Traffic Engineering 101 - The Basics

Understanding the basic principles and how these drive the decisions regarding traffic management in Louisiana
Traffic Engineering 101

• Purpose:
  – To provide an overview of engineering principles; guidelines & laws which govern traffic management in Louisiana
  – Discuss how DOTD’s decisions impact local communities
  – Facilitate feedback & questions from local agencies on state and local traffic engineering issues
Manual on Uniform Traffic Control Devices

• Federal policy
• All states must adopt
• Set minimums for traffic control devices such as
  – Signs
  – Pavement marking
  – And signals
Engineering Design Standard Manual

- DOTD policy
- Signed by Chief Engineer
- Provides additional requirements
Basic Principle of Traffic Engineering

“Everything is designed to meet Driver Expectancy”
Driver Expectancy
Driver Expectancy
TR Engineering 101

• Module:

1. Introduction & Overview (3/22/10)
2. Speed Management Overview (4/26/10)
3. School Zones (4/26/10)
4. Intersection Traffic Control (5/24/10)
5. Traffic Signal (5/24/10)
6. Roundabouts (5/24/10)
7. Sign Selection & Installation (6/28/10)
8. Work Zones (6/28/10)
9. Access Management (7/26/10)
10. Roundabouts (8/23/10)
Work Zone Signing and Devices

- MUTCD & DOTD Policy
- DOTD current details
Standard Signs, Special Signs and Installation

- MUTCD & DOTD Policy
- Installation of signs
More Suggestions?

- Other traffic issues or questions?
- Contact Jody Colvin at Jody.Colvin@la.gov
- or Marie B. Walsh at mbwalsh@ltrc.lsu.edu
Work Zones - Temporary Traffic Control

Traffic Engineering 101
Webinar
June 28, 2010
Work Zones - Temporary Traffic Control

WHY SHOULD WE BE CONCERNED?
Work Zones - Temporary Traffic Control

- Work zones account for 800 to 1000 fatalities per year on our roads.
- About 40,000 injuries occur in work zones every year, and most are occupants of vehicles.
- Work zones account for about 10 percent of delays due to traffic congestion nationwide, or 24 percent of non-recurring delays.
Work Zones - Temporary Traffic Control

Special concerns:

- Work zones present road users with changing and unexpected circumstances
- Work zones affect the public’s perception of government, in both good and bad ways
- As our road system ages, more and more projects must be done under active traffic conditions (80% and rising), meaning more exposure to workers and motorists
Work Zones - Temporary Traffic Control

• There are over 3000 active work zones at any time on our busiest highways

• Motorists can expect to encounter one work zone for every 100 miles traveled
Work Zones - Temporary Traffic Control

- The key to safe and efficient work zones, as in all traffic control, is good communication with the road user.

- Most communication with road users is done visually through signs, markings, and channelizing devices.
Work Zones - Temporary Traffic Control
Work Zones - Temporary Traffic Control

- Design and usage of Traffic Control Devices in Work Zones is governed by the Manual on Uniform Traffic Control Devices (MUTCD)

- Part 6 of the MUTCD addresses the special requirements for Temporary Traffic Control in Work Zones
The most common type of sign in work zones is the warning sign, but instead of being yellow, warning signs in work zones are orange.

Most other signs used in work zones keep the same colors as their counterparts outside of the work zone.
Work Zones - Temporary Traffic Control

- Channelizing devices
  - Drums
  - Cones
  - Delineators

- Always used in a series to provide guidance to road users
Work Zones - Temporary Traffic Control

On which side of this barricade should traffic pass?
Work Zones - Temporary Traffic Control

- Portable Changeable Message Signs (PCMS)
- Programmable Messages
- Can give updates on road, lane and ramp closures
Work Zones - Temporary Traffic Control

- PCMS Messages must relate to traffic conditions
- No advertising allowed
- Guidance and approved abbreviations in the MUTCD
Work Zones - Temporary Traffic Control

Temporary Traffic Control Plans must be prepared by qualified engineering personnel!
Work Zones - Temporary Traffic Control

- Site specific plans will still be needed in many cases
- TC Details developed by DOTD can help standardize Traffic Control in Work Zones
Work Zones - Temporary Traffic Control

Additional resources:

- ATSSA.org
- FHWA.dot.gov
- LTAP center
  - www.louisianaltap.org
- DOTD District Traffic Operations Engineers
Work Zones - Temporary Traffic Control

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Traffic Control Details

Joy Johnson
LA DOTD Section 77
Traffic Engineering Management
What are the LA DOTD Traffic Control Details?

- A resource for state and local agencies
- Also known as TC Details
- General and specific information
  - Design of temporary traffic control plans
  - Placement of traffic control devices
The LA DOTD TC Details also provide:

- Examples of typical traffic control layouts
- References to publications related to work zone safety:
  - NCHRP Reports
  - ATSSA Guidelines
  - LA DOTD QPL List
  - LA Standard Specifications for Roads and Bridges
  - FHWA Handbooks
  - AASHTO Roadside Design Guide
DOTD uses the Traffic Control Details for:

- Permits
- Road and bridge construction
- Roadside mowing and clearing
- Traffic signal maintenance
- Sign installation and replacement
- Roadway striping
Local Agencies can use the TC Details for:

- Implementing state standards into traffic control design
- Answering questions related to traffic control
- Maintaining uniformity in the use of traffic control devices
- Guidance for common traffic control situations
Who else uses the Traffic Control Details?

- Consultants
- Contractors
- Traffic Control Technicians and Supervisors
- Utility Workers
- Maintenance Personnel
2010 Traffic Control Details

- Revised March 2010
- Collaboration of the Louisiana Work Zone Task Force
- Required for Plan Delivery Dates of August 2010 or later
- 20 Sheets
GENERAL PROVISIONS

- Temporary traffic control (TTC) devices used shall be in accordance with the Louisiana Standard Specifications for Roads and Bridges, the MUTCD, and shall meet the NCHRP Report 390 requirements for Test Level 3 devices.

- Materials used for TTC shall be in accordance with the Louisiana Standard Specifications for Roads and Bridges, and, when applicable, the LA DOTD OPL.

- No TTC shall be placed without the approval of the Project Engineer until work is about to begin unless they are covered.

- No lane closures, lane shifts, diversions, or detours shall occur without the approval of the Project Engineer.

- Responsibility is hereby placed upon the contractor for the installation, maintenance, and operation of all TTC devices, including but not limited to those in this plan or required by the Project Engineer for the protection of the traveling public as well as all LA DOTD and construction personnel.

- The contractor shall be responsible for the maintenance of all permanent signs, pavement markings, and traffic signals left in place as associated to the same movement and guidance of traffic within the project limits.

- The DOTD shall serve as a technical advisor to Project Engineers for all traffic control matters.

- The Chief Construction Engineer or his appointed designee shall approve all signs and markings not described in this plan, based on the Project Engineer's and the DOTD's recommendations. All changes shall be noted in all project traffic control plans.

