

Signing Plan Design - At Grade Intersections

TEM Chapter 6-6.0 Application Guidelines - Warning Signs

Application Guidelines - Warning Signs

➤ 6-6.01 Purpose

- The warning sign applications that are discussed in this section are those which:
 - 1. Are not specifically addressed in the MN MUTCD, or
 - 2. Provide additional guidance to that given in the MN MUTCD on application, location, and usage of certain types of warning signs, or
 - 3. Establish practices relating to engineering and traffic investigation requirements for certain warning signs.

Application Guidelines - Warning Signs

➤ 6.01 Purpose

- The chart in Chart 6-5 (TEM page 6-133) and the following paragraph are reprinted from the MN MUTCD, Section 2C-3, and are duplicated here to stress the importance of maintaining proper minimum distances for warning sign placement.
- See Appendix D for MN MUTCD Table 2C-3

Application Guidelines - Warning Signs

Posted or 85th percentile speed mph		Advance Placement Distance ¹													
		Condition A: High judgement required ²		Condition B: Stop condition ³		Condition C -Deceleration condition to listed advisory speed - km/h (mph) for the condition ⁴									
						15 (10)		30 (20)		50 (30)		60 (40)		80 (50)	
						meters	feet	meters	feet	meters	feet	meters	feet	meters	feet
30	20	55	175	NA ⁵	NA ⁵	NA ⁵	NA ⁵	---	---	---	---	---	---	---	---
40	25	75	250	NA ⁵	NA ⁵	30 ⁵	100 ⁵	NA ⁵	NA ⁵	---	---	---	---	---	---
50	30	100	325	30	100	50	150	30	100	---	---	---	---	---	---
60	35	125	400	50	150	65	200	55	175	NA ⁵	NA ⁵	---	---	---	---
60	40	145	475	70	225	85	275	80	250	55	175	---	---	---	---
70	45	170	550	95	300	110	350	95	300	80	250	NA ⁵	NA ⁵	---	---
80	50	195	625	115	375	130	425	125	400	100	325	70	225	---	---
90	55	215	700	140	450	155	500	145	475	125	400	95	300	NA ⁵	NA ⁵
100	60	240	775	170	550	175	575	170	550	155	500	125	400	95	300
110	65	260	850	200	650	200	650	195	625	175	575	155	500	115	375

NOTES:

¹ The distances are adjusted for a sign legibility distance of 50 m (175 ft) which is the appropriate legibility distance for a 125 mm (5 in) Series D word legend. The distances may be adjusted by deducting another 30 m (100 ft) if symbol signs are used. Adjustments may be made for grades if appropriate.

² Typical conditions are locations where the road user might use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge, Right Lane Ends, etc. The distances are determined by providing the driver a PIEV time of 6.7 to 10.0 seconds plus 4.5 seconds for vehicle maneuvers minus the legibility distance of 50 m (175 ft) for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, or Cross Road. The distances are based on the 1990 AASHTO Policy for stopping sight distance (page 120) providing a PIEV time of 2.5 seconds, friction factor of 0.30 to 0.40, minus the sign legibility distance of 50 m (175 ft).

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Hill, or Dip. The distance is determined by providing a 1.6 second PIEV time (1990 AASHTO, page 119), a vehicle deceleration rate of 3 m/second² (10 ft/second²), minus the sign legibility distance of 50 m (175 ft).

⁵ No suggested minimum distances are provided for these speeds, as placement location is dependent on site conditions and other signing to provide an adequate advance warning for the driver.

Application Guidelines - Warning Signs

➤ 6.01 Purpose

- PIEV Time
 - Perception
 - Identification/ understanding
 - Emotion/decision making
 - Volition/execution of decision
- The PIEV time can vary from about 3 seconds for general warning signs to 10 seconds for high driver judgment condition warning signs.

Application Guidelines - Warning Signs

➤ 6-6.03 Chevron Alignment Signs

- The Chevron Alignment sign (W1-8) is a warning sign and, as with all warning signs, should be used sparingly, as excessive use will reduce its effectiveness.
- Generally, this sign should be used only on 6 degree curves or greater. Curves of less than 6 degrees would be marked by standard delineation as covered in Chapter 7.



