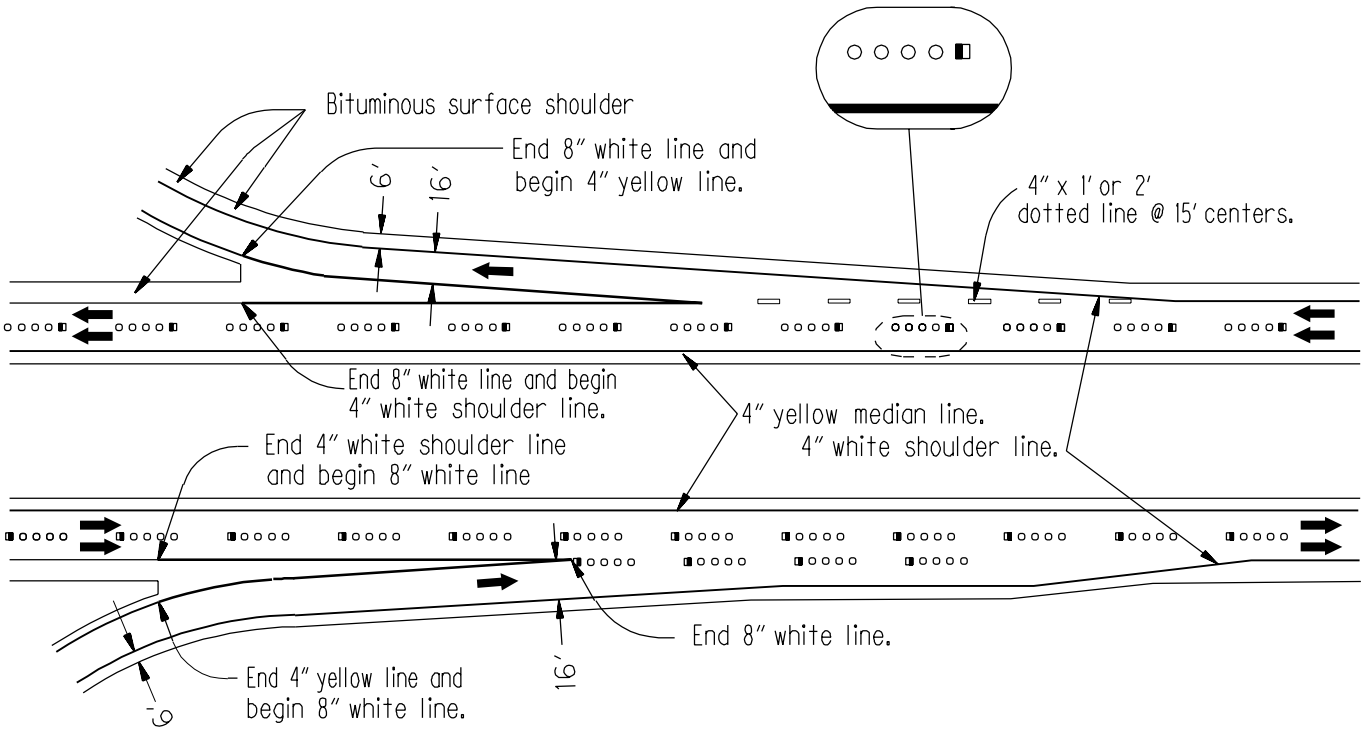
Figure 33

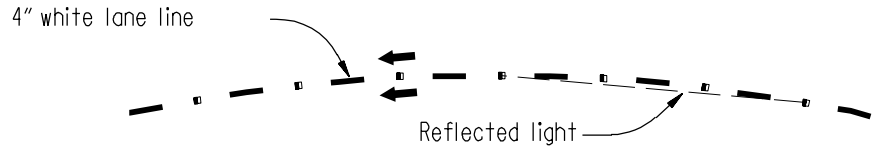


PAVEMENT MARKER LOCATIONS ON FREEWAYS AND EXPRESSWAYS

Figure 34a

TLMANUAL.DGN 9-13-96 VIEW=FIG34B





NOTE:

On one way sections the marker shall be installed with the reflective surface aimed to direct the reflected light back three markers.

L E G E N D

TYPE I MARKER

Mono-Directional Crystal (or Red and White)
(Button reflects White to left in this symbol)

Bi-Directional Yellow

TYPE II MARKER

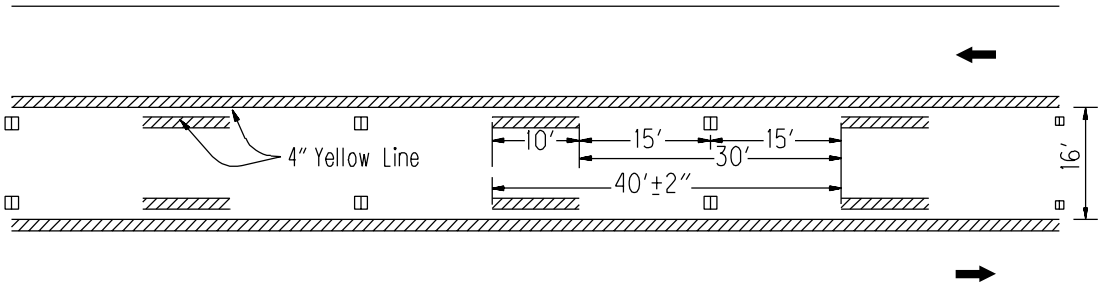
Non-Reflectorized White

Direction of travel

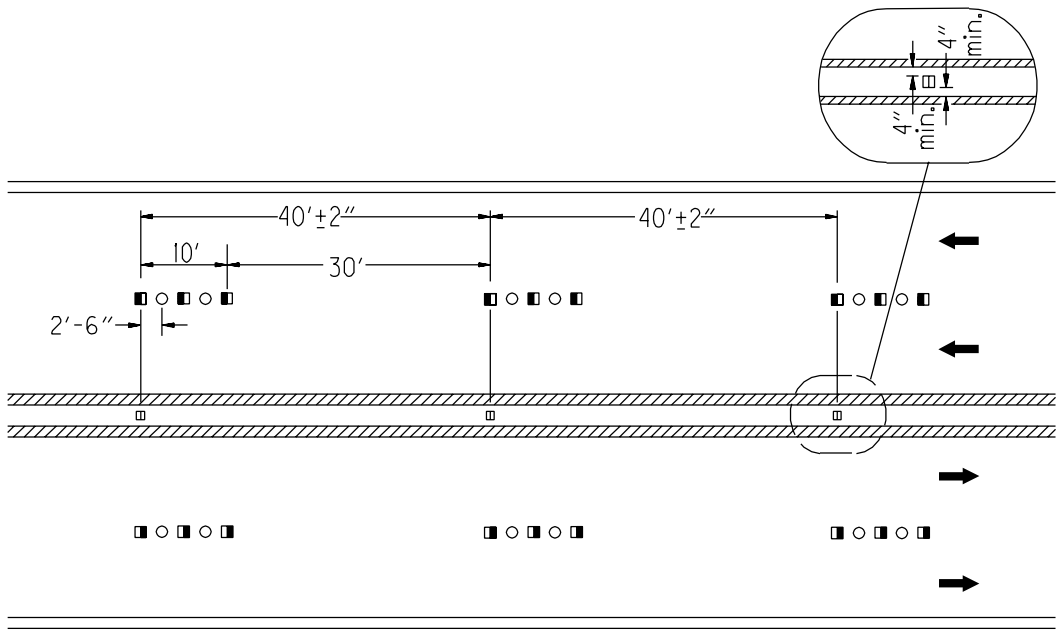
PAVEMENT MARKER LOCATIONS ON FREEWAYS AND EXPRESSWAYS

Reflective and Non-Reflective Markers

Figure 34b



TWO-WAY LEFT-TURN LANES



TWO-WAY FOUR-LANE STREETS

L E G E N D

Mono-Directional Crystal (or Red and White)
(Button reflects White to left in this symbol)