- Any additional signs shown on the MUTCD and required by the Project Engineer shall be installed under item 212-01-000010.

- No work activity area or storage of equipment, vehicles, or materials shall occur within the buffer zones.

- When a work zone has been established on one side of the roadway only, there shall be no conflicting operations or parking on the opposite shoulder within 500 feet of the work area.

- Caution signs shall be submitted to the Project Engineer 30 days prior to being used on the roadway. (See section 103.20 of the Louisiana Standard Specifications for Roads and Bridges.)

- Parking of vehicles or unattended equipment, or storage of materials within the work zone shall not be permitted unless protected by guardrail barriers. If the clear zone is not defined on the plan sheets, the project engineer shall verify.

- See typical sections.

- Upon removal of existing guard rail, the contractor shall install on NCHRP 390 approved crash attenuator or barrier to protect the surf and end of the bridge or column until new guard rail is installed. After removal of the existing guard rail, new guard rail shall be installed without delay.

- All costs associated with crash devices are to be included in item 713-01-000100.

PAVEMENT MARKINGS (see SPL)

- All pavement markings within the limits of the project that are in conflict with the project signing or the required traffic control measures shall be removed from the roadway by blend clearing or grinding. Existing striping shall not be painted over with black paint or covered with tape.

- If speed-related pavement markings are needed, they shall be reflectorized, removable, and accompanied by the proper storage.

- Temporary Pavement Markers may be added to supplement temporary striping in areas of transition, in divergents, and in other areas of need as shown in the plans or as directed by the Project Engineer.

- The DOTD shall install pavement markings in accordance with Section 715 of the Louisiana Standard Specifications for Roads and Bridges. All pavement markings shall be installed under item 713-01-000010.

- Temporary markings installed in the pavement markings shall be completed with DOTD standard plan PW-44-01. Not included in the permanent markings plan.

- Dynamic Message Signs (DMS)

- DMS shall be used on all Intersecting Highways and on all other roadways where volume is an AADT greater than 20,000. DMS will be placed per each under item 713-01-000010.

- When used in advance of a lane closure or a lane shift, the DMS should be placed on the right hand side of the road and should be programmed to indicate the proper lane to be used to travel to the proper exit points.

- For intersections and multi-lane highways, if vehicles are queuing beyond the 2 miles DMS, an additional DMS should be placed on the right hand side of the road approximately 5 miles in advance of the exit point, whichever is greater. DMS message shall be approved by the DOTD. Message shall be no more than 3 lines and 2 screens.

- DMS should be placed as far as the traveled lane as possible. They shall be shielded by guardrail or barriers. If this is not possible, they shall be placed against a curb or wall barrier.

- When the DMS is not displaying a work zone appropriate message pertaining to the ongoing construction project it shall be shielded by guardrail or barriers, or removed from the clear zone.

SPEED LIMITS

- The Project Engineer may approve a 10 mph drop in the speed limit for posted speeds of 45 mph or greater for any construction, maintenance, or utility operation that requires one or more of the following:

  (A) The condition of the traveled way is inadequate due to filled surfaces where lane width less than 12 inches.

  (B) Work is progress in the immediate vicinity of the traveled way requiring lane closures or lane width reductions less than 11 feet.

  (C) Workers present on the shoulder within 2 feet of the traveled way without barrier protection.

- The reduced speed zone will apply only to those portions of the project limits affected. The Project Engineer may also SPEED LIMIT WHEN FLASHING signals to supplement reduced speed zones.

- If the speed limit is reduced, speed limit signs shall be placed:

  (A) Beyond major intersection

  (B) At one mile intervals in rural areas

  (C) Half mile intervals in urban areas

- At the end of the reduced speed zone, a speed limit sign displaying the original speed limit prior to construction shall be installed.

- For all other speed limit reductions not listed above the Project Engineer and the DOTD shall recommend the speed reduction to the Chief Construction Engineer or his appointed designee.

- If the speed limit is reduced more than 10 mph, placement of the signs shall be re-evaluated according to the MUTCD.

FLASHING ARROW PANELS

- All flashing Arrow Panels shall be 4 feet by 8 feet and Type C.

- Flashing Arrow Panels shall be placed on the shoulder. When there is a shoulder or median area, the arrow panel shall be placed within the cleared lane where the channelizing device and be closest to the beginning of the lane as practical.

- Flashing arrow panels shall be connected with capacitance type traffic control devices.

- At no time shall the arrow panel encroach on the traveled way. When flashing Arrow Panels are not being used, they shall be shielded by guard rail or barriers, or removed.

- Arrow panels shall only be used for lane reduction and shall not be used for lane shifts.

ABBREVIATIONS

- LA DOTD Louisiana Department of Transportation and Development

- MUTCD Manual on Uniform Traffic Control Devices

- NCHRP National Cooperative Highway Research Program

- OPL Qualified Products List

- DOTD District Traffic Operations Engineer

- DMS Dynamic Message Sign

- AADT Average Daily Traffic

- TC Details Traffic Control Details

- TTC Temporary Traffic Control

- MTC Movable Traffic Control

- ANS American National Standards Institute

- AGC Associated General Contractors of America

- ATSS American Traffic Safety Services Association

D.O.P. Beginning of Project

E.O.P. End of Project

ALL TC DETAILS SHOW MINIMUM CONSTRUCTION SIGNING. ALL SITUATIONS MUST BE REVIEWED AND/OR DESIGNED BY THE ENGINEER CONTRACTORS ARE RESPONSIBLE FOR COMPLETING WITH ALL TC DETAILS.
SIGN
- Signs used for temporary traffic control shall follow the plans, the
  LADOTD: TC Details, and the MUTCD.
- Signs shown in the TC Illustrations are typical and may vary with each
  specific condition.
- When projects are appointed for less than one mile, they shall be signed
  as one project.
- The type of high-intensity signs shall be used to supplement the first sign
  (or part of sign) that gives warning about a lane closure during nighttime
  operations (see QPL).
- Rollup signs shall not be allowed on any project.
- Contractor shall use caution not to damage existing signs which remain
  in place. Any LADOTD signs damaged by work operations shall be
  replaced by the contractor under item 7130 DT-0000.
- Placement and Temporal shall be removed or completely covered with a strong,
  lightweight, opaque material when no longer applicable. (Surfacing is not
  an acceptable material to cover sign)
- No time shall be included with a particular operation be left in
  place once the operation has been completed or where the condition
  has been removed.
- Signs shall have a minimum of two bolts per sign.
- Warning signs used for temporary traffic control shall meet the
  following guidelines unless otherwise noted in the plans.
  (A) At least 18 inches by 18 inches.
  (B) See the Louisiana Standard Specifications for Roads and Bridges
  and the QPL for shoring information.
- Lateral distance of signs shall be a minimum of 6 feet from
  edge of shoulder or edge of pavement if no shoulder exists, and
  2 feet from the curb of curb in urban areas (see diagram).
- When portable sign frames are not used, they shall be removed from
  the pavement and shoulder area if they remain, shall be standing
  (do not lay the stand down), facing away from traffic, if the sign
  stand is used on a bridge it shall be attached to a bridge rail.
- Lifting a sign will not be required for roadways with a center
turn lane and divided roadways.