Application Guidelines - Warning Signs

➤ 6-6.03 Chevron Alignment Signs

- Height and lateral clearance for all signs on a curve should be uniform, to accurately delineate the roadway.
- The first sign should be placed near the beginning of the curve. Spacing of the signs should be such that the motorist always has two in view, until the change in alignment eliminates the need for the signs.

Application Guidelines - Warning Signs

➤ 6-6.03 Chevron Alignment Signs

- Chart 6-6 (TEM page 6-134) shows spacing of signs on various curves.
- Review Chart 6-6
- Although the standard size for conventional roads is 450 x 600 mm (18" x 24"), the 600 x 750 mm (24" x 30") sign may be used based on engineering judgment.

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➤ 6-6.

Radius of Curve (m)		Degree of Curvature	Chevron Spacing (m)	
meters	feet		meters	feet
45	150	38°15'	14-18	45 - 60
60	200	28°45'	16-21	53 - 70
80	260	23°00'	18-24	60 - 80
90	300	19°00'	23-30	75-100
120	400	14°15'	25-33	83-110
150	500	11°30'	30-40	98-130
180	600	9°30'	32-43	105-140
210	700	8°15'	34-46	112-150
240	800	7°15'	37-49	120-160
270	900	6°15'	39-52	127-170

Formula for finding the degree of curvature from the radius:

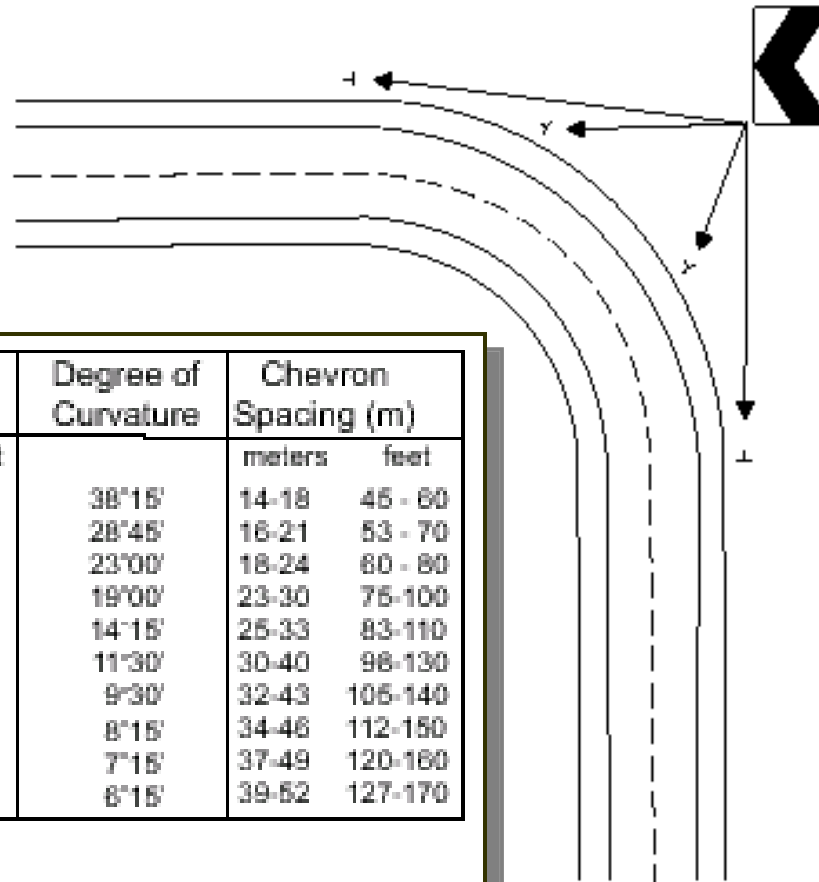
$$D = \frac{5729.578}{\text{Radius}}$$

Text Ref.: 6-6.02

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CHEVRON SIGN SPACING

CHART
6-6



Signs

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Application Guidelines - Warning Signs

