SIGNING

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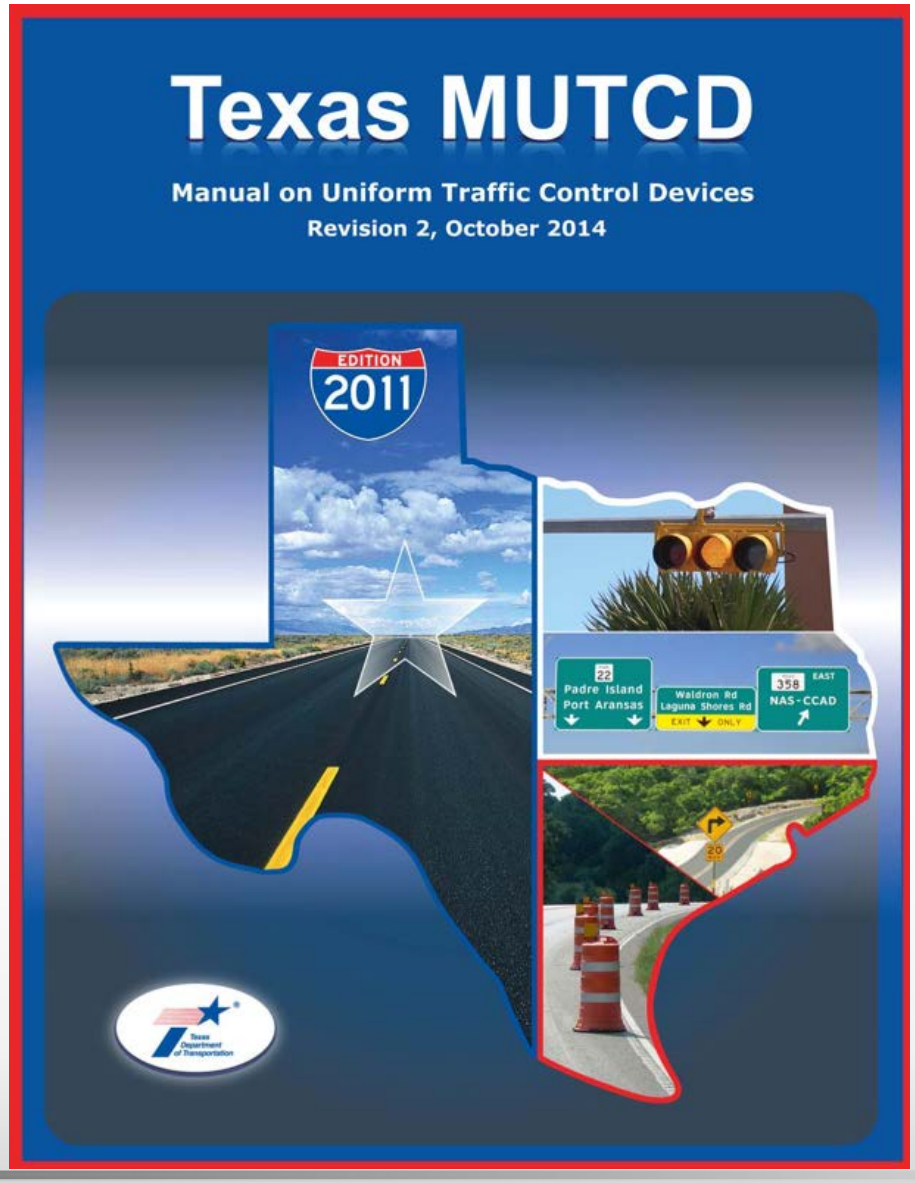
WHY IS SIGNING IMPORTANT ON LOCAL ROADS AND STREETS?

- 75% of Public Roads in the U.S are maintained by local agencies
- Most of the roads in Texas are local roads
- Crash rates are generally higher on these roads and streets

Texas MUTCD

- 2011 Manual on Uniform Traffic Control Devices
- Revision 2, October 2014
- Introduction and 9 parts



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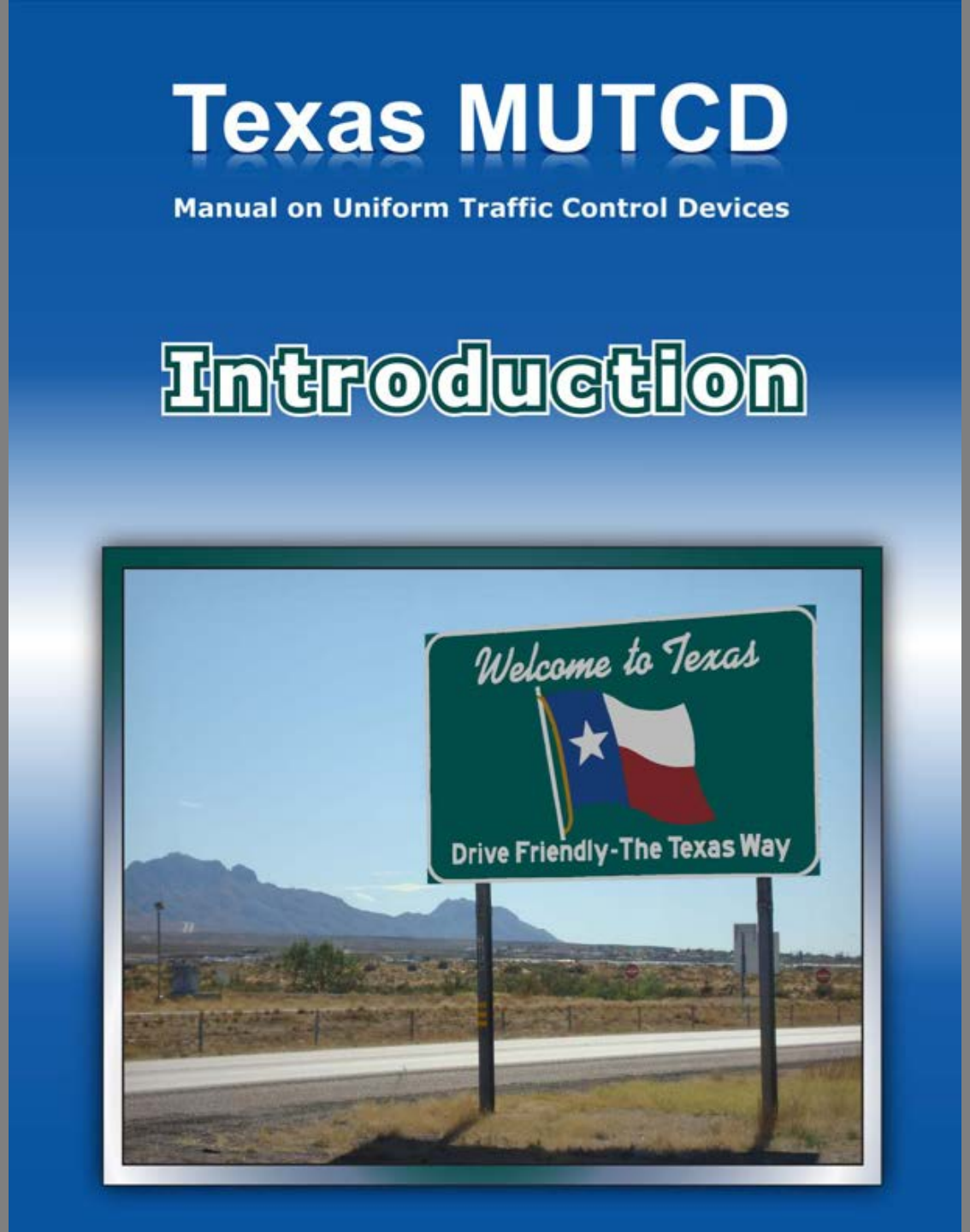
INTRODUCTION



TMUTCD Terminology

- Standard: required, mandatory or specifically prohibited; bold print; verb = SHALL
- Guidance: recommended but not mandatory; deviations allowed if engineering judgment or study permits; verb = SHOULD
- Option: permissive condition; carries no requirement or recommendation; verb = MAY
- Support: informational statements; Shall, Should and May are NOT USED