SIGN SUPPORT AND HEIGHT
- Signs over 10 square feet shall be mounted on one post and
  signs over 20 square feet shall be mounted on at least 3 posts.
  The following sign height and support shall be required:
  (A) A 2 pound U-Channel post shall be used and
  driven to a minimum depth of 1 foot, if seating is not
  required see Alleynel Log Posture for U-Channel Post.
  (B) For 4 transfers or less the sign height shall be a minimum of 5 feet.
  (C) For 2 transfers or less the sign height shall be a minimum of 7 feet
      above the roadway (see diagram).
- For warning signs used for lane closures and shoulder work, where the
  road will return to full use, within 12 hours, and the roadway
  has no more than 2 lanes in each direction then
- A weigh-in-motion sign shall be allowed provided that they meet all
  site color, retroreflective requirements, and NCHRP Report 350
- NCHRP Report 350 approved portable sign frames may be
  used, provided they are visible to the driver (can
  be attached to a pole or other traffic control
  device shall be black-the sign).

REFERENCE
- the contractor shall be responsible for understanding all rules
  and requirements in the current edition of the following documents:
  1. Louisiana Standard Specifications for Roads and
  2. Manual on Uniform Traffic Control Devices for Streets and
     Highways (MUTCD): http://dot.type.gov/mutcd
     http://www.dot.state.la.us/highways/construction/qpl/qpl-topcontents.shtml
  4. LADOTD Engineering Directives and Standard
     Manual (EDSM) V11.4 - Interstate Lane Closures
     http://www.dot.state.la.us/pymaps/edsm
  5. National Cooperative Highway Research Program (NCHRP)
     Report 350: "Guidelines for Work Zones
     and PlanningNighttime Highway Construction and
  7. NCHRP Report 478: "Guidelines for Design and
     Operation of Nighttime Traffic Control for Highway
  8. NCHRP Report 498: "Illumination Guidelines for
  9. American Association of State Highway and
     Transportation Officials (AASHTO) Roadside Design
     Guide
     (ATSSA) Quick Reference Guide for Work Zone Traffic
     Control Devices and Features
  11. U.S. Department of Transportation Federal Highway
     Administration Traffic Control Handbook for Mobile
     Operations at Night: http://www.dot.state.la.us/avt/1003.pdf
Third General Notes Sheet  
TC-00(C)

### CHANNELIZING DEVICES
- The following devices may be used as channelizing devices:
  - Variable Message Signs, Vertical Panels, Cones, Drums, and Super Cones.
  - 28 inch traffic cones are not allowed on
    - Interstates
    - Highways with speeds greater than 40 mph.
  - During night time operations, 28 inch and 36 inch cones are not allowed.
  - Reflective material pattern used on super cones shall match that used on drums.
- **Taper Zones**
  - A) **Standard Spacing**: See Standard Device Spacing and Buffer Space Table.
  - B) **Highway Operational Drums** are spaced at standard spacing.
  - C) **Nighttime Operational Drums** (not standard spacing and super cones at 1/2 standard spacing) are the only devices allowed.
- **Type C devices** are to be used on all channelizing devices in the taper as well as the first two devices in the tangent at night, here the QPLs.
- **Type C channelizing devices** are to be used on all channelizing devices in the taper as well as the first two devices in the tangent at night, here the QPLs.
- Devices may be adjusted to accommodate ongoing work in the immediate vicinity but must be returned to the closed lane after the work activity has ceased.
- A) **10 foot maximum travel lane** shall be maintained when practical.
- Channelizing devices on the lane line shall be of the same type.
- Channelizing devices in each taper shall be of the same type.

### TYPE B BARCODES
- All barcodes shall use Type 3 High Intensity Sheeting on both sides of the barcode.
- All Type B barcodes shall be a minimum of 12 feet in length and must meet IRC/RRP Report 350 requirements.
- When a single barcode is not sufficient, two Type B High Intensity lights shall supplement barcodes that are placed in a closed lane or that extend across a highway. Two Type A Low Intensity lights may be used in urban areas if approved by the Project Engineer (see QPL).
- When lights are mounted on a pole or to a base, they shall comply with the IRC/RRP Report 350 requirements.
- **Type B Barcodes** shall be placed:
  - At the beginning of a closed lane or shoulder, and at 1,000 foot intervals where an active work zone is ongoing and the lane must remain closed. A minimum of 2 barcodes shall be placed if the lane or shoulder closure is less than 2,000 feet.
  - (One Barcode will be placed at the beginning of the lane closure and one shall be placed in the middle of the lane closure.)
  - Before each group of unflushed holes or holes filled with temporary material.
  - (C) Before ungraded concrete.
  - (D) In the closed lane on each side of every intersection and crossover.
  - In front of piles of materials (ciment, aggregate, broken concrete, asphalt, and equipment which is near the work zone).

### DROP-OFFS
- When a shoulder drop-off greater than 2 inches but less than 6 inches wide, a "SHOULD－DROP-OFF" sign shall follow the "SHOULD－DROP-OFF" sign.
- When the drop-off exceeds 6 inches, the "SHOULD－DROP-OFF" sign shall be replaced by a "NO SHOULDER" sign.
- A temporary sign or channelizing device shall be placed at the pavement edge adjacent to the drop-off during nonworking hours when the drop-off is greater than 2 feet.
- For drop-offs on non-interstate routes, a temporary shoulder shall be added.
  - (A) For pre-construction speeds of 40 mph or less space at 20 feet.
  - (B) For pre-construction speeds of 45 mph or more space at 40 feet.
- A concrete barrier shall be used:
  - (A) For non-interstate work where a drop-off is 6 inches or greater and within 2 feet of the shoulder.
  - (B) For non-interstate work with speeds greater than 45 mph where a drop-off is 10 inches or greater and within 2 feet of the centerline.
- If a portable concrete barrier is required then the duration shall be considered in the design.

### SHIFTS TAPER LENGTH
- **Shifting Taper Length** is the length of the shift to accommodate ongoing work in the immediate vicinity but must be returned to the closed lane after the work activity has ceased.

### STANDOFF DEVICE SPACE AND BUFFER SPACE
- **Standard Device Spacing**
  - See Standard Device Spacing and Buffer Space Table.
  - **Nighttime Operational Drums** are spaced at standard spacing.
  - **Standard Spacing** is the only devices allowed.

### ALLIANABLE LAP SPACING FOR U-COLUMN POSTS
- **U-Channel Posts** may be spliced where length requirements are:
  - The upper section shall overlap the lower section by at least 1 inch. The bottom edge of the upper section of the splice shall be a minimum of 24 inches above the ground. The splice sections shall be secured with at least four bolts spaced equally along the splice.
Example of a Typical Layout

TC-01

**LEGEND**

- Traffic Sign
- Work Area
- Direction of Travel
- Truck with Amber Light

**NOTES**

This sheet shall be used with the Temporary Traffic Control General Notes Sheets TC-00(A), TC-00(B), TC-00(C), and TC-00(D).