➤ STOP AHEAD Warning Sign

- Needs to be one size larger than the STOP sign
- If 48" x 48" STOP sign, use 48" x 48" STOP AHEAD warning sign



Application Guidelines - Warning Signs

➤ 6-6.05 BUMP and DIP Signs

- The BUMP and DIP signs shall be installed in advance, and at the site of, sharp rises or depressions in the profile of the roadway, respectively, which are sufficiently abrupt to:
 - create a hazardous condition
 - cause considerable discomfort to passengers
 - cause a shifting of the cargo
 - deflect a vehicle from its true course at the normal driving speeds for the road

Application Guidelines - Warning Signs

➤ **6-6.05 BUMP and DIP Signs**

- It may be desirable to supplement these signs with an Advisory Speed plate (MN MUTCD, Section 2C-35)
- At less severe or multiple bumps, a BUMP AHEAD (W8-1A) or BUMPS (W8-1B) sign, should be placed an adequate distance in advance of the site(s) to ensure that a motorist has sufficient warning before arriving at the location(s).
- See TEM Chart 6-5 or MN MUTCD Table 2C-3 for placement distance.

Application Guidelines - Warning Signs

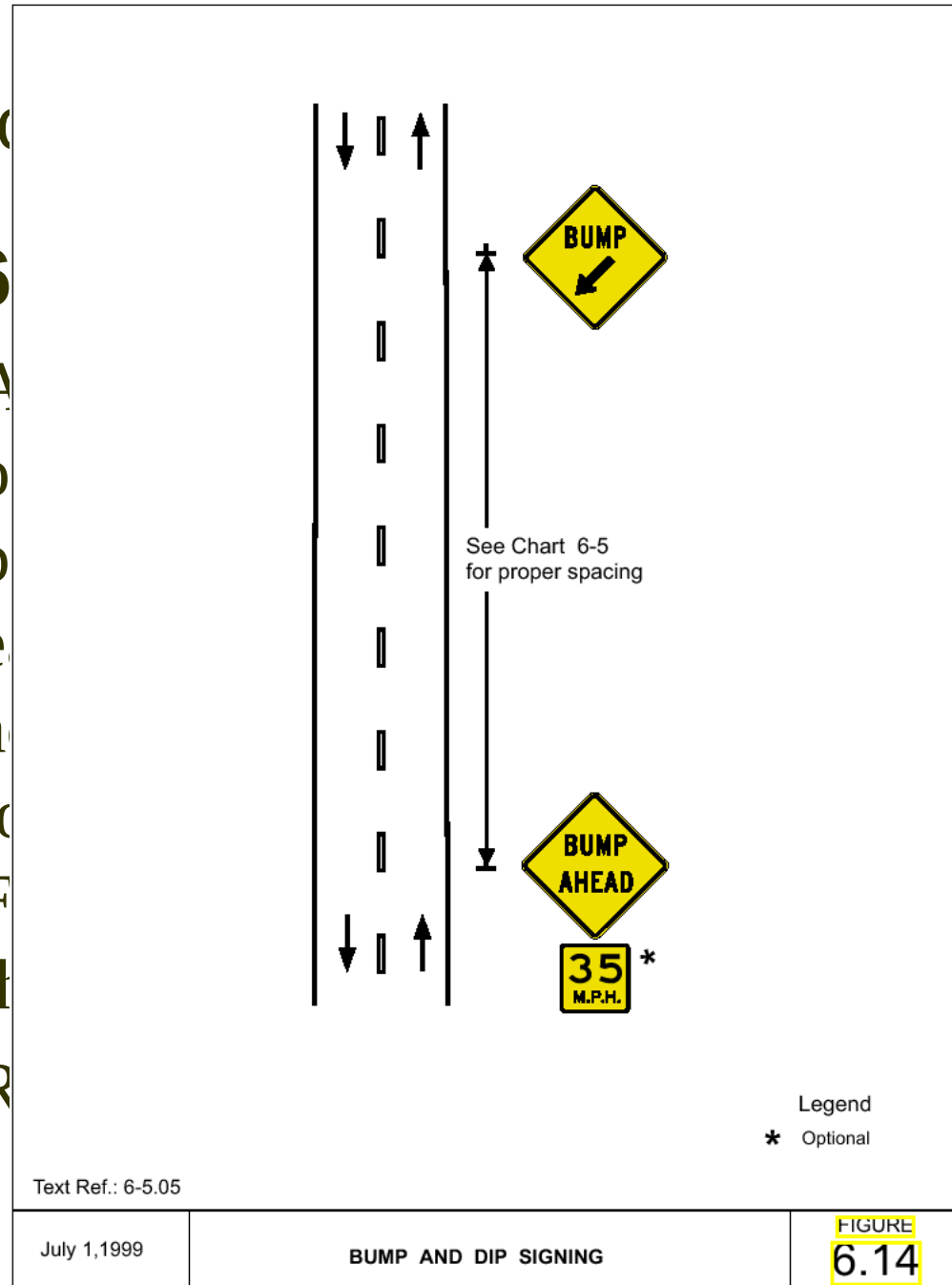
➤ 6-6.05 BUMP and DIP Signs