Bi-Directional Yellow

Direction of travel

White stripe

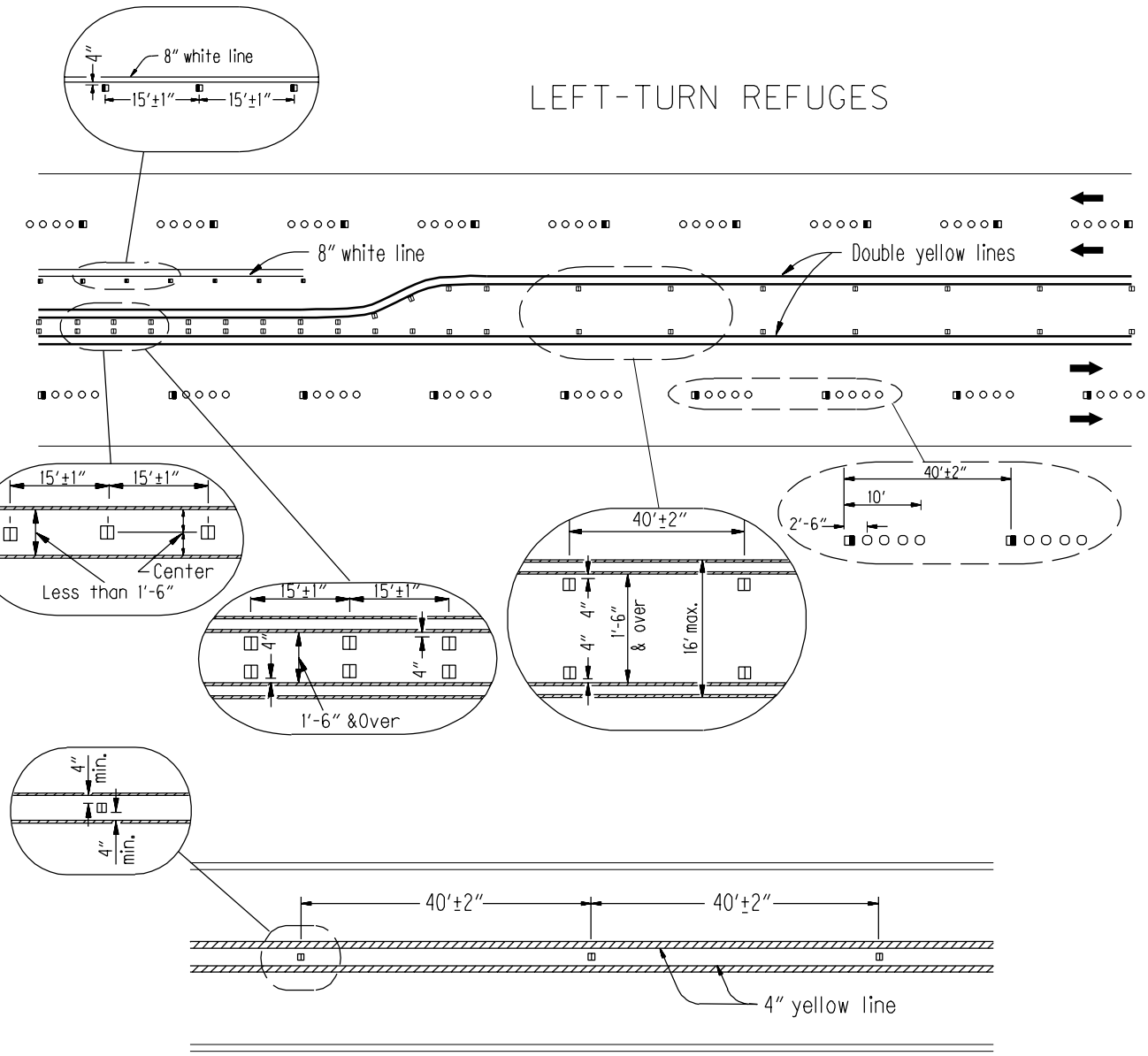
Yellow stripe

PAVEMENT MARKERS INSTALLATION

FOR URBAN STREETS

Figure 35a

TLMANUAL.DGN 5-18-98 VIEW=FIG35B



TWO-WAY, TWO-LANE NO PASSING LANES

L E G E N D

TYPE I MARKER

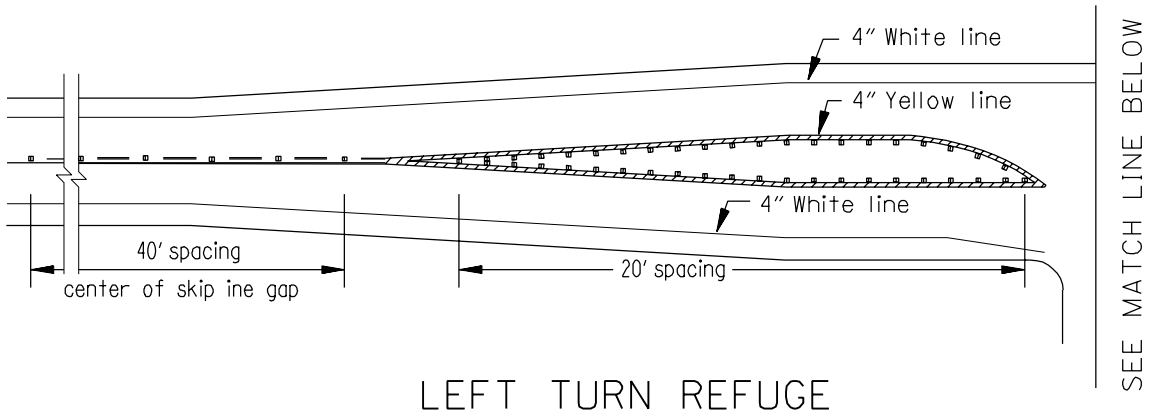
- Mono-Directional Crystal (Button reflects to left in this symbol)
- Bi-Directional Yellow

TYPE II MARKER

- Non-Reflectorized Yellow Buttons
- Non-Reflectorized White Buttons
- Direction of travel
- White stripe
- Yellow stripe

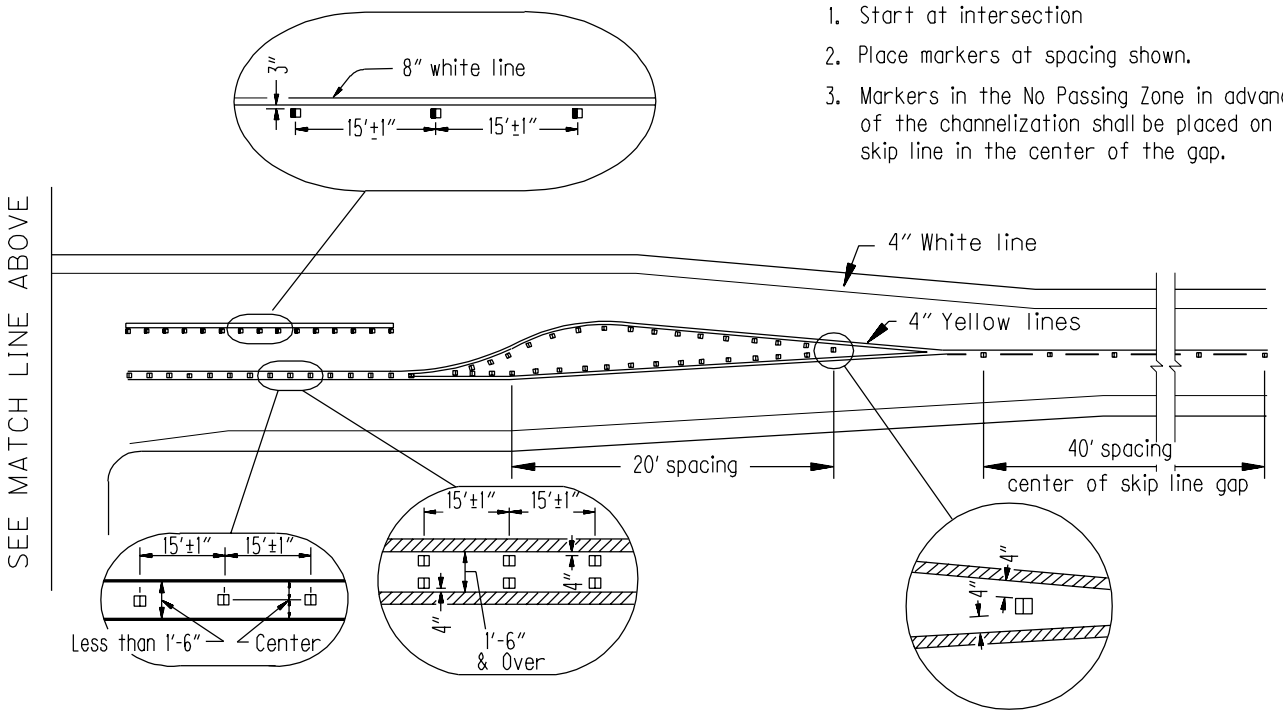
PAVEMENT MARKERS INSTALLATION FOR URBAN STREETS

Figure 35b



LEFT TURN REFUGE

1. Start at intersection
2. Place markers at spacing shown.
3. Markers in the No Passing Zone in advance of the channelization shall be placed on the skip line in the center of the gap.