1. The layout represents the minimum traffic controls required for workers and equipment operating more than 15 feet from the travel way.

2. If the operation results in equipment or other vehicles being parked closer than 15 feet to the travel way, but not within the roadway, each vehicle shall have an amber light.

3. When a work area has been established on one side of the roadway only, there shall be no parking on the opposite shoulder within 500 feet of the work area.

**SIGN SPACING CHART**

<table>
<thead>
<tr>
<th>Speed Limit (mph)</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>320 FT</td>
</tr>
<tr>
<td>35</td>
<td>480 FT</td>
</tr>
<tr>
<td>45</td>
<td>1000 FT</td>
</tr>
<tr>
<td>55</td>
<td>1500 FT</td>
</tr>
</tbody>
</table>
TC Details address the following situations:

- Shoulder work
- Flagging operations
- Diversions
- Lane closures
- Detours
- Moving operations
Highlights of the Traffic Control Details

- Encourage uniformity
- Provide guidance above MUTCD minimum
- Consult TC Details:
  - Before performing work that affects traffic
  - Before designing temporary traffic control plans
- Contractors are responsible for complying
Resources

- Contact LTAP for on-site work zone training
  - Low-volume roads
  - www.LouisianaLTAP.org
  - Louisiana Roads Scholar Program
- Contact a local LA DOTD District traffic office
LA DOTD Traffic Control Details are located at www.dotd.la.gov.

For more information or to request a copy of the DOTD Traffic Control Details contact Joy Johnson:

(225) 242-4636
joy.johnson@la.gov
Why a Sign?

Convey Messages
- Laws
- Warning
- Guide

Communicate!
Too Many Signs?
Excessive Use of Signs

• All signs should be used conservatively

• If over used tend to lose their effectiveness.

• Signs should be used only where justified by engineering judgment or studies.
Which way do you go?
Which route?
Standard Signs

• Covered in the MUTCD

• Different categories
  – Regulatory
  – Warning
  – Guide

• Standardized
  – Shapes
  – Colors
  – Sizes
  – Layouts
  – Fonts
  – Symbols
Standard Signs

A. Regulatory signs give notice of traffic laws or regulations.
Standard Signs

B. Warning signs give notice of a situation that might not be readily apparent.
Standard Signs

C. Guide signs show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information.
Standard Highway Signs

This manual shows typical signs approved for use on streets and highways.

What’s included:

• Design layout for standard signs
• Design guidelines for non standard signs
• Approved alphabet
• Pavement marking standards
Standard Sign Layout
Alphabet Example
Symbols

• All symbols shall be unmistakably similar to, or mirror images of, the adopted symbol signs

• Symbols and colors shall not be modified unless otherwise provided in the MUTCD

• In the “Standard Highway Signs and Markings” book
Word Messages

- Where a standard word message is applicable, the wording shall be as provided in this Manual.

- Non standard word message signs may be used on the same shape and color as described in the MUTCD.
Signs at Night

- Signs shall be retroreflective or illuminated
- Must look the same at night as during the day
  - Same shape
  - Similar color
- The requirements for sign illumination shall not be considered to be satisfied by street or highway lighting.
Shapes

Particular shapes shall be used exclusively for specific signs or series of signs.
Shapes

Particular shapes shall be used exclusively for specific signs or series of signs.
### Table 2A-4. Use of Sign Shapes

<table>
<thead>
<tr>
<th>Shape</th>
<th>Signs</th>
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<tbody>
<tr>
<td>Octagon</td>
<td>Stop*</td>
</tr>
<tr>
<td>Equilateral Triangle (1 point down)</td>
<td>Yield*</td>
</tr>
<tr>
<td>Circle</td>
<td>Grade Crossing Advance Warning*</td>
</tr>
<tr>
<td>Pennant Shape/Isosceles Triangle (longer axis horizontal)</td>
<td>No Passing*</td>
</tr>
<tr>
<td>Pentagon (pointed up)</td>
<td>School Advance Warning Sign (squared bottom corners)*</td>
</tr>
<tr>
<td>Pen (pointed up)</td>
<td>County Route Sign (tapered bottom corners)*</td>
</tr>
<tr>
<td>Crossbuck (two rectangles in an “X” configuration)</td>
<td>Grade Crossing*</td>
</tr>
<tr>
<td>Diamond</td>
<td>Warning Series</td>
</tr>
<tr>
<td>Rectangle (including square)</td>
<td>Regulatory Series</td>
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<tr>
<td></td>
<td>Guide Series**</td>
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<tr>
<td></td>
<td>Warning Series</td>
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<tr>
<td>Trapezoid</td>
<td>Recreational and Cultural Interest Area Series</td>
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<td></td>
<td>National Forest Route Sign</td>
</tr>
</tbody>
</table>

* This sign shall be exclusively the shape shown.

** Guide series includes general service, specific service, tourist-oriented directional, general information, recreational and cultural interest area, and emergency management signs.
The colors to be used on standard signs and their specific use on these signs shall be as provided in the applicable Sections of the MUTCD.
Colors

The colors to be used on standard signs and their specific use on these signs shall be as provided in the applicable Sections of the MUTCD.
<table>
<thead>
<tr>
<th>Type of Sign</th>
<th>Legend</th>
<th>Background</th>
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<tr>
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<tr>
<td>Prohibitive</td>
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<td>Warning</td>
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<td>Pedestrian</td>
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<td>Bicycle</td>
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<td>Interstate Route</td>
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</tr>
<tr>
<td>Destination</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reference Location</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Evacuation Route</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Road User Service</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Recreational</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Temporary Traffic Control</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Incident Management</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>School</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ETC-Account Only</td>
<td></td>
<td>X</td>
<td>X****</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Changeable Message Signs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory</td>
<td>X***</td>
</tr>
<tr>
<td>Warning</td>
<td>X</td>
</tr>
<tr>
<td>Temporary Traffic Control</td>
<td>X</td>
</tr>
<tr>
<td>Guide</td>
<td>X</td>
</tr>
<tr>
<td>Motorist Services</td>
<td>X</td>
</tr>
<tr>
<td>Incident Management</td>
<td>X</td>
</tr>
<tr>
<td>School, Pedestrian, Bicycle</td>
<td>X</td>
</tr>
</tbody>
</table>

* Fluorescent versions of these background colors may also be used.
** These alternative background colors would be provided by blue or green lighted pixels such that the entire CMS would be lighted, not just the legend.
*** Red is used only for the circle and slash or other red elements of a similar static regulatory sign.
**** The use of the color purple on signs is restricted per the provisions of Paragraph 1 of Section 2F.03.
## Example of Sign Colors

### Table 2A-5. Common Uses of Sign Colors

<table>
<thead>
<tr>
<th>Type of Sign</th>
<th>Legend</th>
<th>Background</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
<td>Green</td>
</tr>
<tr>
<td>Incident Management</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>School, Pedestrian, Bicycle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Fluorescent versions of these background colors may also be used.
** These alternative background colors would be provided by blue or green lighted pixels such that the entire CMS would be lighted, not just the legend.
*** Red is used only for the circle and slash or other red elements of a similar static regulatory sign.
**** The use of the color purple on signs is restricted per the provisions of Paragraph 1 of Section 2F:03.