- An appropriate distance plaque, W20-100P or NEXT ____ MILES (W7-3a), shall be placed below the warning sign. At the site of each severe bump, a "down arrow" shall be added to the sign face instead of "AHEAD" to identify the exact location of the bump. Figure 6.14 (TEM page 6-82) shows the typical placement of these signs.
- Review Figure 6.14

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Application Guidelines - Warning Signs

➤ 6-6.05 BUMP and DIP Signs

- When locations have multiple bumps of lesser severity or pavement breaks, for a distance in excess one mile, then the "ROUGH ROAD" (W8-8) warning sign should be used. The supplemental distance plaque W7-3a should be used below it.
 - Note:

The use of a flashing beacon or orange flag is discretionary, depending on the severity of the bump or dip. When used, they should be mounted on the advance sign assembly.

Application Guidelines - Warning Signs

➤ 6-6.07 Crossing Signs

— 6-6.07.01 *Pedestrian Crossing Signs* (warning and regulatory)

- 1. Typical Pedestrian Crossings

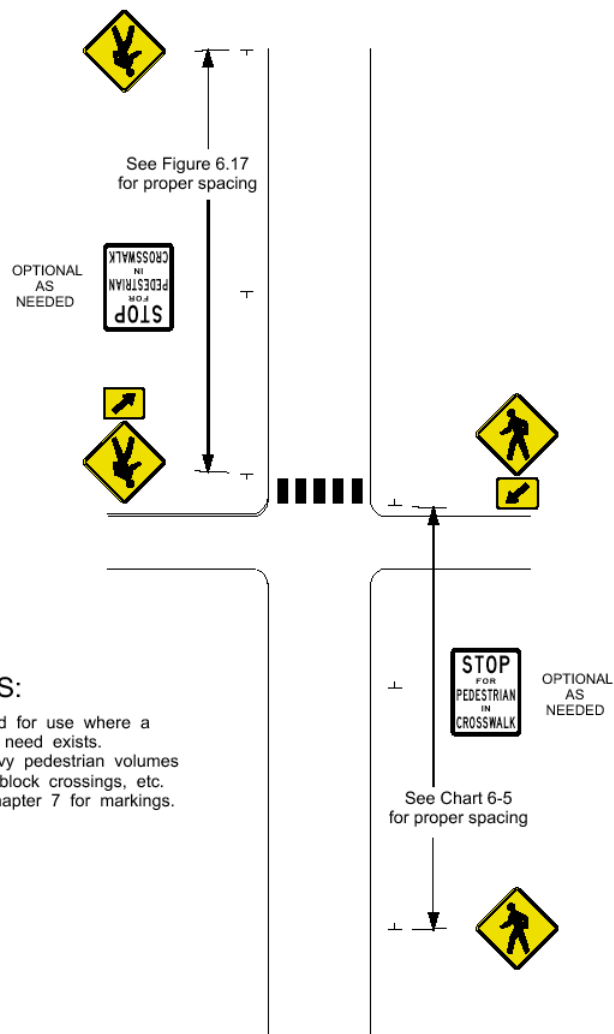
This section covers usage of pedestrian warning signs at locations where *emphasis* is needed to alert motorists to pedestrians crossing the highway.