TMUTCD Differences

Material in the TMUTCD that is unique to Texas is identified with Arial font

This material is unique to the TMUTCD – it is listed in Arial font

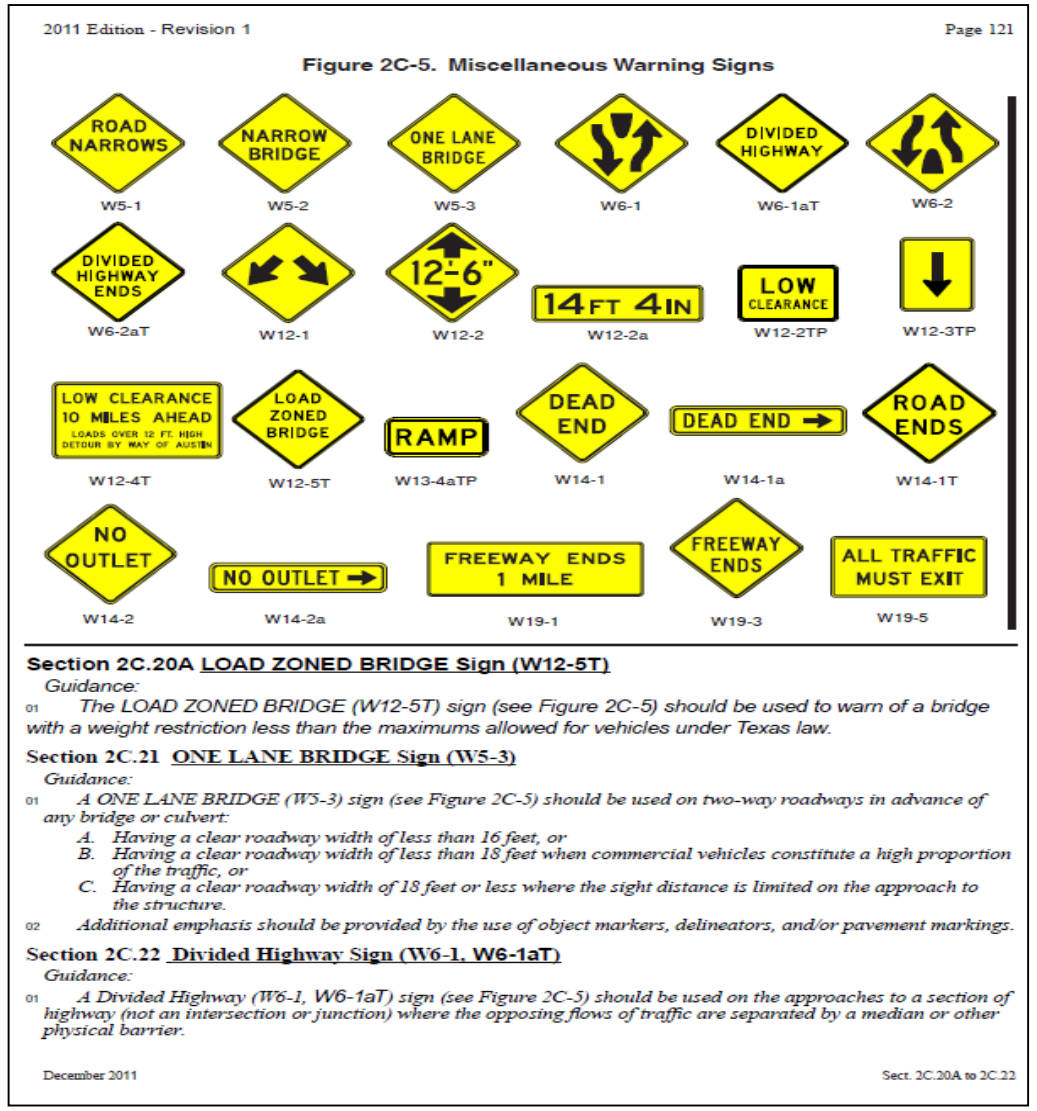


Figure 2C-5. Miscellaneous Warning Signs

Section 2C.20A LOAD ZONED BRIDGE Sign (W12-5T)

Guidance:

01 *The LOAD ZONED BRIDGE (W12-5T) sign (see Figure 2C-5) should be used to warn of a bridge with a weight restriction less than the maximums allowed for vehicles under Texas law.*

Section 2C.21 ONE LANE BRIDGE Sign (W5-3)

Guidance:

01 *A ONE LANE BRIDGE (W5-3) sign (see Figure 2C-5) should be used on two-way roadways in advance of any bridge or culvert:*

- *A. Having a clear roadway width of less than 16 feet, or*
- *B. Having a clear roadway width of less than 18 feet when commercial vehicles constitute a high proportion of the traffic, or*
- *C. Having a clear roadway width of 18 feet or less where the sight distance is limited on the approach to the structure.*

02 *Additional emphasis should be provided by the use of object markers, delineators, and/or pavement markings.*

Section 2C.22 Divided Highway Sign (W6-1, W6-1aT)

Guidance:

01 *A Divided Highway (W6-1, W6-1aT) sign (see Figure 2C-5) should be used on the approaches to a section of highway (not an intersection or junction) where the opposing flows of traffic are separated by a median or other physical barrier.*

TMUTCD Police

What are the consequences for non-compliance?

There are no TxDOT or FHWA sign police inspecting your work

From a risk management perspective, it is important to follow TMUTCD standards to minimize exposure to tort claims

About 30% of DOT law suits involve traffic signing

Traffic Control Device

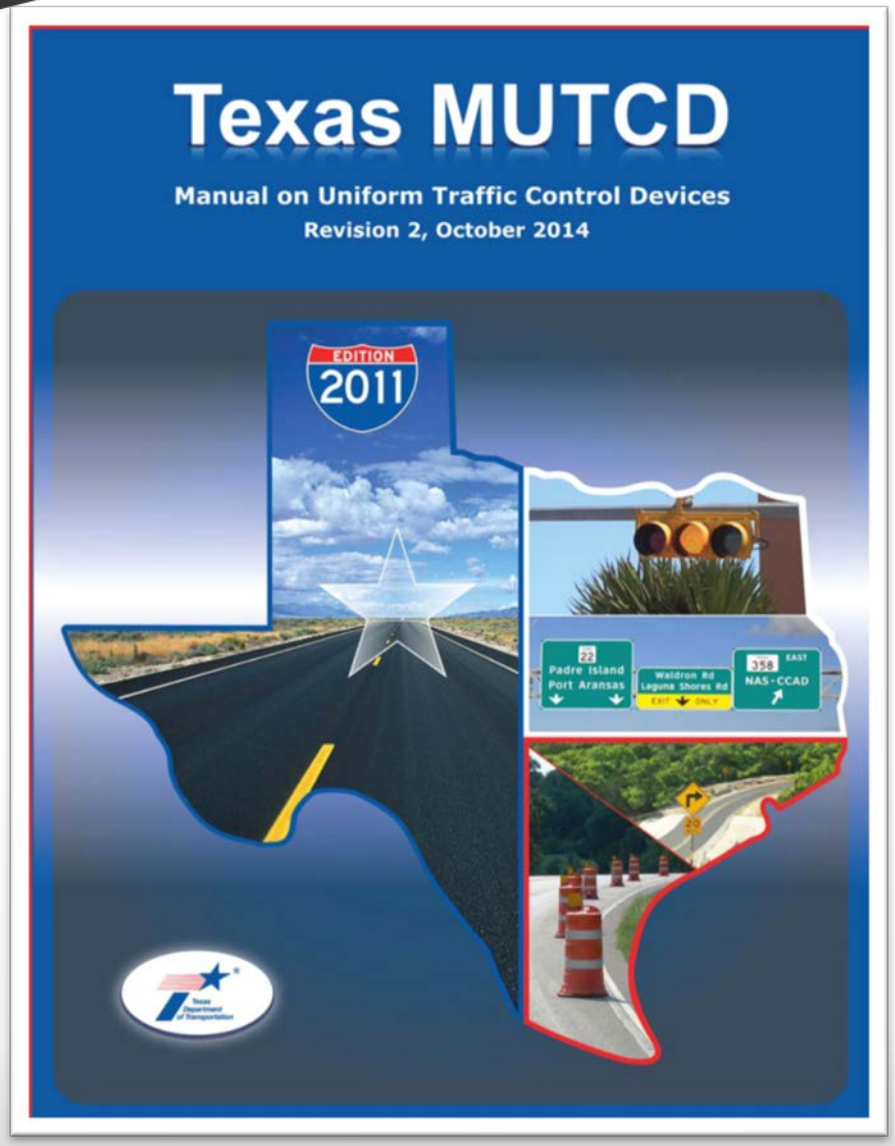
Standard:

Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, bikeway, or private road open to public travel (see definition in Section 1A.13) by authority of a public agency or official having jurisdiction, or, in the case of a private road, by authority of the private owner or private official having jurisdiction.

Traffic Control Device

Standard:

- The Texas Manual on Uniform Traffic Control Devices (TMUTCD) is incorporated by reference in the Texas Administrative Code, Title 43, Section 25.1 and shall be recognized as the Texas standard for all traffic control devices installed on any street, highway, bikeway, or private road open to public travel (see definition in Section 1A.13) in accordance with 23 U.S.C. 109(d) and 402(a).
- The policies and procedures of the Texas Department of Transportation and the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices shall be as described in 23 CFR 655, Subpart F.



Traffic Control Device

Standard:

- In accordance with 23 CFR 655.603(a), for the purposes of applicability of the TMUTCD:
- Toll roads under the jurisdiction of public agencies or authorities or public-private partnerships shall be considered to be public highways;
- Private roads open to public travel shall be as defined in Section 1A.13; and parking areas, including the driving aisles within those parking areas, that are either publicly or privately owned shall not be considered to be “open to public travel” for purposes of TMUTCD applicability.

Traffic Control Device

Standard:

- After the effective date of a new edition of the TMUTCD or a revision thereto new or reconstructed devices installed shall be in compliance with the new edition or revision.

Traffic Control Device

Standard:

- Unless a particular device is no longer serviceable, non-compliant devices on existing highways and bikeways shall be brought into compliance with the current edition of the TMUTCD as part of the systematic upgrading of substandard traffic control devices (and installation of new required traffic control devices) required pursuant to the Highway Safety Program, 23 U.S.C. §402(a).
- The FHWA has the authority to establish other target compliance dates for implementation of particular changes to the MUTCD [23 CFR 655.603(d)(1)]. The TMUTCD will adhere to these dates and these target compliance dates are shown in Table I-1.

Traffic Control Device

Standard:

- Except as provided in the following paragraph, when a non-compliant traffic control device is being replaced or refurbished because it is damaged, missing, or no longer serviceable for any reason, it shall be replaced with a compliant device.

Purpose of Traffic Control Devices

Standard:

- The purpose of traffic control devices, as well as the principles for their use, is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets, highways, bikeways, and private roads open to public travel throughout Texas and the Nation.
- Traffic control devices notify road users of regulations and provide warning and guidance needed for the uniform and efficient operation of all elements of the traffic stream in a manner intended to minimize the occurrences of crashes.