L E G E N D

TYPE I MARKERS

- Mono-Directional Crystal (Marker reflects to left in this symbol.)
- Bi-Directional Yellow

All striping 4" in width unless otherwise shown.

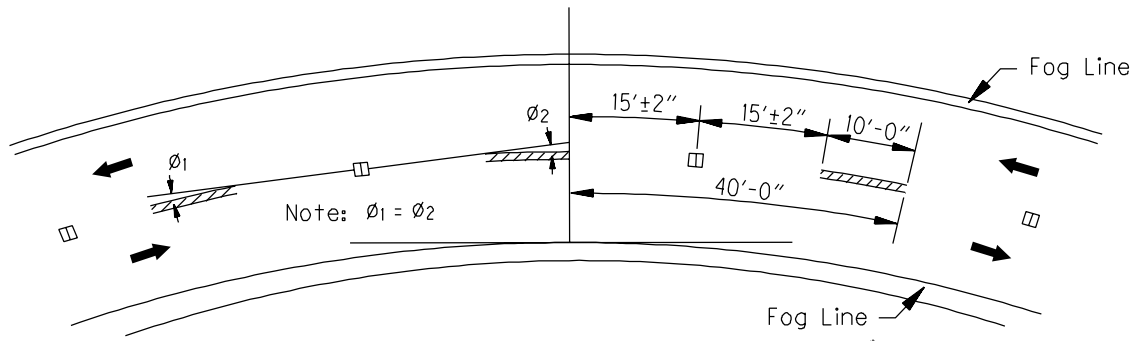
Note:
Marker may be moved laterally + half their width to avoid longitudinal cracks or joints with the approval of the Engineer.

STANDARD RAISED PAVEMENT MARKER INSTALLATION FOR RURAL ROAD

Figure 36a

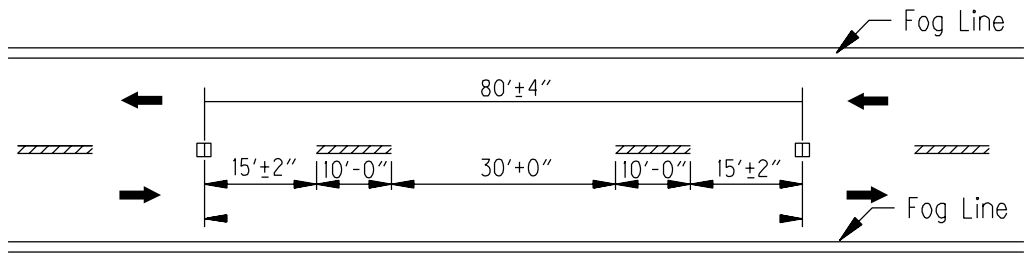
TLMANUAL.DGN 6-23-98 VIEW=FIG36A

TLMANUAL.DGN 9-13-96 VIEW=FIG36B

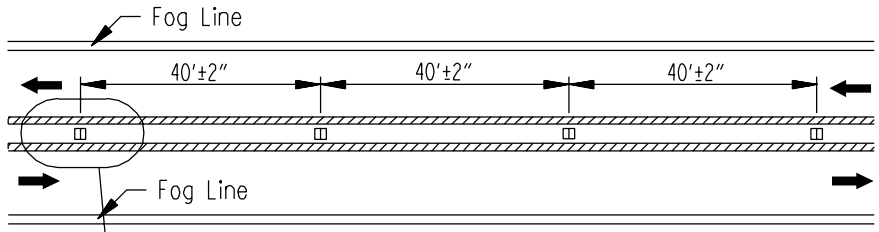


* Spacing may be increased to 80 feet if justified by on Engineering Study.

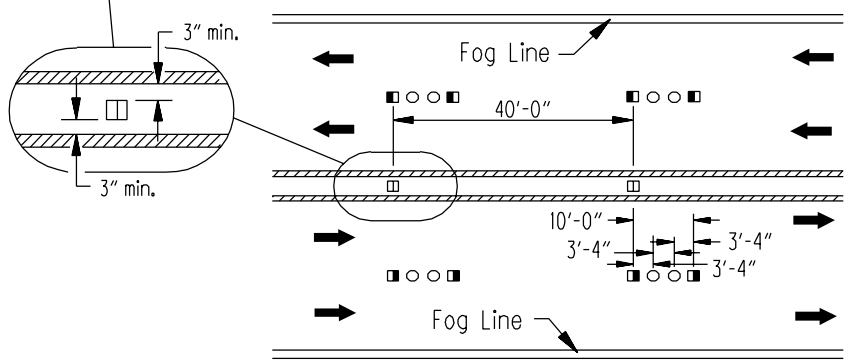
TWO LANE - TWO WAY CURVE HIGHWAY * (Supplementing Skip Line)



TWO LANE - TWO WAY TANGENT HIGHWAY (Supplementing Skip Line)



TWO LANE - TWO WAY NO PASSING LANES



FOUR LANE - TWO WAY HIGHWAY

L E G E N D

TYPE I MARKERS

- Mono-Directional Crystal (Button reflects to left in this symbol.)
- Bi-Directional Yellow

TYPE II MARKERS

- Non-Reflectorized Yellow
- Non-Reflectorized White

PAINTED LINE

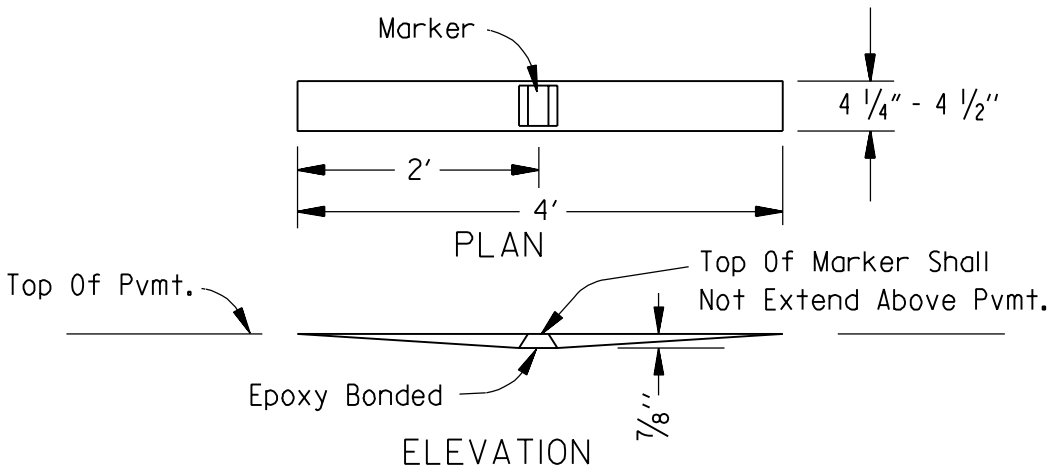
- White Stripe
- Yellow Stripe
- Direction of traffic

All striping 4″ in width unless otherwise shown.

Note:
Marker may be moved laterally ± half their width to avoid longitudinal cracks or joints with the approval of the Engineer.