Application Guidelines - Warning Signs

➤ 6-6.07 Crossing Signs

— 6-6.07.01 *Pedestrian Crossing Signs* (warning and regulatory)

- Figures 6.15A and 6.15B (TEM pages 6-83 & 6-84) sets forth guidelines for the placement of signs and markings for pedestrian crossings.
- In urban areas, the distance for the crossing advance sign may be less where mounting problems are encountered, provided that the regulatory sign is not used.
- Review Figures 6.15A and 15B

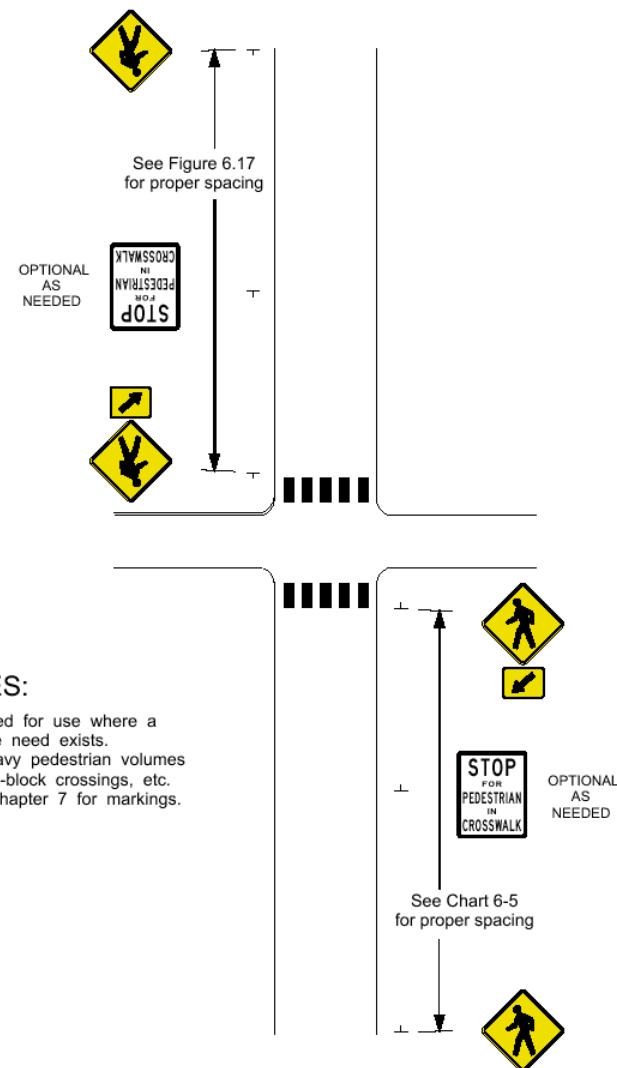


NOTES:

1. Intended for use where a definite need exists.
 - Heavy pedestrian volumes
 - Mid-block crossings, etc.
2. See Chapter 7 for markings.

Text Ref.: 6-6.07.01

FIGURE
6.15A



NOTES:

1. Intended for use where a definite need exists.
 - Heavy pedestrian volumes
 - Mid-block crossings, etc.
2. See Chapter 7 for markings.

Text Ref.: 6-6.07.01

FIGURE
6.15B

July 1, 1999

PEDESTRIAN CROSSING SIGNING

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PEDESTRIAN CROSSING SIGNING

Application Guidelines - Warning Signs

➤ 6-6.07 Crossing Signs

— 6-6.07.01 *Pedestrian Crossing Signs* (warning and regulatory)

- Crosswalks shall be painted by the local jurisdiction at the crossing before the signs are installed.
- Where signs are installed, the pedestrian warning sign (W11-2) shall be placed in all cases.