Design of Traffic Control Devices

Guidance*:*

- Devices should be designed so that features such as size, shape, color, composition, lighting or retro-reflection, and contrast are combined to draw attention to the devices; that size, shape, color, and simplicity of message combine to produce a clear meaning; that legibility and size combine with placement to permit adequate time for response; and that uniformity, size, legibility, and reasonableness of the message combine to command respect.

TMUTCD COLOR ASSIGNMENTS (PAGE 10)

BLACK
regulation

WHITE
regulation

RED
stop or prohibited

YELLOW
warning

FLUORESCENT PINK
incident management

FLOURESCENT YELLOW-GREEN
pedestrian warning, bicycle warning, playground warning, school bus and school warning

GREEN
indicated movements permitted, direction guidance

ORANGE
temporary traffic control

PURPLE
Lanes restricted to use by vehicles with registered ETC accounts

BROWN
recreational and cultural interest area guidance

BLUE
road user services guidance, tourist information, evacuation route

Placement of Traffic Control Devices

Guidance:

- Placement of a traffic control device should be within the road user's view so that adequate visibility is provided.
- To aid in conveying the proper meaning, the traffic control device should be appropriately positioned with respect to the location, object, or situation to which it applies.
- The location and legibility of the traffic control device should be such that a road user has adequate time to make the proper response in both day and night conditions.

Maintenance of Traffic Control Devices

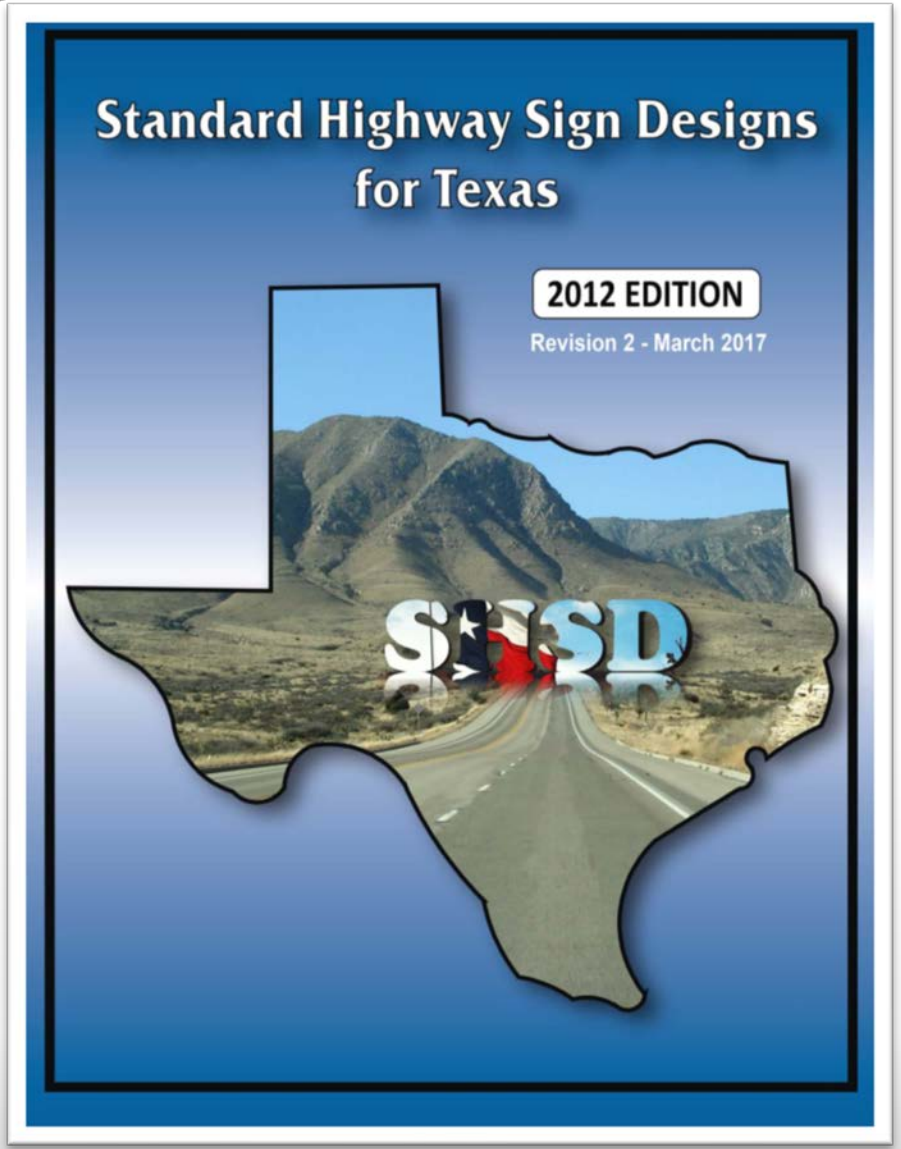
- Clean, legible, properly mounted devices in good working condition command the respect of road users.

Authority for Placement of Traffic Control Devices

- Traffic control devices, advertisements, announcements, and other signs or messages within the highway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction, or, in the case of private roads open to public travel, by the private owner or private official having jurisdiction, for the purpose of regulating, warning, or guiding traffic.
- All regulatory traffic control devices shall be supported by laws, ordinances, or regulations.

Relation to Other Publications

- To the extent that they are incorporated by specific reference, the latest editions of the following publications, or those editions specifically noted, shall be a part of this Manual “Standard Highway Sign Designs for Texas” book (TxDOT); and “Color Specifications for Retroreflective Sign and Pavement Marking Materials” (appendix to subpart F of Part 655 of Title 23 of the Code of Federal Regulations).



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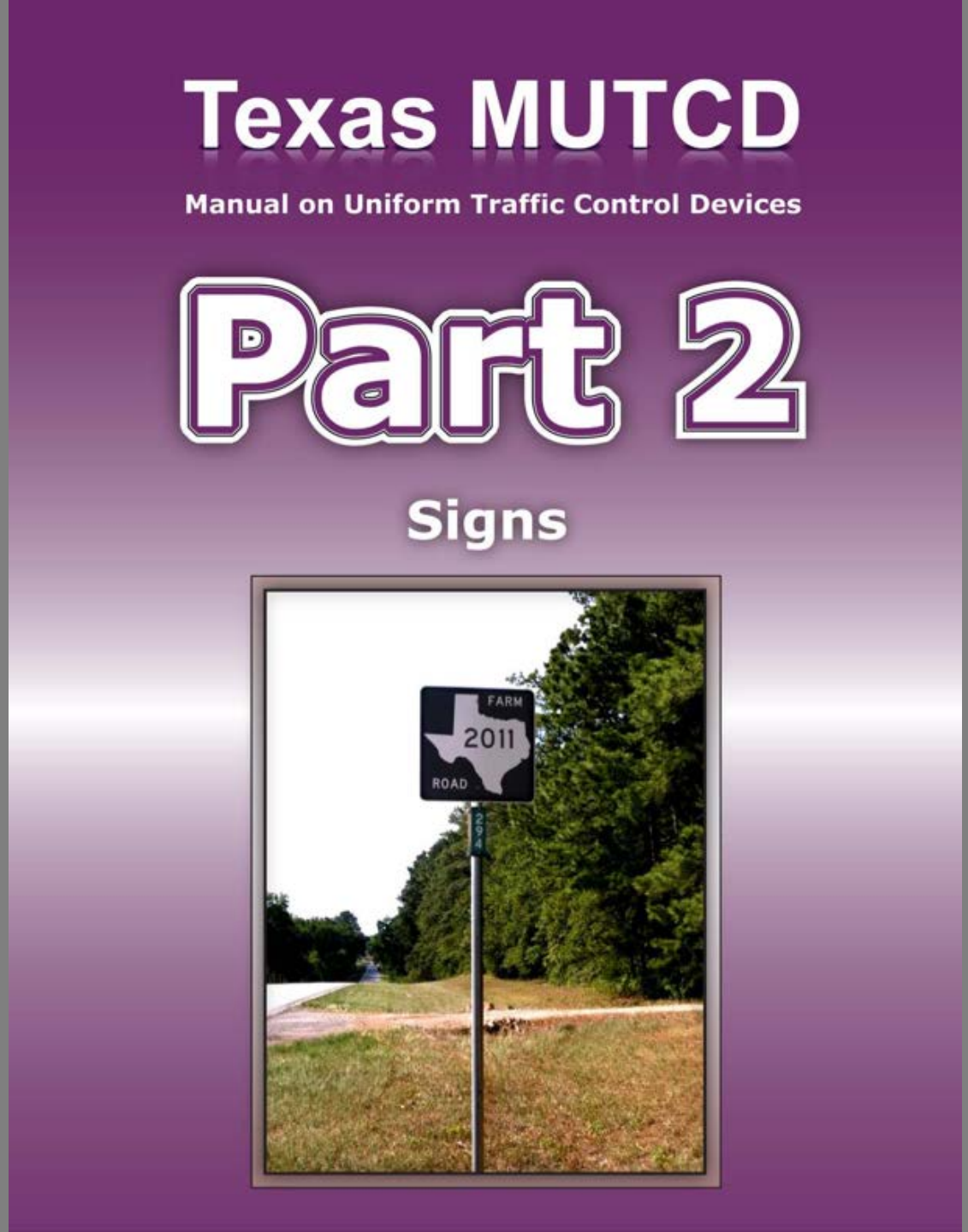
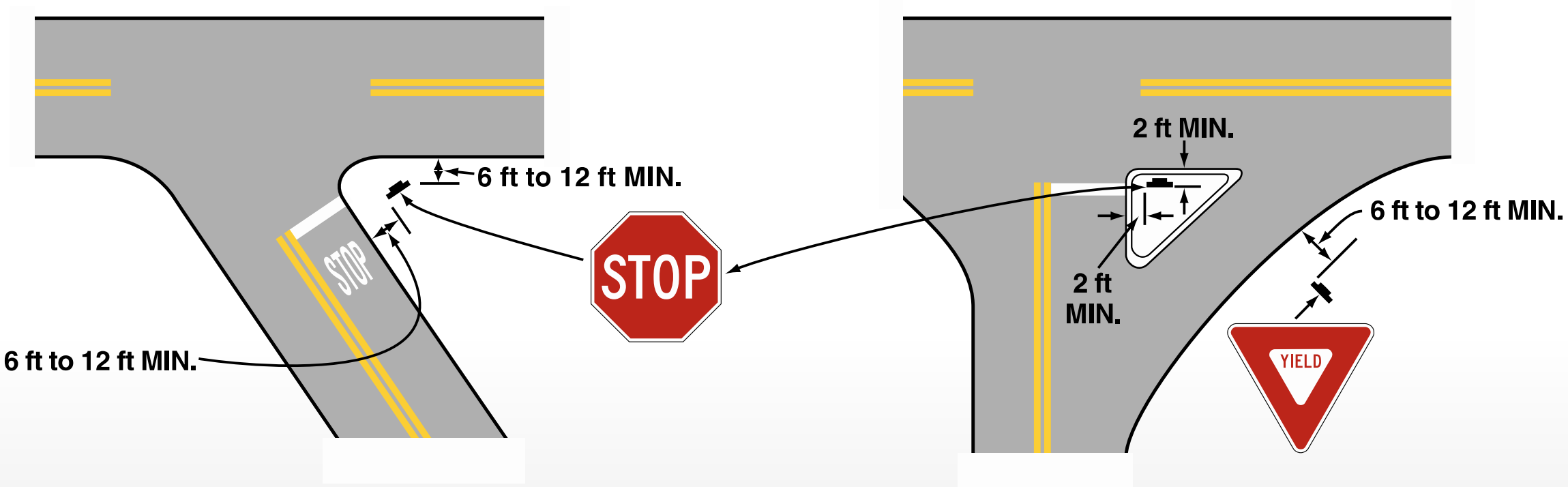
INTERSECTION SIGNS