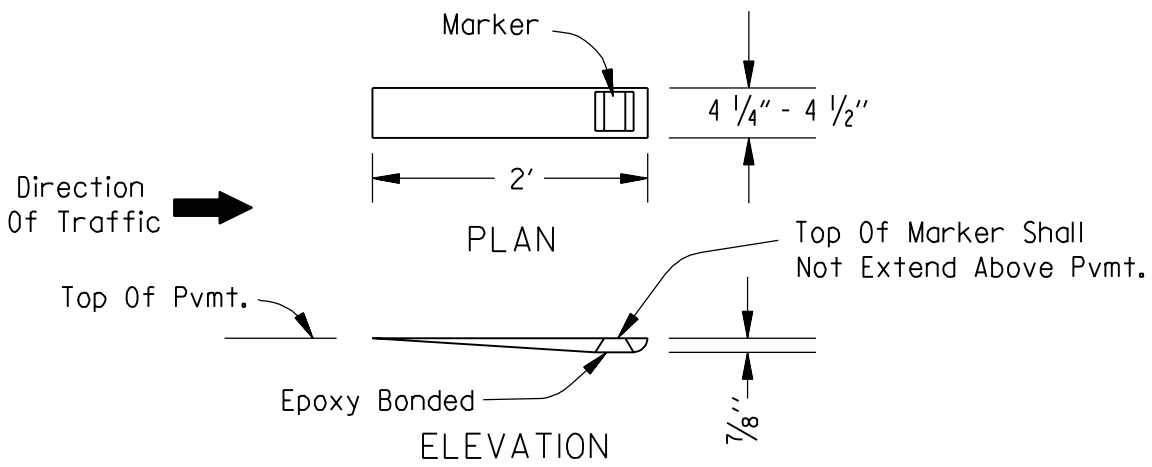
STANDARD RAISED PAVEMENT MARKER INSTALLATION FOR RURAL ROAD

Figure 36b



NOTE: Pvmt. Marker Spacing, As Designated By The Project Manager

BI-DIRECTIONAL RECESSED PAVEMENT MARKER DETAIL

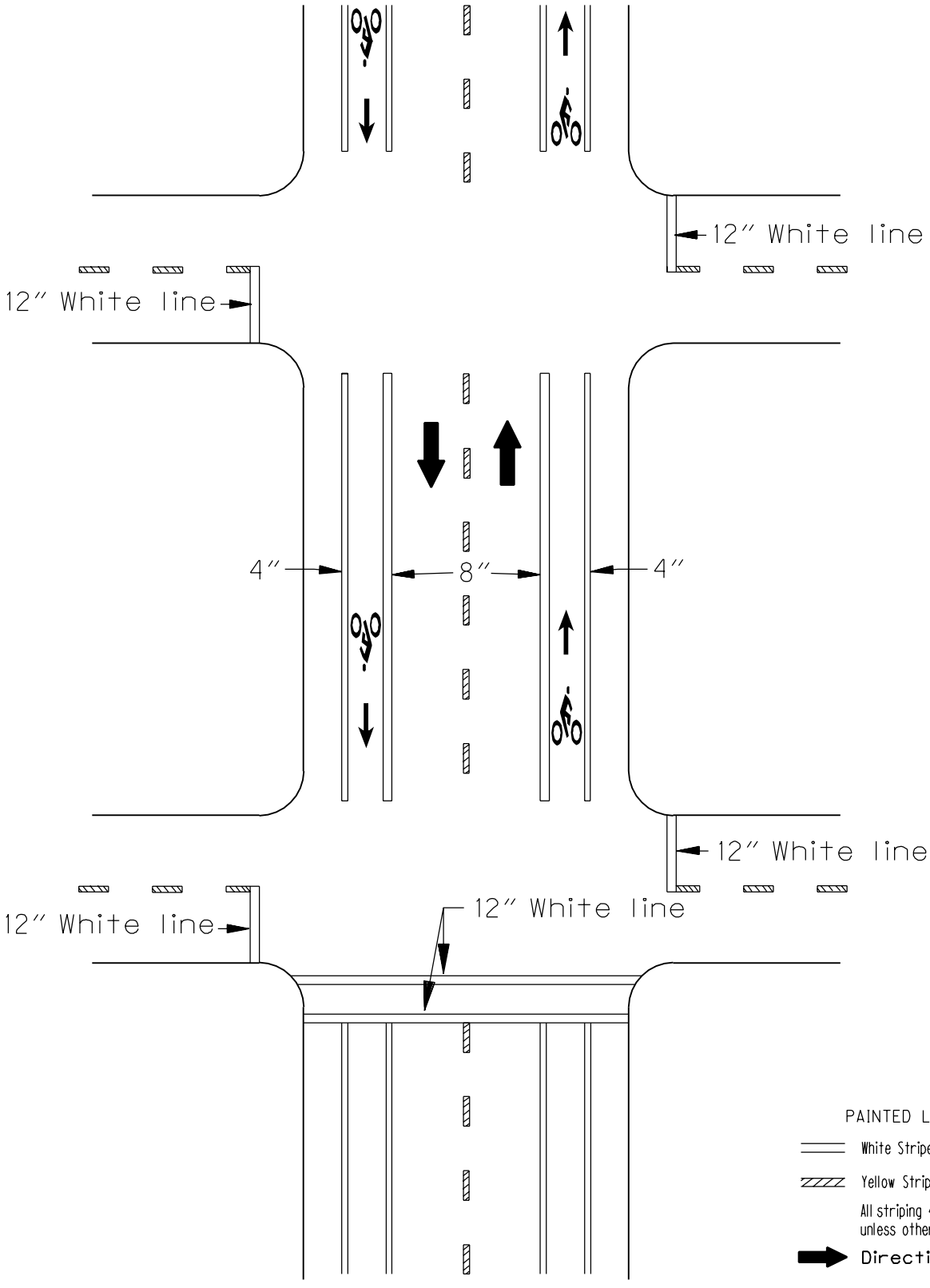


NOTE: Pvmt. Marker Spacing, As Designated By The Project Manager

MONO-DIRECTIONAL RECESSED PAVEMENT MARKER DETAIL

Figure 37

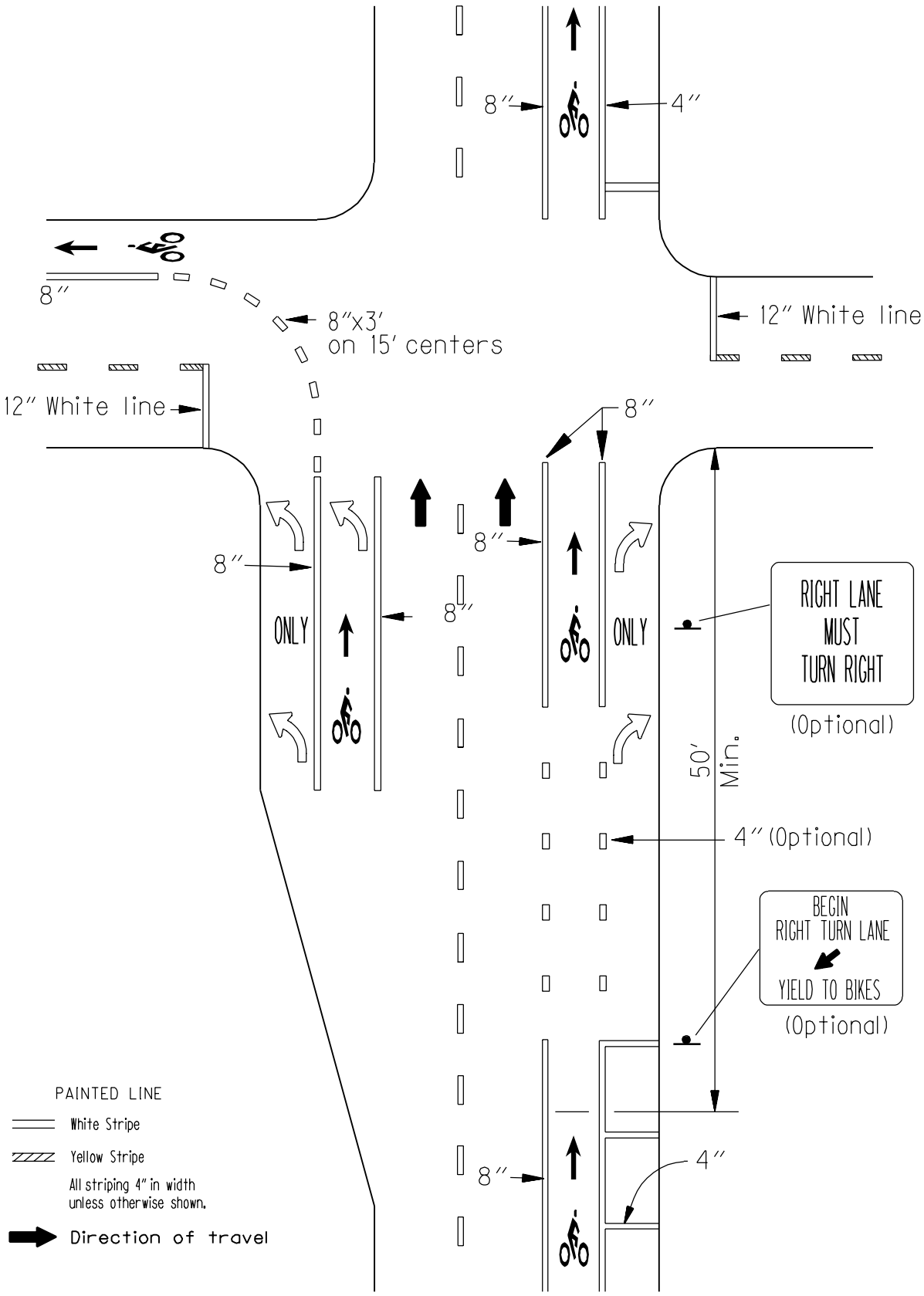
TLMANUAL.DGN 5-18-98 VIEW=FIG38A



TYPICAL PAVEMENT MARKING-DESIGNATED BIKE LANE,