Application Guidelines - Warning Signs

➤ 6-6.07 Crossing Signs

— 6-6.07.04 Trail Crossing Signs

- TRAIL CROSSING (W11-X7) warning signs should be used only in advance of officially designated trails which cross the highway. Typical signing is shown in Figure 6.16 (TEM page 6-85).
- Review Figure 6.16



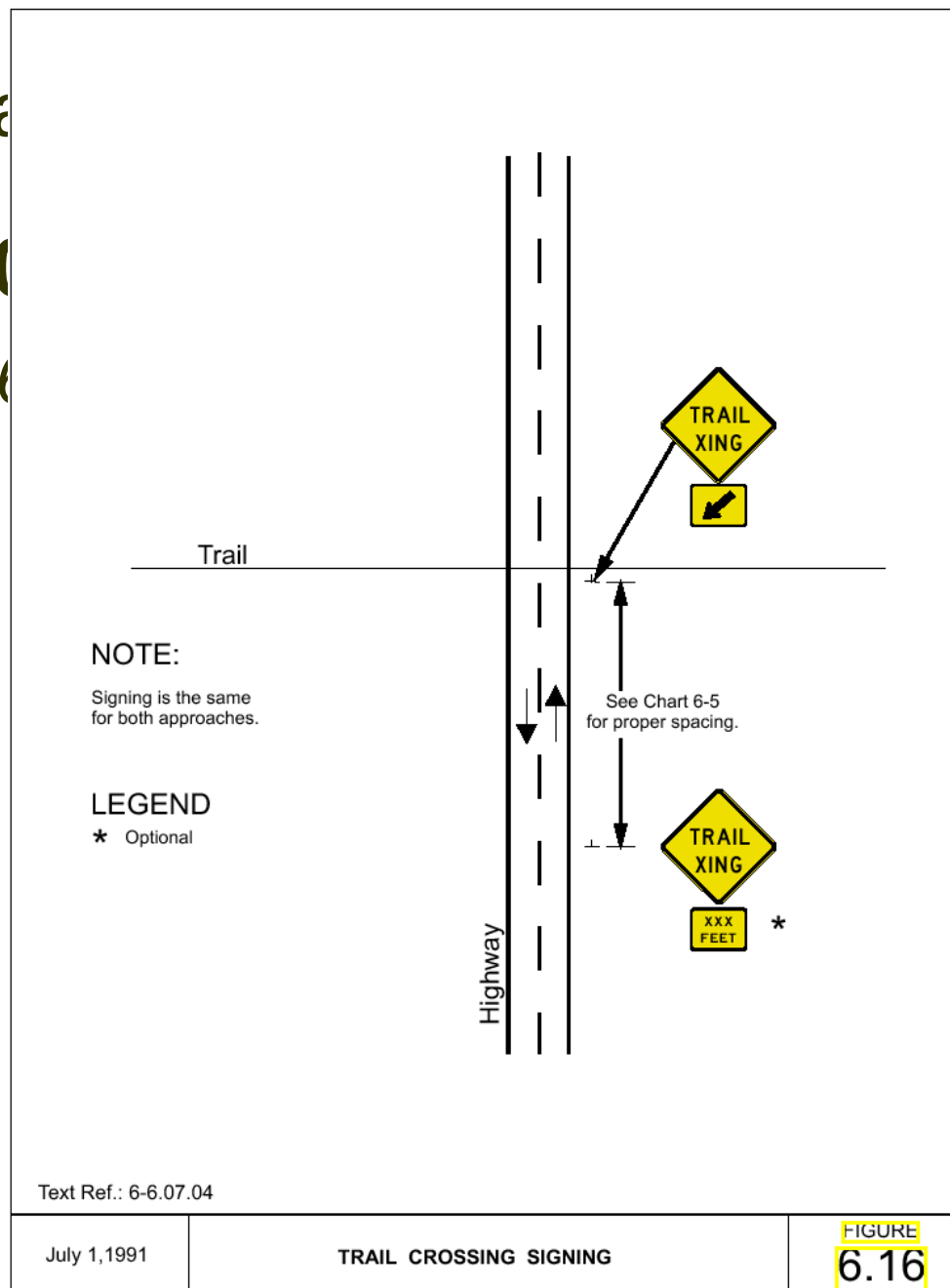
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Application Guidelines - Warning Signs

- **6-6.09 Typical Signing for Transitions Between Divided Highway Section and Two-Lane, Two-Way Sections**
 - Figure 6.17 (TEM page 6-86) indicates signing for transitions between divided highways and two-lane, two-way highways.
 - Review Figure 6.17