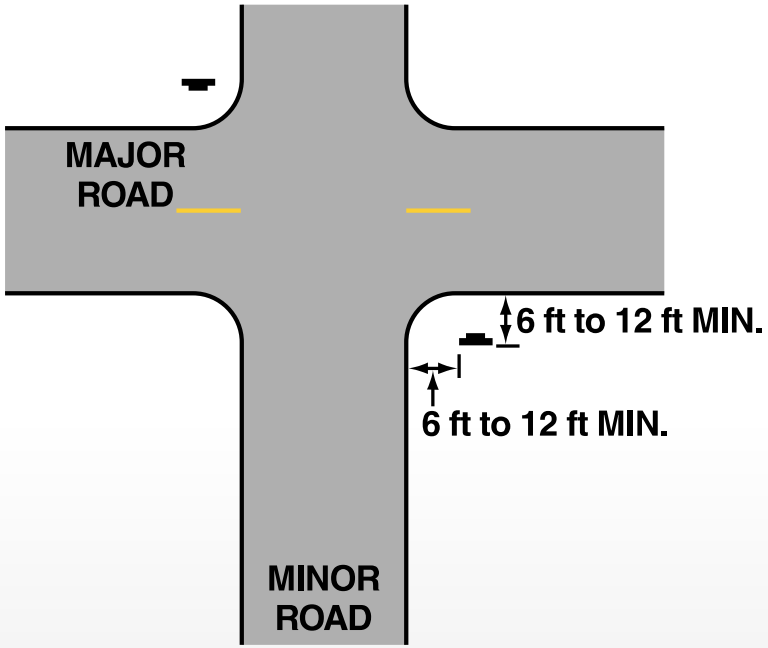
Typical Intersection Sign Locations



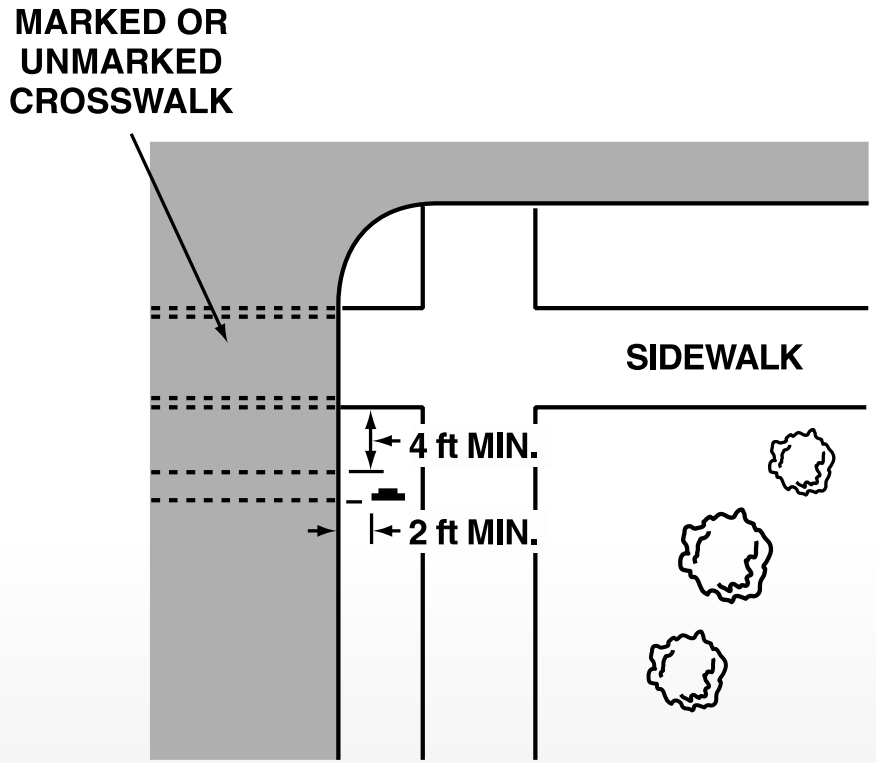
A - ACUTE ANGLE INTERSECTION

B - CHANNELIZED INTERSECTION

Typical Intersection Sign Locations

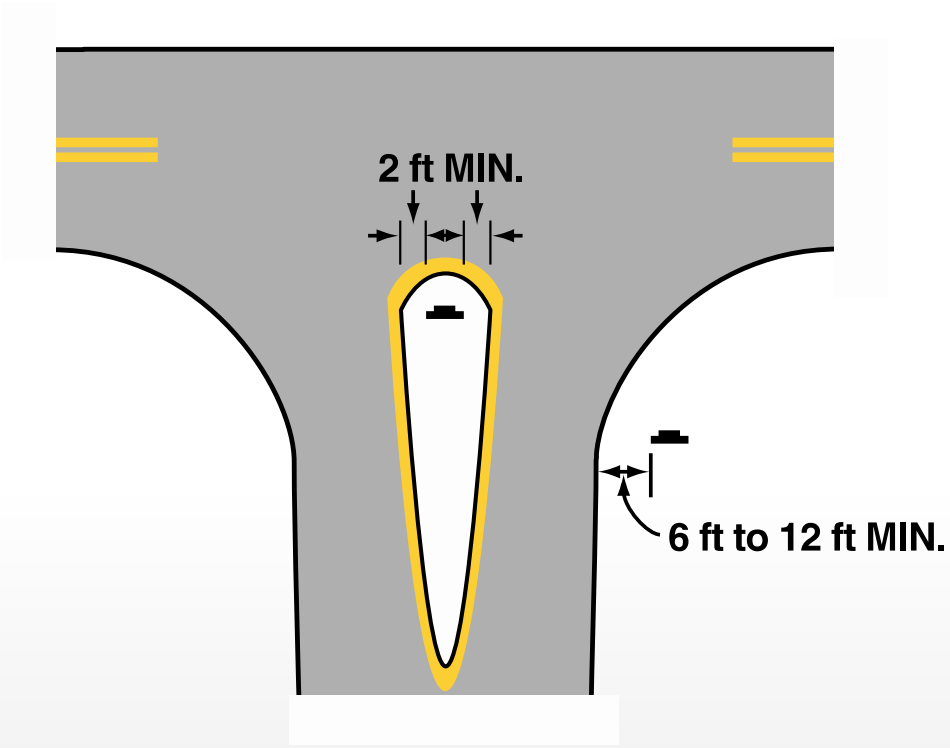


C - MINOR CROSSROAD

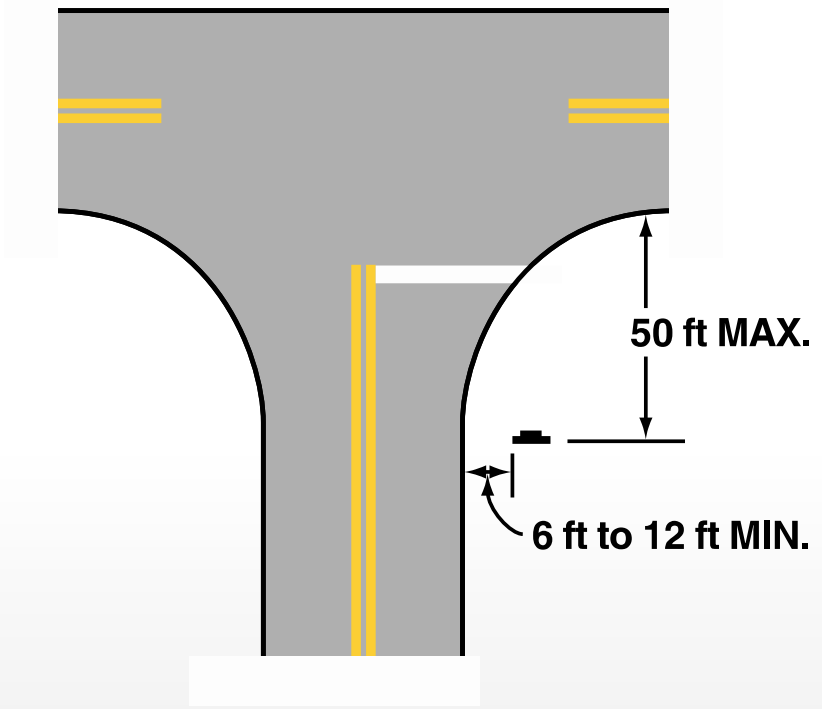


D - URBAN INTERSECTION

Typical Intersection Sign Locations



E - DIVISIONAL ISLAND



F - WIDE THROAT INTERSECTION

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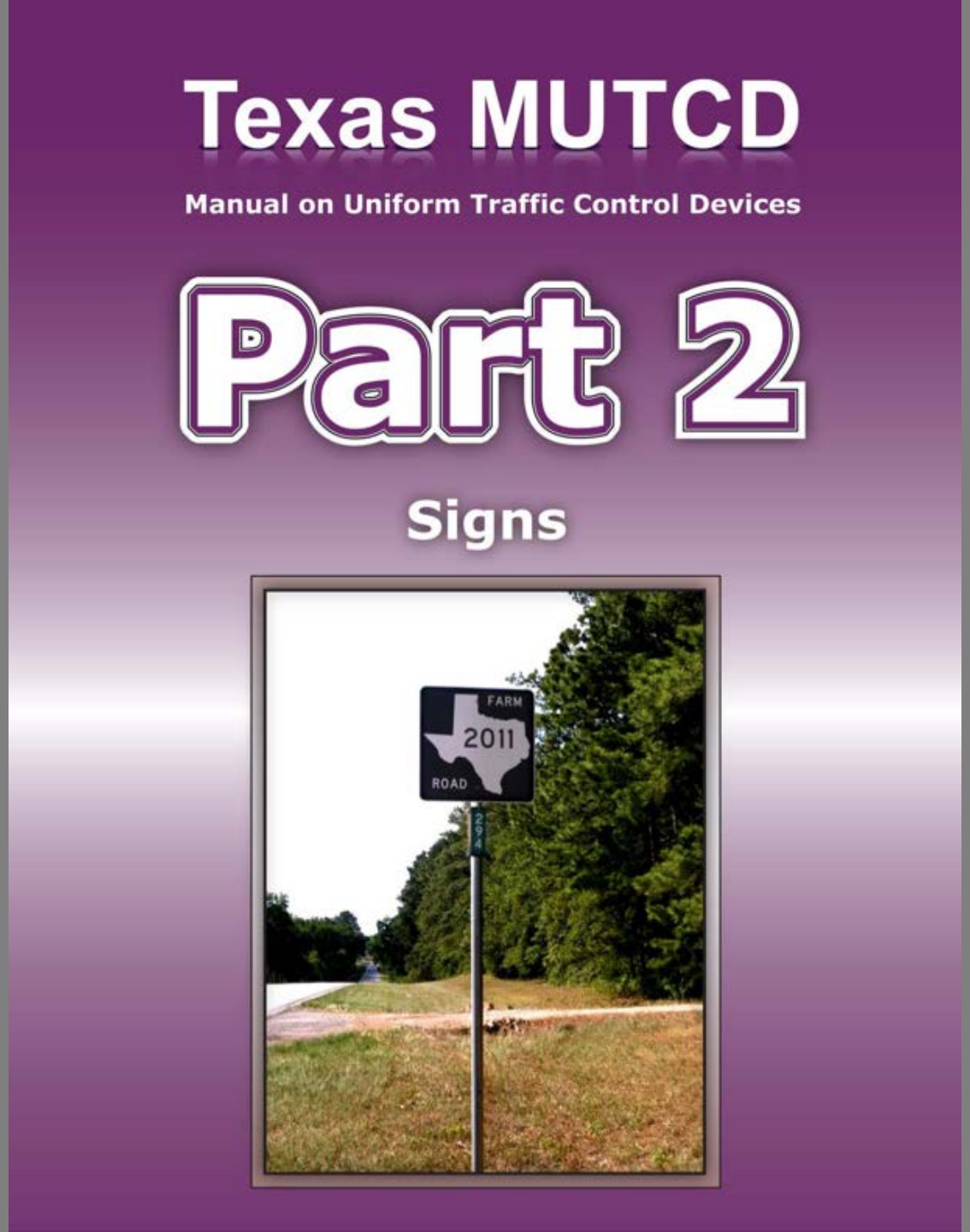
RETROREFLECTIVITY



Maintaining Minimum Retroreflectivity

- Public agencies or officials having jurisdiction shall use an assessment or management method that is designed to maintain sign retroreflectivity at or above the minimum levels in Table 2A-3.

Table 2A-3. Minimum Maintained Retroreflectivity Levels[1]

Sign Color	Sheeting Type (ASTM D4956-04)				Additional Criteria
	Beaded Sheeting			Prismatic Sheeting	
	I	II	III	III, IV, VI, VII, VIII, IX, X	
White on Green	W*; G ≥ 7	W*; G ≥ 15	W*; G ≥ 25	W ≥ 250; G ≥ 25	Overhead
	W*; G ≥ 7	W ≥ 120; G ≥ 15			Post-mounted
Black on Yellow or Black on Orange	Y*; O*	Y ≥ 50; O ≥ 50			[2]
	Y*; O*	Y ≥ 75; O ≥ 75			[3]
White on Red	W ≥ 35; R ≥ 7				[4]
Black on White	W ≥ 50				–

[1] The minimum maintained retroreflectivity levels shown in this table are in units of cd/lx/m² measured at an observation angle of 0.2° and an entrance angle of -4.0°.
[2] For text and fine symbol signs measuring at least 48 inches and for all sizes of bold symbol signs
[3] For text and fine symbol signs measuring less than 48 inches
[4] Minimum sign contrast ratio ≥ 3:1 (white retroreflectivity ÷ red retroreflectivity)