TWO-WAY TRAFFIC WITH PARKING AND LOW RIGHT TURN VOLUME

Figure 38

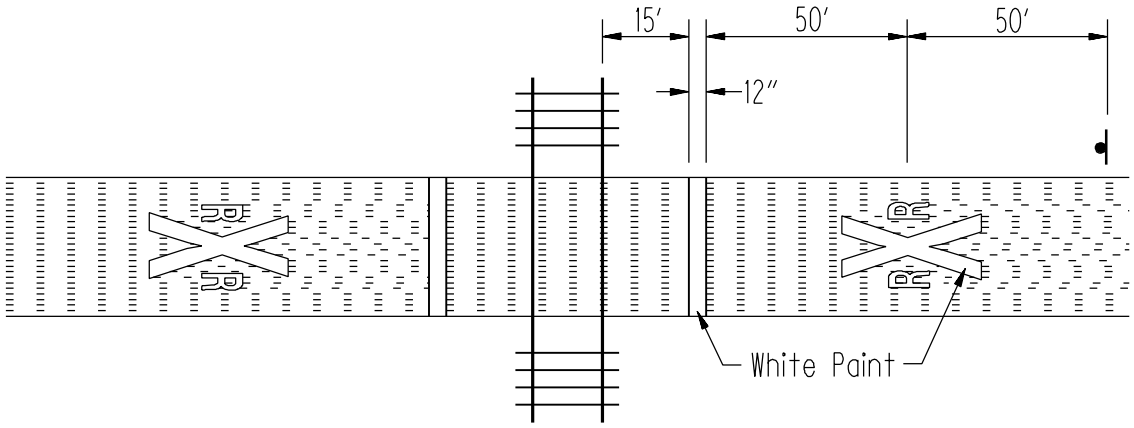


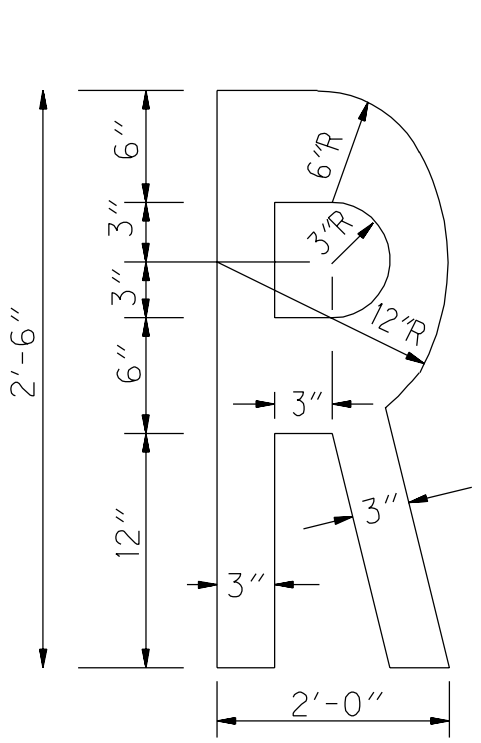
TLMANUAL.DGN 5-18-98 VIEW=FIG39A

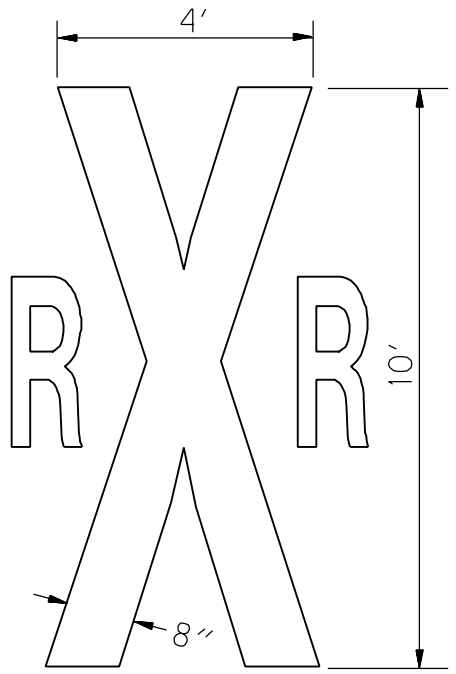
INTERSECTION PAVEMENT MARKINGS-DESIGNATED BIKE LANE

Figure 39

TLMANUAL.DGN 9-13-96 VIEW=FIG40A

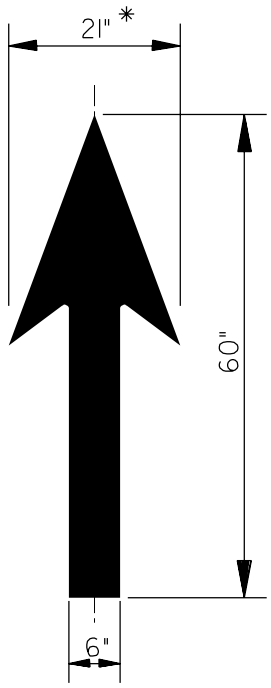






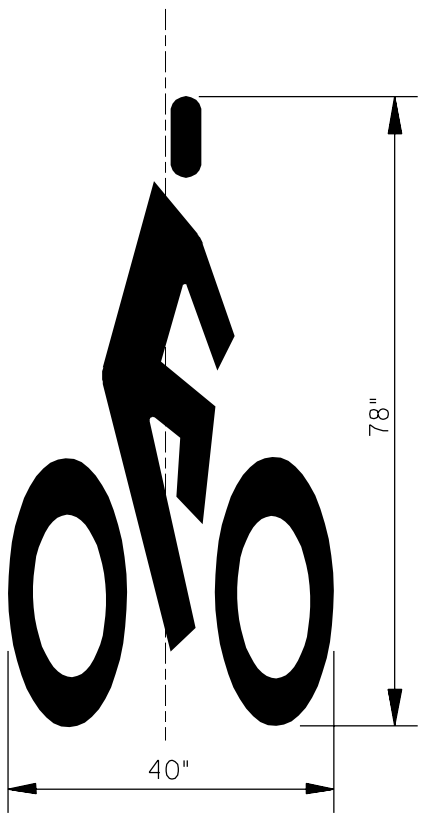
PAVEMENT WORD AND SYMBOL MARKINGS FOR BIKE ROUTE AT R/R GRADE X-ING

Figure 40a



* Width may be 25" for thermoplastic application.