Application

6-6

Traffic

Highway

Two-Lane

For

Both

Types

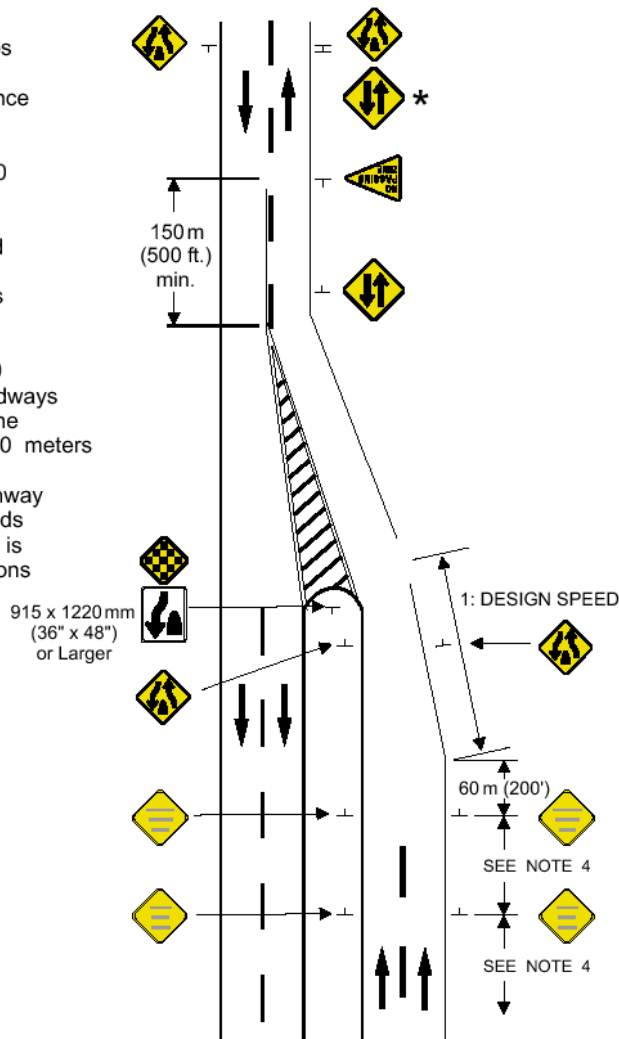
Of

Roadways

NOTES:

1. All sign location distances are approximate.
2. Distances between advance signs in the two-lane two-way section to the painted gore are 150-360 meters (500-1200 feet).
3. Pavement Markings and Delineation can be found in Chapter 7.
4. On high speed roadways of 45 mph and above, the spacing should be 120-150 meters (400-500 feet). On low speed roadways of 40 mph and below, the spacing should be 60-120 meters (200-400 feet).
5. Do not use Divided Highway and Divided Highway Ends signs when the highway is divided only at intersections or junctions.

* - Optional



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TRANSITION SIGNING
(Divided and Undivided Roadways)

FIGURE
6.17

Signs

Two-Lane,

Transitions

Two-Lane,

Application Guidelines - Warning Signs

➤ 6-6.10 Typical Signing for Channelized Intersections

- Figures 6.18A, 18B, and 18C indicate the signing required for channelized intersections.
- Review Figures 6.18A, 18B, 18C (TEM pages 6-87, 6-88, 6-89)

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NOTE:

The signing is the same
for both approaches to
the intersection.



RIGHT
TURN
LANE



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Text Ref.: 6

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Text Ref.: 6-6.10

July 1, 1999

CHANNELIZED INTERSECTION SIGNING
WITH MULTIPLE TURN LANES

FIGURE

6.18C

Application Guidelines - Warning Signs

➤ 6-6.12 No Passing Zone Sign

- No Passing Zone Pennant sign used on trunk highways shall have a nominal size of 1200 x 1500 x 1500 mm (48" x 60" x 60") as indicated on Standard Sign Drawing W14-3.
- The purpose of this larger size on trunk highways is to provide added visibility of the sign for motorists.