### Figure 7B-1. School Area Signs

- **School Advance Crossing Assembly**
  - S1-1
  - AHEAD
  - W16-9P

- **School Crossing Assembly**
  - S1-1
  - W16-7P

- **School Zone Sign**
  - S1-1
  - ALL YEAR
  - SCHOOL
  - S4-7P (optional)
  - S4-3P (optional)

- **School Speed Limit Assembly**
  - SPEED LIMIT 20
  - 7:30-8:30 AM
  - 2:30-3:30 PM
  - S4-1P
  - S4-3P (optional)
Regulatory

• Used to inform road users of selected traffic laws or regulations

• Rectangular unless specifically designated otherwise in the MUTCD

• Black letters on white background or red letters on white background

• Exceptions
  – Stop Sign
  – Yield sign
Regulatory Signs for City Ordinances

- Non standard Sign
- Complete a Traffic Control Device Permit Form
- Attach
  - Ordinance
  - Shop drawing of sign
  - Map showing proposed location of sign
Warning

• Used to alert road users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations.

• The use of warning signs shall be based on an engineering study or on engineering judgment.

• The use of warning signs should be kept to a minimum as the unnecessary use of warning signs tends to breed disrespect for all signs.
Warning

- Diamond shaped unless specifically designated otherwise in the MUTCD
- Black letters on yellow background
- Exception:
  - Construction Warning signs
    - Orange background and black lettering
Warning

• Placed to provide an adequate Perception Reaction Time.

• MUTCD Table 2C-4 show the guidelines for advance warning signs

• Do not place too far in advance of the condition because drivers might forget the warning because of other driving distractions.
<table>
<thead>
<tr>
<th>Posted or 85th-Percentile Speed</th>
<th>Condition A: Speed reduction and lane changing in heavy traffic</th>
<th>Advance Placement Distance¹</th>
<th>Condition B: Deceleration to the listed advisory speed (mph) for the condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0³</td>
</tr>
<tr>
<td>20 mph</td>
<td></td>
<td>225 ft</td>
<td>100 ft²</td>
</tr>
<tr>
<td>25 mph</td>
<td></td>
<td>325 ft</td>
<td>100 ft²</td>
</tr>
<tr>
<td>30 mph</td>
<td></td>
<td>460 ft</td>
<td>100 ft²</td>
</tr>
<tr>
<td>35 mph</td>
<td></td>
<td>565 ft</td>
<td>100 ft²</td>
</tr>
<tr>
<td>40 mph</td>
<td></td>
<td>670 ft</td>
<td>125 ft²</td>
</tr>
<tr>
<td>45 mph</td>
<td></td>
<td>775 ft</td>
<td>175 ft²</td>
</tr>
<tr>
<td>50 mph</td>
<td></td>
<td>885 ft</td>
<td>250 ft²</td>
</tr>
<tr>
<td>55 mph</td>
<td></td>
<td>990 ft</td>
<td>325 ft²</td>
</tr>
<tr>
<td>60 mph</td>
<td></td>
<td>1,100 ft</td>
<td>400 ft²</td>
</tr>
<tr>
<td>65 mph</td>
<td></td>
<td>1,200 ft</td>
<td>475 ft²</td>
</tr>
<tr>
<td>70 mph</td>
<td></td>
<td>1,250 ft</td>
<td>550 ft²</td>
</tr>
<tr>
<td>75 mph</td>
<td></td>
<td>1,350 ft</td>
<td>650 ft²</td>
</tr>
</tbody>
</table>

¹ The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

² Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second², minus the sign legibility distance of 180 feet.

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second², minus the sign legibility distance of 250 feet.

⁵ No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

⁶ The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.
# Table 2C-4. Guidelines for Advance Placement of Warning Signs

<table>
<thead>
<tr>
<th>Condition A: Speed reduction and lane changing in heavy traffic</th>
<th>Advance Placement Distance&lt;sup&gt;1&lt;/sup&gt;</th>
<th>0&lt;sup&gt;3&lt;/sup&gt;</th>
<th>10&lt;sup&gt;4&lt;/sup&gt;</th>
<th>20&lt;sup&gt;4&lt;/sup&gt;</th>
<th>30&lt;sup&gt;4&lt;/sup&gt;</th>
<th>40&lt;sup&gt;4&lt;/sup&gt;</th>
<th>50&lt;sup&gt;4&lt;/sup&gt;</th>
<th>60&lt;sup&gt;4&lt;/sup&gt;</th>
<th>70&lt;sup&gt;4&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mph</td>
<td>225 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>25 mph</td>
<td>325 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>30 mph</td>
<td>460 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>35 mph</td>
<td>565 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>40 mph</td>
<td>670 ft</td>
<td>125 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>45 mph</td>
<td>775 ft</td>
<td>175 ft</td>
<td>125 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>50 mph</td>
<td>885 ft</td>
<td>250 ft</td>
<td>200 ft</td>
<td>175 ft</td>
<td>125 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>55 mph</td>
<td>990 ft</td>
<td>325 ft</td>
<td>325 ft</td>
<td>275 ft</td>
<td>225 ft</td>
<td>200 ft</td>
<td>125 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
</tr>
<tr>
<td>60 mph</td>
<td>1,100 ft</td>
<td>400 ft</td>
<td>400 ft</td>
<td>350 ft</td>
<td>275 ft</td>
<td>275 ft</td>
<td>200 ft</td>
<td>125 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>65 mph</td>
<td>1,200 ft</td>
<td>475 ft</td>
<td>475 ft</td>
<td>400 ft</td>
<td>350 ft</td>
<td>275 ft</td>
<td>275 ft</td>
<td>200 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>70 mph</td>
<td>1,250 ft</td>
<td>550 ft</td>
<td>550 ft</td>
<td>525 ft</td>
<td>450 ft</td>
<td>375 ft</td>
<td>275 ft</td>
<td>150 ft</td>
<td>—</td>
</tr>
<tr>
<td>75 mph</td>
<td>1,350 ft</td>
<td>650 ft</td>
<td>650 ft</td>
<td>625 ft</td>
<td>550 ft</td>
<td>475 ft</td>
<td>375 ft</td>
<td>250 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>1</sup> The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

<sup>2</sup> Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

<sup>3</sup> Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second<sup>2</sup>, minus the sign legibility distance of 180 feet.

<sup>4</sup> Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second<sup>2</sup>, minus the sign legibility distance of 250 feet.