STENCIL IS WHITE



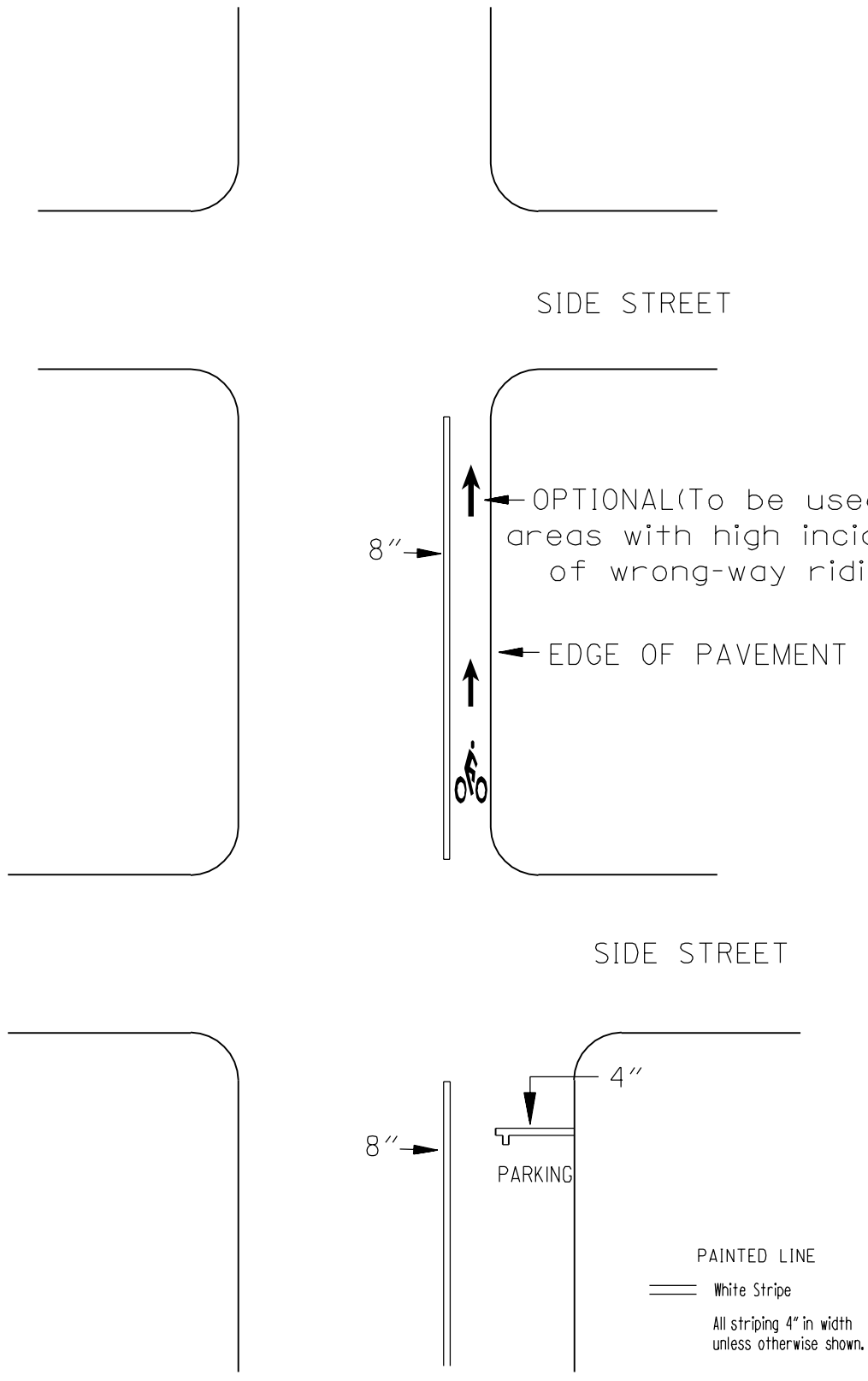
STENCIL IS WHITE

BIKE LANE STENCIL STANDARD

Figure 40b

TLMANUAL.DGN 9-13-96 VIEW=FIG40B

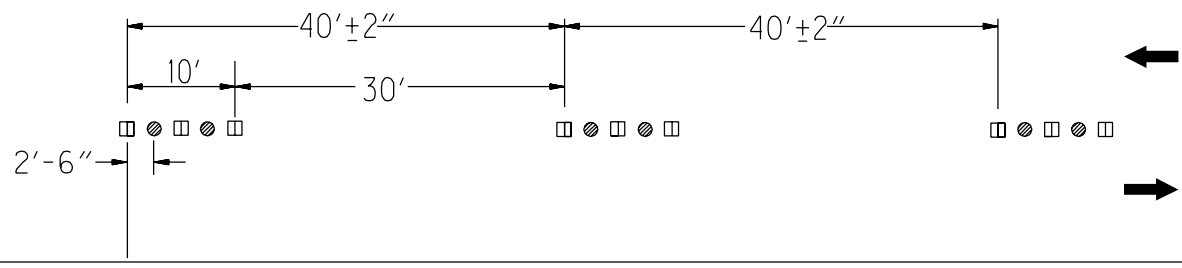
TLMANUAL.DGN 9-13-96 VIEW=FIG41



BIKE LANE MARKINGS

Figure 41

TLMANUAL.DGN 5-18-98 VIEW=FIG42



TWO-WAY TWO-LANE STREETS*

* No-passing markings must be painted where required

L E G E N D

Bi-Directional Yellow Type II marker

Non-Reflectorized Yellow

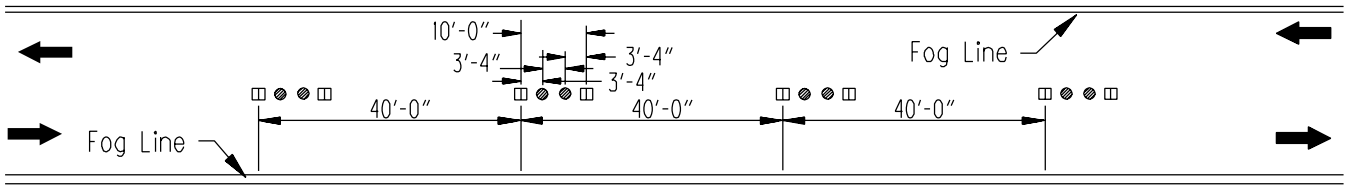
White stripe

PAVEMENT MARKERS INSTALLATION

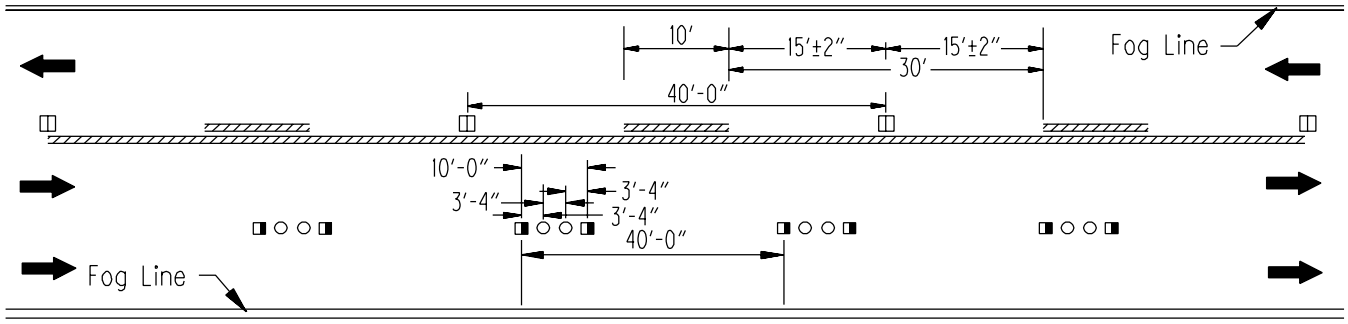
FOR URBAN STREETS

Figure 42

TLMANUAL.DGN 5-18-98 VIEW=FIG43



TWO LANE - TWO WAY HIGHWAY (Supplementing Skip Line)



CLIMBING and/or PASSING LANE * (Supplementing Skip Line)

* Supplementing skip line pattern may also be used.