* This sheeting type shall not be used for this color for this application.

Bold Symbol Signs

- W1-1,2 – Turn and Curve
- W1-3,4 – Reverse Turn and Curve
- W1-5 – Winding Road
- W1-6,7 – Large Arrow
- W1-8 – Chevron
- W1-10 – Intersection in Curve
- W1-11 – Hairpin Curve
- W1-15 – 270 Degree Loop
- W2-1 – Cross Road
- W2-2,3 – Side Road
- W2-4,5 – T and Y Intersection
- W2-6 – Circular Intersection
- W2-7,8 – Double Side Roads
- W3-1 – Stop Ahead
- W3-2 – Yield Ahead
- W3-3 – Signal Ahead
- W4-1 – Merge
- W4-2 – Lane Ends
- W4-3 – Added Lane
- W4-5 – Entering Roadway Merge
- W4-6 – Entering Roadway Added Lane
- W6-1,2 – Divided Highway Begins and Ends
- W6-3 – Two-Way Traffic
- W10-1,2,3,4,11,12 – Grade Crossing Advance Warning
- W11-2 – Pedestrian Crossing
- W11-3,4,16-22 – Large Animals
- W11-5 – Farm Equipment
- W11-6 – Snowmobile Crossing
- W11-7 – Equestrian Crossing
- W11-8 – Fire Station
- W11-10 – Truck Crossing
- W12-1 – Double Arrow
- W16-5P,6P,7P – Pointing Arrow Plaques
- CW20-7 – Flagger
- CW21-1a – Worker

Fine Symbol Signs (symbol signs not listed as bold symbol signs)

Special Cases

- W3-1 – Stop Ahead: Red retroreflectivity ≥ 7
- W3-2 – Yield Ahead: Red retroreflectivity ≥ 7; White retroreflectivity ≥ 35
- W3-3 – Signal Ahead: Red retroreflectivity ≥ 7; Green retroreflectivity ≥ 7
- W3-5 – Speed Reduction: White retroreflectivity ≥ 50
- For non-diamond shaped signs, such as W14-3 (No Passing Zone), W4-4P (Cross Traffic Does Not Stop), or W13-1P,2,3,6,7 (Speed Advisory Plaques), use the largest sign dimension to determine the proper minimum retroreflectivity level.