<sup>5</sup> No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signage. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

<sup>6</sup> The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.
<table>
<thead>
<tr>
<th>Posted or 85th-Percentile Speed</th>
<th>Condition A: Speed reduction and lane changing in heavy traffic</th>
<th>Condition B: Deceleration to the listed advisory speed (mph) for the condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0&lt;sup&gt;3&lt;/sup&gt;</td>
<td>10&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>20 mph</td>
<td>225 ft</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>25 mph</td>
<td>325 ft</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>30 mph</td>
<td>460 ft</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>35 mph</td>
<td>565 ft</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>40 mph</td>
<td>670 ft</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>45 mph</td>
<td>775 ft</td>
<td>125 ft</td>
</tr>
<tr>
<td>50 mph</td>
<td>885 ft</td>
<td>200 ft</td>
</tr>
<tr>
<td>55 mph</td>
<td>990 ft</td>
<td>225 ft</td>
</tr>
<tr>
<td>60 mph</td>
<td>1,100 ft</td>
<td>275 ft</td>
</tr>
<tr>
<td>65 mph</td>
<td>1,200 ft</td>
<td>325 ft</td>
</tr>
<tr>
<td>70 mph</td>
<td>1,250 ft</td>
<td>350 ft</td>
</tr>
<tr>
<td>75 mph</td>
<td>1,350 ft</td>
<td>400 ft</td>
</tr>
</tbody>
</table>

1 The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

2 Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

3 Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second<sup>2</sup>, minus the sign legibility distance of 180 feet.

4 Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second<sup>2</sup>, minus the sign legibility distance of 250 feet.

5 No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

6 The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.
Curve Warning Signs

• Shall be used in advance of horizontal curves:
  – on freeways,
  – on expressways, and
  – on roadways with more than 1,000 AADT
Figure 2C-2. Example of Warning Signs for a Turn

Notes:
1. See Table 2C-4 for advance placement distance guidelines
2. See Table 2C-5 for the selection of horizontal alignment signs
3. See Table 2C-6 for spacing of W1-8 signs
4. A 25-mph advisory speed is shown for illustrative purposes only

Table 2C-5. Horizontal Alignment Sign Selection

<table>
<thead>
<tr>
<th>Type of Horizontal Alignment Sign</th>
<th>Difference Between Speed Limit and Advisory Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/Intersection (W10-1) (see Section 2C.07 to determine which sign to use)</td>
<td>Recommended</td>
</tr>
<tr>
<td>Advisory Speed Plaque (W13-1P)</td>
<td>Recommended</td>
</tr>
<tr>
<td>Chevrons (W1-8) and/or One Direction Large Arrow (W1-6)</td>
<td>Optional</td>
</tr>
<tr>
<td>Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp</td>
<td>Optional</td>
</tr>
</tbody>
</table>

Note: Required means that the sign and/or plaque shall be used, recommended means that the sign and/or plaque should be used, and optional means that the sign and/or plaque may be used.

See Section 2C.06 for roadways with less than 1,000 ADT.
Guide Signs

- Rectangular unless specifically designated otherwise in the MUTCD
- White message and border on a green background.
- Letters and numerals shall be at least 6 inches in height for all upper-case letters, or a combination of 6 inches in height for upper-case letters and 4.5 inches in height for lower-case letters.
Guide Signs

• Limited to no more than three lines of destinations, which include place names, route numbers, street names, and cardinal directions.

• Where two or more signs are included in the same overhead display, the amount of legend should be further minimized.
Too Much Information?
Street Name Signs

• Shall be retroreflective or illuminated

• Background colors shall be green, blue, brown, or white

• Legend and border shall be white unless a white background then the legend and border shall be black.
<table>
<thead>
<tr>
<th>Type of Mounting</th>
<th>Type of Street or Highway</th>
<th>Speed Limit</th>
<th>Recommended Minimum Letter Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial Upper-Case</td>
</tr>
<tr>
<td>Overhead</td>
<td>All types</td>
<td>All speed limits</td>
<td>12 inches</td>
</tr>
<tr>
<td>Post-mounted</td>
<td>Multi-lane</td>
<td>More than 40 mph</td>
<td>8 inches</td>
</tr>
<tr>
<td>Post-mounted</td>
<td>Multi-lane</td>
<td>40 mph or less</td>
<td>6 inches</td>
</tr>
<tr>
<td>Post-mounted</td>
<td>2-lane</td>
<td>All speed limits</td>
<td>6 inches*</td>
</tr>
</tbody>
</table>

* On local two-lane streets with speed limits of 25 mph or less, 4-inch initial upper-case letters with 3-inch lower-case letters may be used.
### Table 2D-2. Recommended Minimum Letter Heights on Street Name Signs

<table>
<thead>
<tr>
<th>Type of Mounting</th>
<th>Type of Street or Highway</th>
<th>Speed Limit</th>
<th>Recommended Minimum Letter Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial Upper-Case</td>
</tr>
<tr>
<td>Overhead</td>
<td>All types</td>
<td>All speed limits</td>
<td>12 inches</td>
</tr>
<tr>
<td>Post-mounted</td>
<td>Multi-lane</td>
<td>More than 40 mph</td>
<td>8 inches</td>
</tr>
<tr>
<td>Post-mounted</td>
<td>Multi-lane</td>
<td>40 mph or less</td>
<td>6 inches</td>
</tr>
<tr>
<td>Post-mounted</td>
<td>2-lane</td>
<td>All speed limits</td>
<td>6 inches*</td>
</tr>
</tbody>
</table>

* On local two-lane streets with speed limits of 25 mph or less, 4-inch initial upper-case letters with 3-inch lower-case letters may be used.
Supplemental Guide Signs
MUTCD

- No more than one on each interchange approach.
- Should not list more than two destinations.
- Should be installed as an independent guide sign assembly.
- States and other agencies should adopt an appropriate policy for installing supplemental signs:
  - Such items as population, amount of traffic generated, distance from the route, and the significance of the destination should be taken into account.
DOTD Policy

- EDSM VI.2.1.3 Supplemental Guide Signs on Interstate Highways
- EDSM VI.2.1.4 Supplemental Guide Signs on Non Interstate State Maintained Highways
Supplemental Guide

Signs on the Interstate

• No more than 2 destinations

• Charts that give examples of what qualifies and what doesn’t qualify
GUIDELINE CRITERIA FOR SIGNING TRAFFIC GENERATORS
ACCESSIBLE FROM INTERSTATES IN LOUISIANA