L E G E N D

TYPE I MARKERS

- Mono-Directional Crystal (Marker reflects to left in this symbol.)
- Bi-Directional Yellow
- Non-Reflectorized Yellow

All striping 4″ in width unless otherwise shown.

Note:
Marker may be moved laterally ± half their width to avoid longitudinal cracks or joints with the approval of the Engineer.

- White Stripe
- Yellow Stripe
- Direction of traffic

STANDARD RAISED PAVEMENT MARKER INSTALLATION FOR RURAL ROAD

Figure 43

RAISED PAVEMENT MARKING
STANDARD LANE DROP MARKINGS

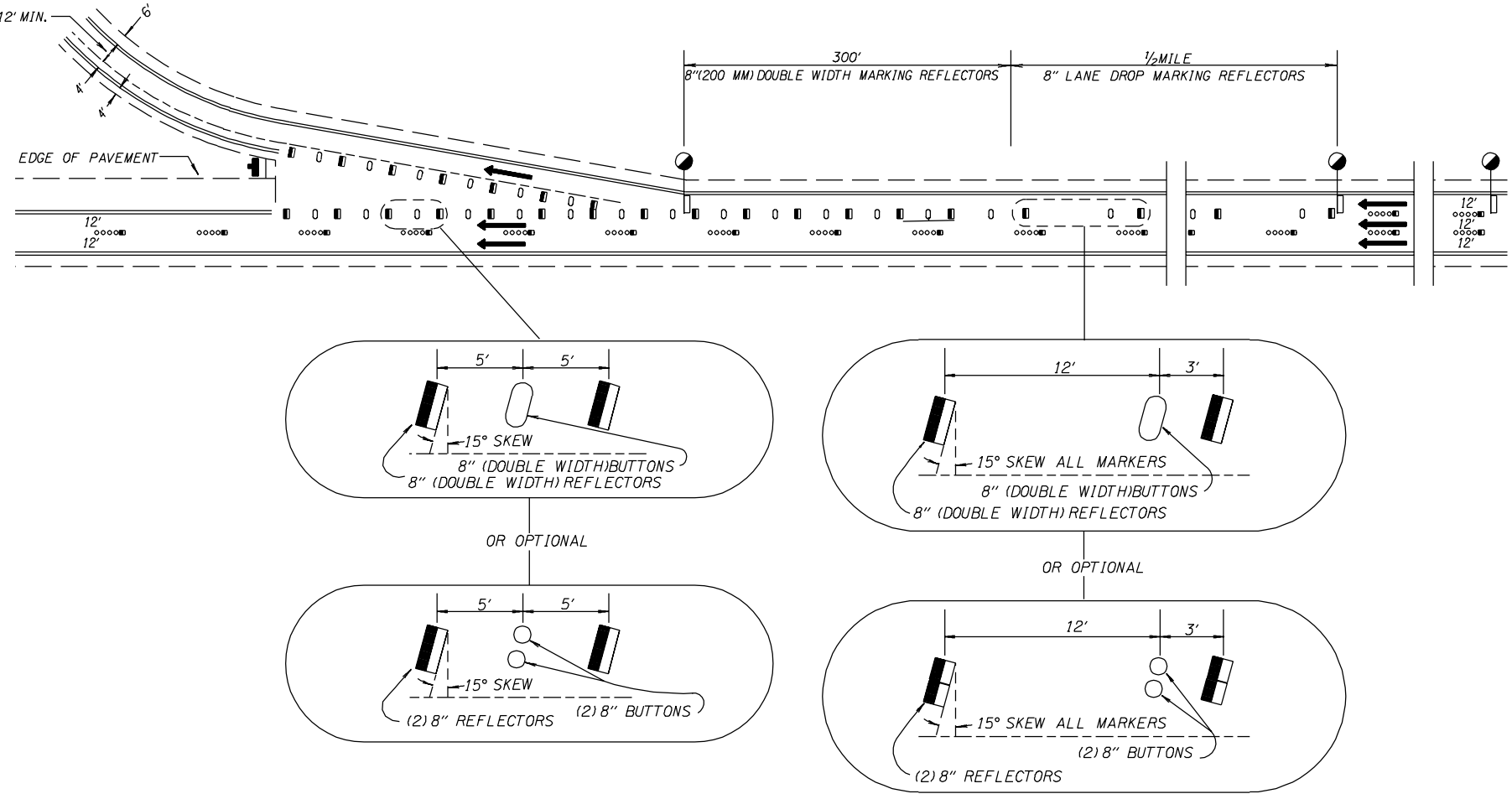
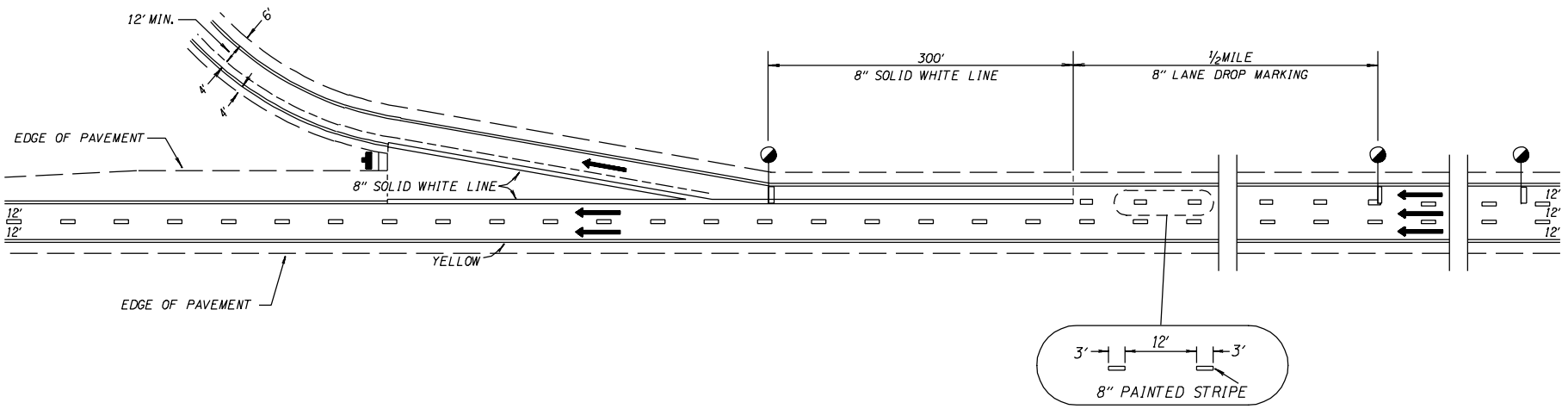