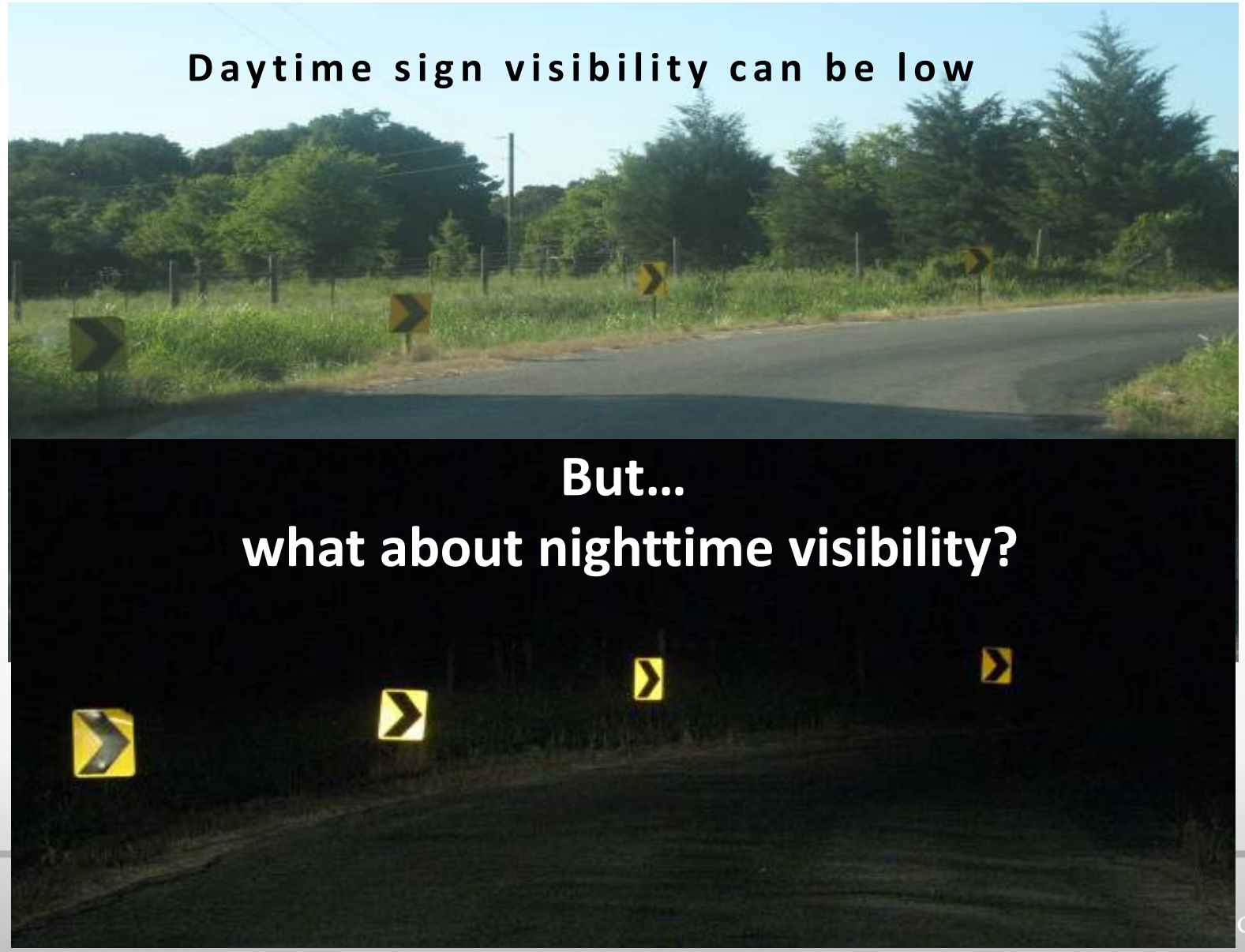
Maintaining Minimum Retroreflectivity

- Except for those signs specifically identified in Paragraph , one or more of the following assessment or management methods should be used to maintain sign retroreflectivity:
- Visual nighttime Inspection The retroreflectivity of an existing sign is assessed by a trained sign inspector conducting a visual inspection from a moving vehicle during nighttime conditions. Signs that are visually identified by the inspector to have retroreflectivity below the minimum levels should be replaced.
- Measured Sign Retroreflectivity: Sign retroreflectivity is measured using a retroreflectometer. Signs with retroreflectivity below the minimum levels should be replaced.

Maintaining Minimum Retroreflectivity

- Expected Sign Life: When signs are installed, the installation date is labeled or recorded so that the age of a sign is known. The age of the sign is compared to the expected sign life. The expected sign life is based on the experience of sign retroreflectivity degradation in a geographic area compared to the minimum levels. Signs older than the expected life should be replaced.
- Blanket Replacement: All signs in an area/corridor, or of a given type, should be replaced at specified intervals. This eliminates the need to assess retroreflectivity or track the life of individual signs. The replacement interval is based on the expected sign life, compared to the minimum levels, for the shortest-life material used on the affected signs.

Importance of Retroreflective Signs


Daytime sign visibility can be low
But…
what about nighttime visibility?

Pass or Fail ?

Common Visual Inspection Features

- Aim inspection vehicle headlamps (take to certified auto mechanic)
- Two-person crew works best
- Having an inventory is preferred
- Use low-beam headlamps
- Have evaluation form and criteria
  - Example: good or bad (replace)
- Conduct evaluations at roadway speed

Some Additional Sign Items

What to look for in signs?

- Sign materials
- Sheeting types
- Sign Posts

VANDALIZED SIGNS

- Over-painted or stickered
- Missing signs
- Gunshot/Bullet holes
- Mr. Clean Eraser Pad to clean paint gun marks on signs

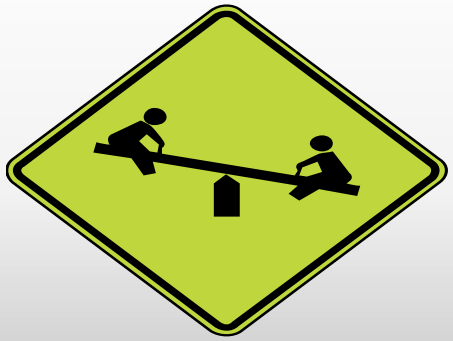
LOSS OF RETROREFLECTIVITY

- Exposure to sunlight
- Natural color fading, discoloration
- Replace immediately

FLUORESCENT YELLOW-GREEN COLOR

Required for school and school bus signs

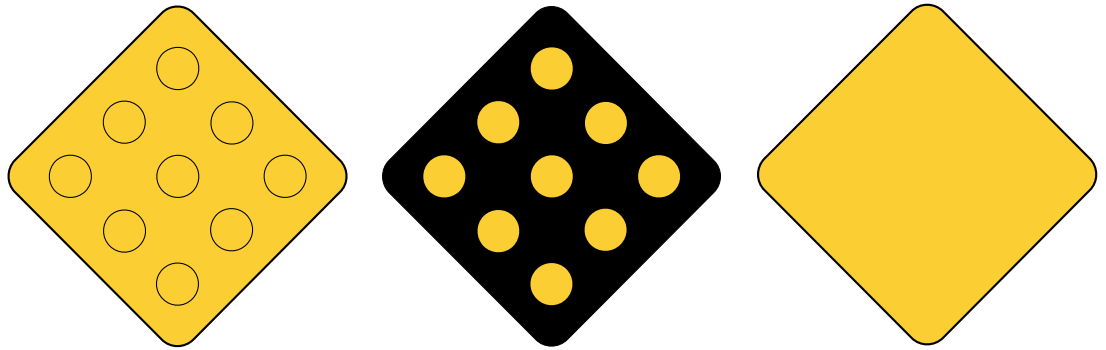
Optional for pedestrian, bike, and playground signs



Object Markers for Obstructions

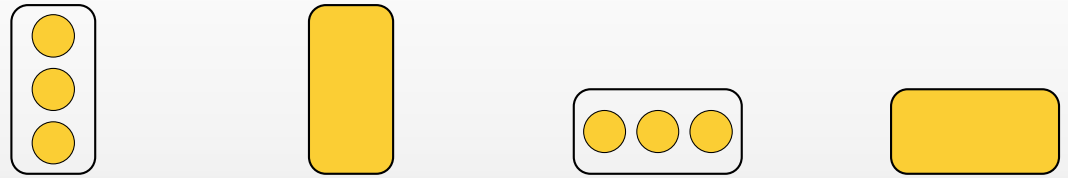
Figure 2C-13. Object Markers

Type 1 Object Markers
(obstructions within the roadway)



OM1-1 OM1-2 OM1-3

Type 2 Object Markers
(obstructions adjacent to the roadway)



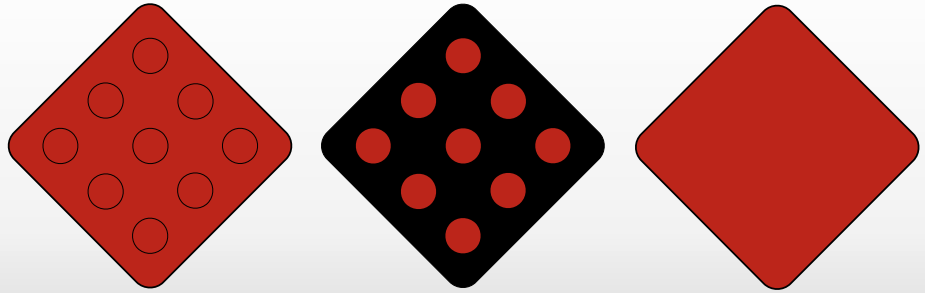
OM2-1V OM2-2V OM2-1H OM2-2H

Object Markers for Obstructions

Type 3 Object Markers
(obstructions adjacent to or within the roadway)

OM3-L OM3-C OM3-R

Type 4 Object Markers
(end of roadway)