<table>
<thead>
<tr>
<th>TYPE OF GENERATOR</th>
<th>SPECIFIC CRITERIA</th>
<th>ABOVE 400,000</th>
<th>50,000 - 400,000</th>
<th>BELOW 50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIRPORTS</td>
<td>NUMBER OF REGULARLY SCHEDULED MOVEMENTS (ONE-WAY) PER DAY (COMMERCIAL)</td>
<td>35</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>MILEAGE FROM INTERCHANGE</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>COLLEGES* UNIVERSITY*</td>
<td>TOTAL ENROLLMENT FULL-TIME &amp; PART TIME</td>
<td>2,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>MILEAGE FROM INTERCHANGE</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>MILITARY BASES*</td>
<td>EMPLOYEES OR PERMANENTLY ASSIGNED PERSONNEL</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>MILEAGE FROM INTERCHANGE</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>ARENAS, AUDITORIUMS, CONVENTION HALLS, DAMS, FAIRGROUNDS, RACE TRACKS, LAKES, NATIONAL HISTORICAL SITES-MONUMENTS, NATIONAL PARKS, RECREATION AREAS, STADIUMS, STATE PARKS</td>
<td>SEATING CAPACITY</td>
<td>6,000</td>
<td>5,000</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td>ANNUAL ATTENDANCE</td>
<td>300,000</td>
<td>250,000</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td><strong>MILEAGE FROM INTERCHANGE</strong></td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>REGIONAL MEDICAL CENTERS</td>
<td>TOTAL NO. OF BEDS</td>
<td>600</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>MILEAGE FROM INTERCHANGE</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>TYPE OF CARE</td>
<td>HOSPITAL HAS 24 HOUR EMERGENCY PHYSICIAN COVERAGE AND REGULARLY OFFERING CARDIOLOGY AND TRAUMA-RELATED SURGICAL SPECIALTIES (i.e. GENERAL SURGERY, NEUROSURGERY, AND ORTHOPEDICS)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STATE POLICE STATIONS (TROOP HQS)</td>
<td>MILEAGE FROM INTERCHANGE</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>TOLL HIGHWAYS AND BRIDGES</td>
<td>DIRECT ACCESS FROM EXIT AND PART OF THE STATE HIGHWAY SYSTEM.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUSINESS DISTRICT</td>
<td>DIRECT ACCESS AND NOT MORE THAN 5 MILES FROM THE INTERCHANGE.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHOPPING CENTERS</td>
<td>SEE RS 48:244.3 and LAC 70:401</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUDUBON TRAIL GOLF COURSES</td>
<td>SEE Act 951 of the 2001 Regular Session of the Louisiana Legislature</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* DISTANCE MAY BE INCREASED ONE MILE FOR EACH 10% OVER THE MINIMUM STUDENTS OR EMPLOYEES LISTED UP TO A MAXIMUM OF 25 MILES.
** DISTANCE MAY BE INCREASED ONE MILE FOR EACH 20,000 PEOPLE OVER THE MINIMUM ATTENDANCE SHOWN UP TO A MAXIMUM OF 25 MILES.
## Guideline Criteria for Signing Traffic Generators Accessible from Interstates in Louisiana

<table>
<thead>
<tr>
<th>Type of Generator</th>
<th>Specific Criteria</th>
<th>Major Metropolitan Area</th>
<th>Urban Areas</th>
<th>Rural Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airports</strong></td>
<td>Number of regularly scheduled movements (one-way) per day (commercial)</td>
<td>35</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Mileage from interchange</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><em><em>Colleges</em> Universities</em>*</td>
<td>Total enrollment: full-time &amp; part-time</td>
<td>2,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Mileage from interchange</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Military Bases</strong></td>
<td>Employees or permanently assigned personnel</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>Mileage from interchange</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>** Arenas, Auditoriums, Convention Halls, Dams, Fairgrounds, Race Tracks, Lakes**</td>
<td>Seating capacity</td>
<td>6,000</td>
<td>5,000</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td>Annual attendance</td>
<td>300,000</td>
<td>250,000</td>
<td>200,000</td>
</tr>
<tr>
<td><strong>Military Bases</strong></td>
<td><strong>Mileage from interchange</strong></td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Regional Medical Centers</strong></td>
<td>Total no. of beds</td>
<td>800</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Mileage from interchange</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Type of care: hospital has 24-hour emergency physician coverage and regularly offering cardiology and trauma-related surgical specialties (i.e., general surgery, neurosurgery, and orthopedics)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>State Police Stations (Troop Hqts)</strong></td>
<td>Mileage from interchange</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Toll Highways and Bridges</strong></td>
<td>Direct access from exit and part of the state highway system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Business District</strong></td>
<td>Direct access and not more than 5 miles from the interchange</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shopping Centers</strong></td>
<td>See RS 48:244.3 and LAC 70:401</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Audubon Trail Golf Courses</strong></td>
<td>See Act 951 of the 2001 Regular Session of the Louisiana Legislature</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Distance may be increased one mile for each 10% over the minimum students or employees listed up to a maximum of 25 miles.

** Distance may be increased one mile for each 20,000 people over the minimum attendance shown up to a maximum of 25 miles.
Non Interstate Supplemental Guide Signs

- No more than 3 traffic generators per intersection

- Not signed for if there is a need for trail blazers

- Charts that give examples of what qualifies and what doesn’t qualify
<table>
<thead>
<tr>
<th>Classification</th>
<th>Criteria</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Facilities</td>
<td><strong>Commercial Aviation Airports</strong> must provide at least two scheduled movements (one-way) per day. <strong>General Aviation Airports:</strong> Facility must accommodate freight, charter and private aircraft, have a minimum of five year-round based aircraft and have a fixed based operator. <strong>Railroad Stations:</strong> Must provide regular scheduled passenger service. <strong>Bus Station:</strong> Must provide regular scheduled passenger service.</td>
<td></td>
</tr>
<tr>
<td>Educational Institutions</td>
<td>1. Post high-school institutions having a minimum of 1,000 full-time or part-time students.</td>
<td>Colleges:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Junior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Universities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seminaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trade Schools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>School for Deaf</td>
</tr>
<tr>
<td></td>
<td>2. State schools for special education.</td>
<td>School for Blind</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Middle and High Schools with athletic facilities.</td>
<td>Private</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior High</td>
</tr>
<tr>
<td>Correctional Institutions</td>
<td>Federal or State operated.</td>
<td>Correctional Centers, Youth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Camps, Prisons</td>
</tr>
<tr>
<td>Health Care Facilities</td>
<td>Any hospital or mental health care facility licensed by the State.</td>
<td>Mental Health Facilities:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mental Health Centers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development Centers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>State Hospitals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>State Schools</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hospitals:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Veterans</td>
</tr>
<tr>
<td>Historical, Recreational, or Cultural Facilities</td>
<td>1. The facilities must be open to the general public have a minimum annual attendance of 50,000 with no charge when privately owned.</td>
<td>Historical Sites/Areas: Home/Buildings, Indian Sites, Monuments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Camps</td>
</tr>
<tr>
<td></td>
<td>2. Outdoor recreational facilities provided by youth organizations.</td>
<td>Boy/Girl Scout Church</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YMCA/YWCA</td>
</tr>
<tr>
<td>CLASSIFICATION</td>
<td>CRITERIA</td>
<td>EXAMPLES</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Historical, Recreational, or Cultural Facilities</td>
<td>3. Special local historical attractions open continuously, with no charge to the public, or any State historical site listed on the official State map.</td>
<td>National Cemeteries, State Historical Site, National Historical Sites</td>
</tr>
<tr>
<td></td>
<td>4. The facilities must be open to the public and have a minimum annual attendance of 50,000.</td>
<td>Cultural Attractions: Aquariums, Museums, Zoos, Planetariums and Arboretums</td>
</tr>
<tr>
<td></td>
<td>5. Indoor facilities with a seating capacity of 5,000.</td>
<td>Arenas, Auditoriums, Convention Halls, Civic Centers</td>
</tr>
<tr>
<td></td>
<td>7. The facilities must have an annual attendance of 200,000.</td>
<td>Fairgrounds, Racetracks and Stadiums.</td>
</tr>
<tr>
<td>Miscellaneous Governmental Facilities</td>
<td>Any building complex owned &amp; operated or specifically for a local State or Federal governmental agency that has 10 employees or assigned personnel.</td>
<td>Ammunition Plants, Military Bases, Research Facilities: State-Federal, Highway Department Facilities, Court Houses, State Police Offices, City Police Station, Sheriff's Offices.</td>
</tr>
<tr>
<td>Business Districts</td>
<td>The marked route within city limits and not closer than three blocks to the C.B.D. of a community with less 10,000 population.</td>
<td></td>
</tr>
<tr>
<td>Parking Facilities</td>
<td>The facilities must be open to the public, be 4 blocks of the marked route and have a minimum of 400 parking spaces.</td>
<td>Public off-street parking facilities, Private off-street parking facilities open to the public &amp; not operated to serve any specific business.</td>
</tr>
</tbody>
</table>
Gateway Signs