Figure 44

TLMANUAL.DGN 9-13-96 VIEW=FIG44

PAINTED MARKING STANDARD LANE DROP MARKINGS

Figure 4-5



RAISED PAVEMENT MARKING
STANDARD TWO-LANE EXIT
WITH SINGLE LANE DROP MARKINGS

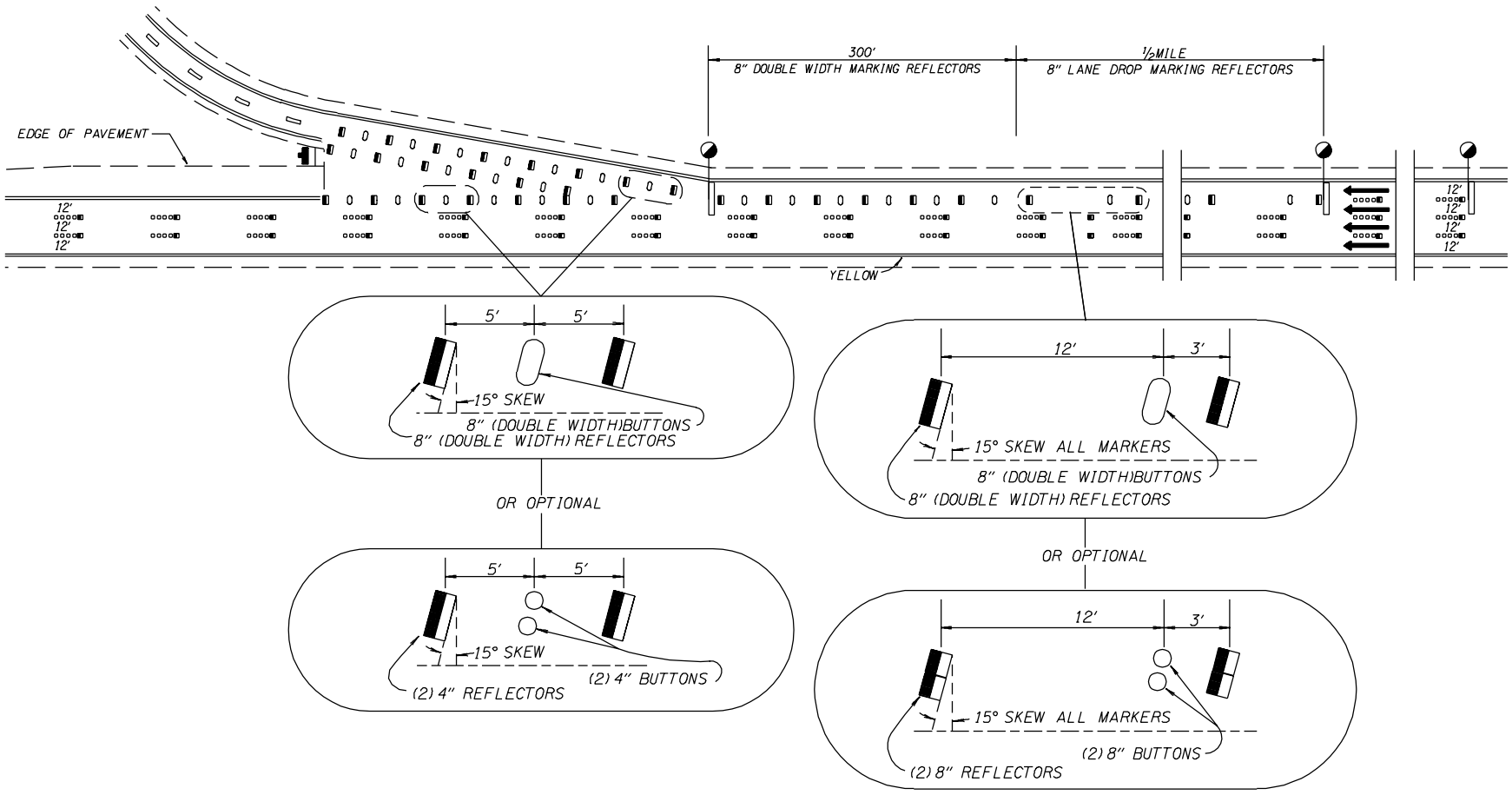


Figure 46

TLMANUAL.DGN 5-18-98 VIEW=FIG46

PAINTED MARKING STANDARD TWO-LANE EXIT WITH SINGLE LANE DROP MARKINGS

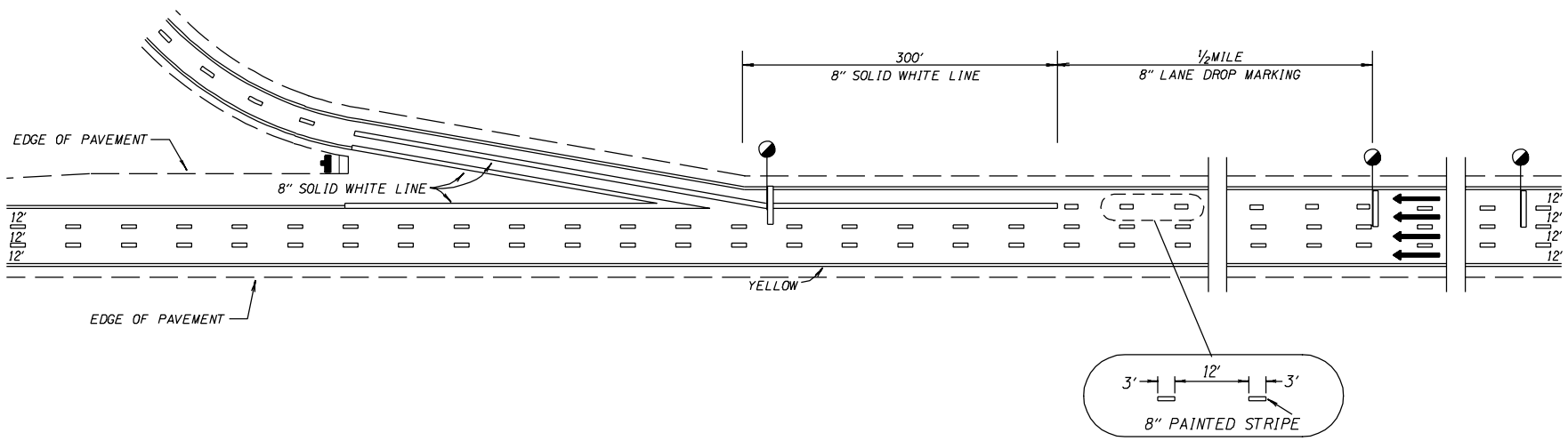
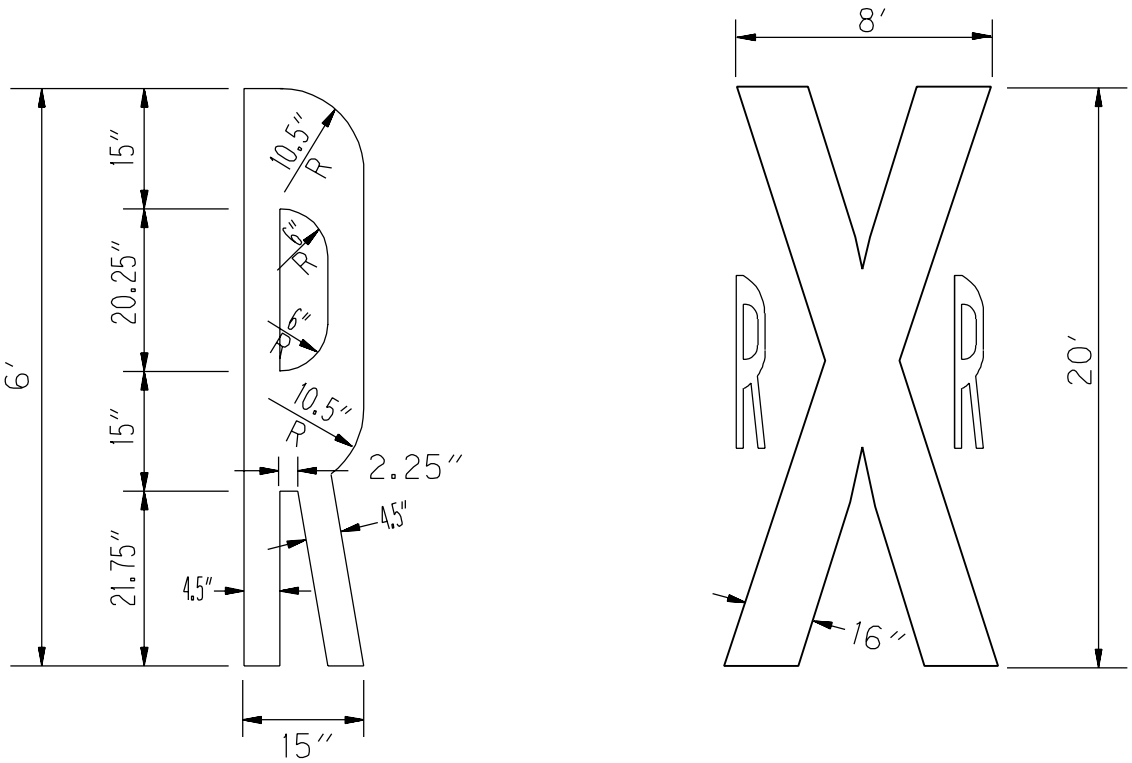


Figure 47



TLMANUAL.DGN 4-18-98 VIEW=FIG48

PAVEMENT MARKINGS FOR R/R X-ING

Figure 48