OM4-1 OM4-2 OM4-3

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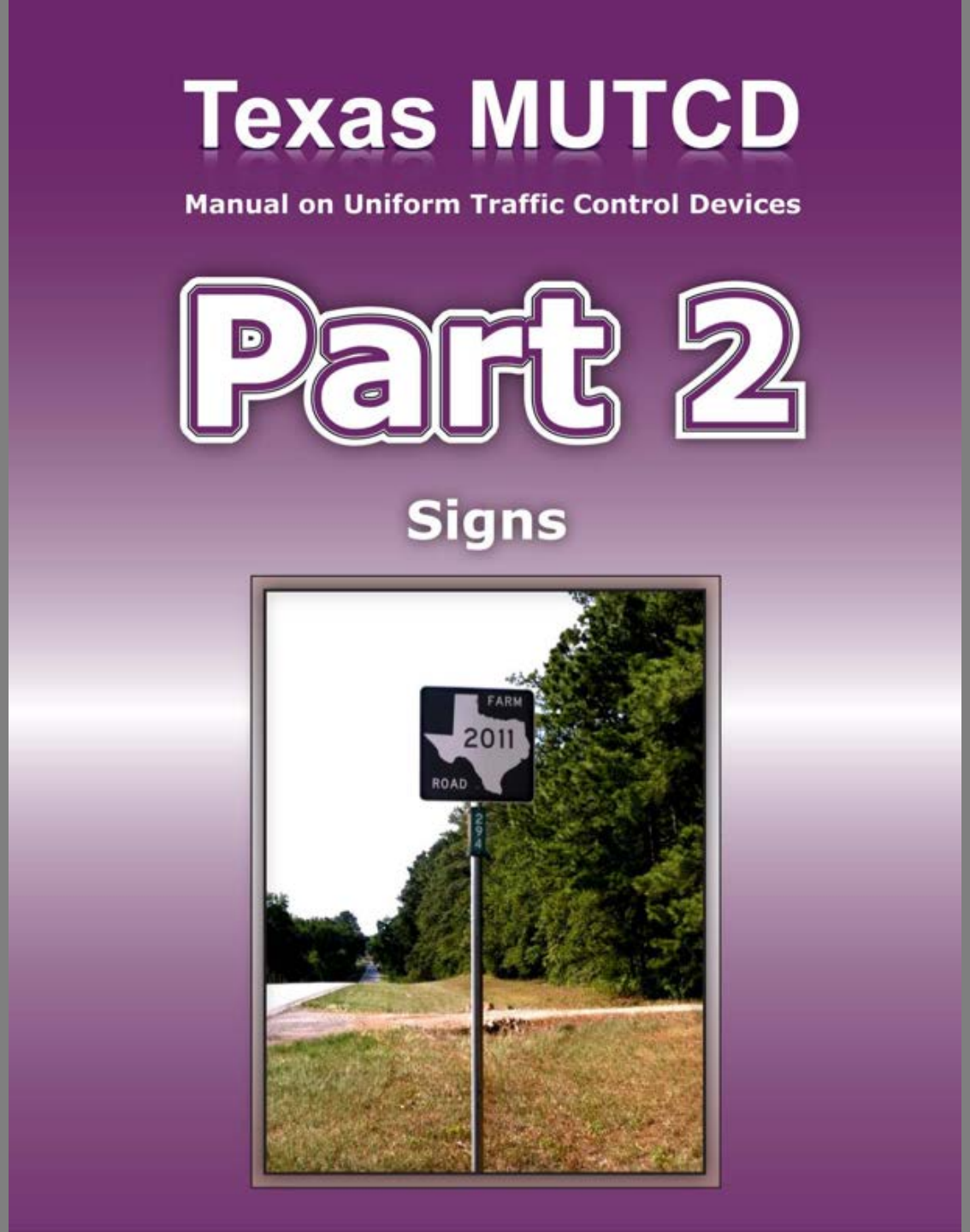
POSTS AND MOUNTINGS



Posts and Mountings

- Sign posts, foundations, and mountings shall be so constructed as to hold signs in a proper and permanent position, and to resist swaying in the wind or displacement by vandalism.
- Post-mounted sign supports shall be crashworthy (breakaway, yielding, or shielded with a longitudinal barrier or crash cushion) if within the clear zone.

Posts and Mountings

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- Post-mounted sign supports shall be crashworthy (breakaway, yielding, or shielded with a longitudinal barrier or crash cushion) if within the clear zone.

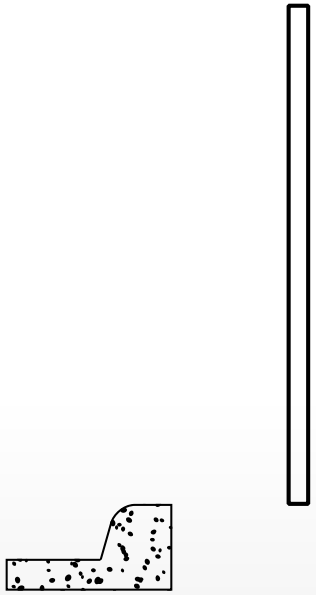
Size of Regulatory Signs

- Except as provided in Section 2A.11, the sizes for regulatory signs shall be as shown in Table 2B-1.
- A minimum size of 36 x 36 inches shall be used for STOP signs that face multi-lane approaches.
- 5 pages

Table 2B-1. Regulatory Sign and Plaque Sizes (Sheet 1 of 5)

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	** Multi-Lane				
Stop	R1-1	2B.05	30 x 30	36 x 36	36 x 36	—	30 x 30*	48 x 48
Yield	R1-2	2B.08	36x36x36	48x48x48	48x48x48	60x60x60	30x30x30*	—
To Oncoming Traffic (plaque)	R1-2aP	2B.10	24 x 18	24 x 18	36 x 30	48 x 36	24 x 18	—
To Ramp (plaque)	R1-2bTP	2B.10	21 x 15	21 x 15	—	—	—	30 x 24
To Train	R1-2cTP	2B.10	21 x 15	21 x 15	—	—	—	30 x 24
All Way (plaque)	R1-3P	2B.05	18 x 6	18 x 6	—	—	—	30 x 12
Yield Here to Peds	R1-5	2B.11	—	36 x 36	—	—	—	36 x 36
Yield Here to Pedestrians	R1-5a	2B.11	—	36 x 48	—	—	—	36 x 48
In-Street Ped Crossing	R1-6	2B.12	12 x 36	12 x 36	—	—	—	—
Overhead Ped Crossing	R1-9	2B.12	90 x 24	90 x 24	—	—	—	—
Except Right Turn (plaque)	R1-10P	2B.05	24 x 18	24 x 18	—	—	—	—
Speed Limit	R2-1	2B.13	24 x 30	30 x 36	36 x 48	48 x 60	18 x 24	30 x 36
Minimum Speed Limit (plaque)	R2-4P	2B.16	24 x 30	24 x 30	36 x 48	48 x 60	—	36 x 48
Combined Speed Limit	R2-4a	2B.16	24 x 48	24 x 48	36 x 72	48 x 96	—	36 x 72
Maximum Legal Speeds	R2-4cT	2B.13	—	180 x 84	—	180 x 84	—	—
Unless Otherwise Posted (plaque)	R2-5P	2B.13	24 x 18	24 x 18	—	—	—	—
Citywide (plaque)	R2-5aP	2B.13	24 x 6	24 x 6	—	—	—	—
Neighborhood (plaque)	R2-5bP	2B.13	24 x 6	24 x 6	—	—	—	—
Residential (plaque)	R2-5cP	2B.13	24 x 6	24 x 6	—	—	—	—
Movement Prohibition	R3-1,2,3,4,18,27	2B.18	24 x 24	36 x 36	36 x 36	—	—	48 x 48
Mandatory Movement Lane Control	R3-5,5a	2B.20	30 x 36	30 x 36	—	—	—	—
Left Lane (plaque)	R3-5bP	2B.20	30 x 12	30 x 12	—	—	—	—
HOV 2+ (plaque)	R3-5cP	2B.20	24 x 12	24 x 12	—	—	—	—

Proper Sign Placement



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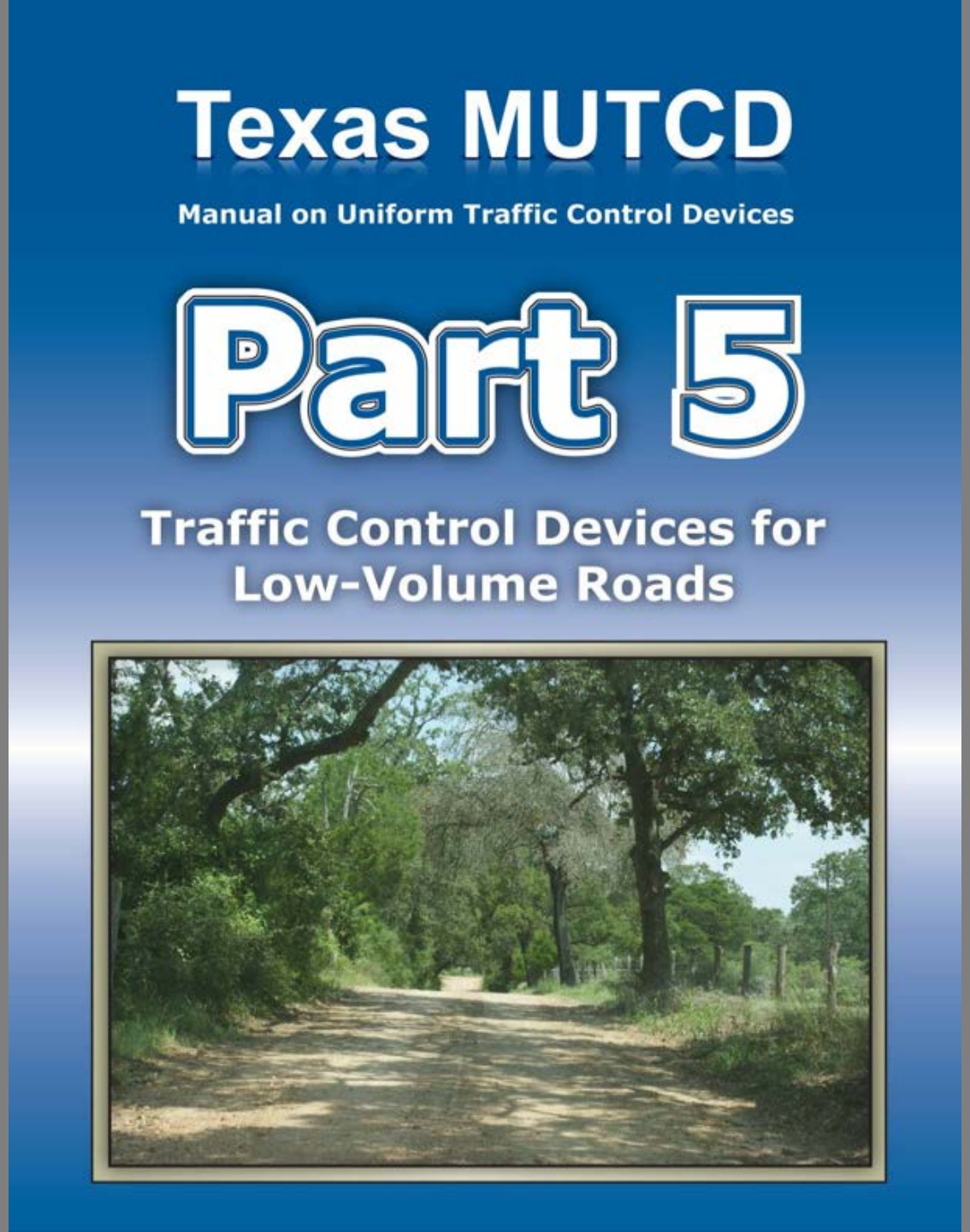
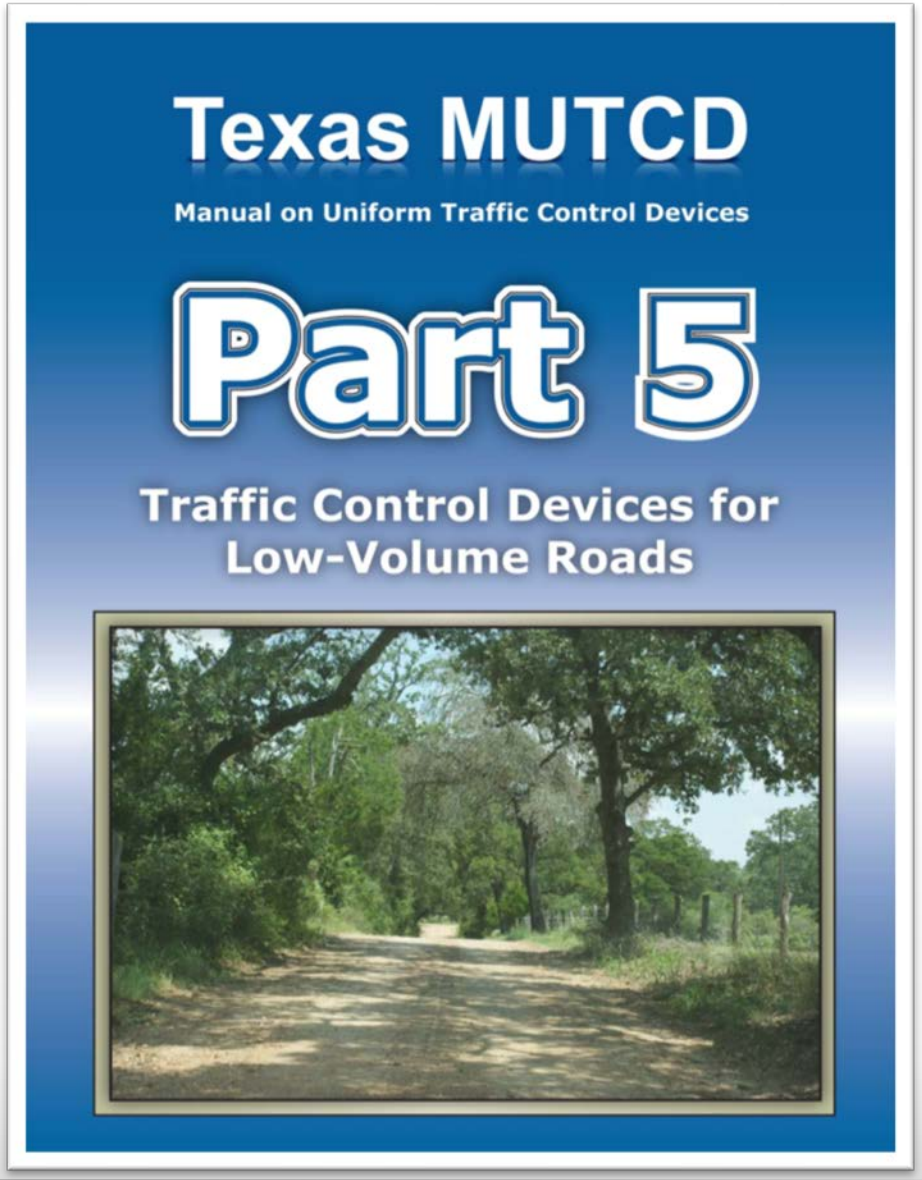
LOW VOLUME ROADS



Traffic Control for Low Volume Roads

A low-volume road shall be defined for this Part of the Manual as follows

- A low-volume road shall be a facility lying outside of built-up areas of cities, towns, and communities, and it shall have a traffic volume of less than 400 AADT.
- A low-volume road shall not be a freeway, an expressway, an interchange ramp, a freeway service road, a road on a designated State highway system, or a residential street in a neighborhood. In terms of highway classification, it shall be a variation of a conventional road or a special purpose road as defined in Section 1A.13.
- A low-volume road shall be classified as either paved or unpaved.



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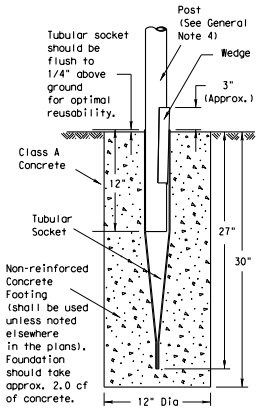
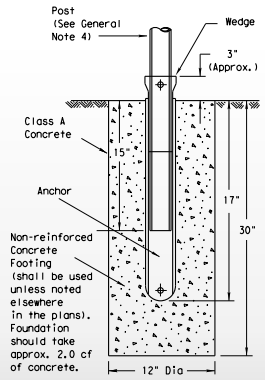
Wedge Anchor Steel System



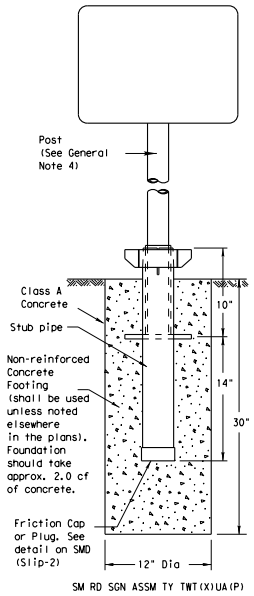
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

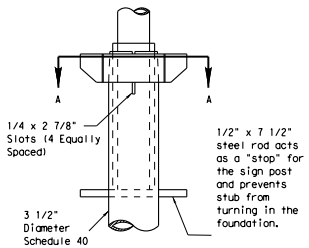


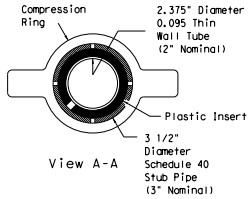
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post

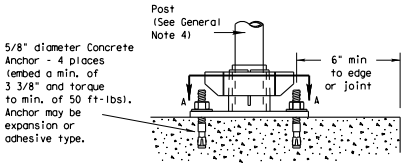


SM RD SGN ASSM TY TWT(X)UA(P)

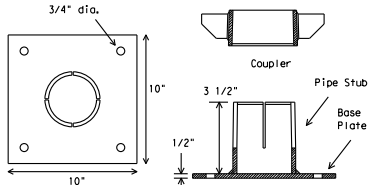




Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

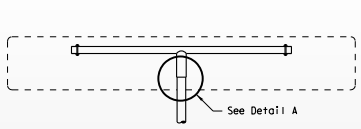


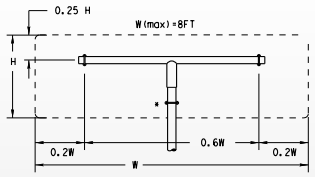
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



SM RD SGN ASSM TY TWT(X)UB(P)

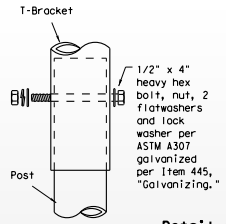
Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)

(* - See General Note 6)



9/16" hole may need to be drilled through post to accommodate bolt.

Detail A

NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: https://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximately 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

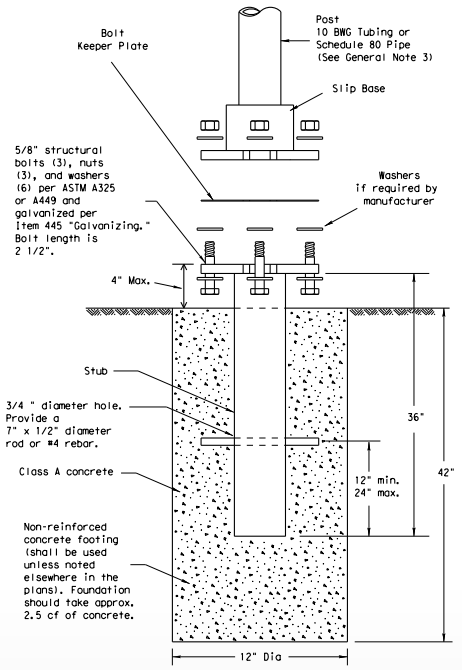
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.

26E

DATE:
FILE:

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved
for the Triangular Slipbase System.
Please reference the Material Producer
List for approved slip base systems.
http://www.txdot.gov/business/producer_list.htm
The devices shall be installed per
manufacturers' recommendations.
Installation procedures shall be
provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

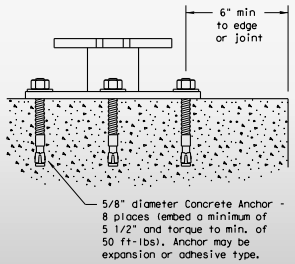
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is:
   http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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