• Community Welcome Sign
• Standard and Non Standard
• Policy in LADOTD Traffic Engineering Manual

Non Standard

Standard
Standard Gateway Sign

- Installed and maintained by DOTD forces
- Make sign request to DTOE
- Placed at:
  - State Line
  - Parish Line
  - Corporate Limits of an incorporated community
Non Standard Gateway Sign

- Installed and maintained by local government

- Complete a Traffic Control Device Permit signed by a government official and attach
  - Proposed location
  - Shop Drawing

- Shall be retroreflective or illuminated

- No commercial advertising or sponsorship
Non Standard

- Should be placed beyond the clearzone

- If in the clearzone then shall be breakaway

- Minimum letter heights
  - Interstate 13 inches
  - Multi lane 10 inches
  - Other 6 inches
Gateway Signs
Summary

No Conflicting Messages

No Confusing Information
Summary

Only use standard symbols

Limit the information

Use standard font & font sizes
Summary

Message needs to make sense

Follow Policy

Manual on Uniform Traffic Control Devices for Streets and Highways
2003 Edition

101
Questions?

Contact

Jody Colvin
225-242-4635
Installation & Maintenance of Signs

Jared Chaumont, P.E.
District 05 Assistant Traffic Operations Engineer
Uniform Vehicle Code Section 15-116

“No person shall install or maintain in any area of private property used by the public any sign, signal, marking, or other device intended to regulate, warn, or guide traffic ...”
Figure 2A-2. Examples of Heights and Lateral Locations of Sign Installations

A - ROADSIDE SIGN IN RURAL AREA

B - ROADSIDE SIGN IN RURAL AREA

C - ROADSIDE SIGN IN BUSINESS, COMMERCIAL, OR RESIDENTIAL AREA

D - WARNING SIGN WITH ADVISORY SPEED PLAQUE IN RURAL AREA

*Where parking or pedestrian movements are likely to occur
Figure 2A-3. Examples of Locations for Some Typical Signs at Intersections

A - ACUTE ANGLE INTERSECTION

B - CHANNELIZED INTERSECTION

C - MINOR CROSSROAD

D - URBAN INTERSECTION
Figure 2A-4. Relative Locations of Regulatory, Warning, and Guide Signs on an Intersection Approach

A – Single-lane approach

U.S. ROUTE 46

DEFENSE HWY

200 ft MIN.

400 ft MIN.

600 ft MIN.

800 ft MIN.

200 ft MIN.

200 ft MIN.

Note: See Chapter 2D for information on guide signs and Part 3 for information on pavement markings

B – Multi-lane approach

WOOD AVE

200 ft MIN.

200 ft MIN.

*** (Optional)

See Table 2C-4 for the recommended minimum distance

** See Section 2C.46 for the application of the W2-1 sign and Section 2C.36 for the application of the W3-1 sign

### See Section 2B.22 for the application of Intersection Lane Control signs
<table>
<thead>
<tr>
<th>Posted or 85th-Percentile Speed</th>
<th>Condition A: Speed reduction and lane changing in heavy traffic&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Advance Placement Distance&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Condition B: Deceleration to the listed advisory speed (mph) for the condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0&lt;sup&gt;3&lt;/sup&gt;</td>
<td>10&lt;sup&gt;4&lt;/sup&gt;</td>
<td>20&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>20 mph</td>
<td>225 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>25 mph</td>
<td>325 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>30 mph</td>
<td>460 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>35 mph</td>
<td>565 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
<td>N/A&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>40 mph</td>
<td>670 ft</td>
<td>125 ft</td>
<td>100 ft&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>45 mph</td>
<td>775 ft</td>
<td>175 ft</td>
<td>125 ft</td>
</tr>
<tr>
<td>50 mph</td>
<td>885 ft</td>
<td>250 ft</td>
<td>200 ft</td>
</tr>
<tr>
<td>55 mph (highlighted)</td>
<td>990 ft</td>
<td>325 ft</td>
<td>275 ft</td>
</tr>
<tr>
<td>60 mph</td>
<td>1,100 ft</td>
<td>400 ft</td>
<td>350 ft</td>
</tr>
<tr>
<td>65 mph</td>
<td>1,200 ft</td>
<td>475 ft</td>
<td>450 ft</td>
</tr>
<tr>
<td>70 mph</td>
<td>1,250 ft</td>
<td>550 ft</td>
<td>525 ft</td>
</tr>
<tr>
<td>75 mph</td>
<td>1,350 ft</td>
<td>650 ft</td>
<td>625 ft</td>
</tr>
</tbody>
</table>
Standard:

Regulatory, warning, and guide signs and object markers shall be retroreflective ... to show the same shape and similar color by both day and night...
## Table 2A-3. Minimum Maintained Retroreflectivity Levels

<table>
<thead>
<tr>
<th>Sign Color</th>
<th>Beaded Sheeting</th>
<th>Prismatic Sheeting</th>
<th>Additional Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III, IV, VI, VII, VIII, IX, X</td>
</tr>
<tr>
<td>White on Green</td>
<td>W*; G ≥ 7</td>
<td>W*; G ≥ 15</td>
<td>W ≥ 250; G ≥ 25</td>
</tr>
<tr>
<td></td>
<td>W*; G ≥ 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black on Yellow or Black on Orange</td>
<td>Y*; O*</td>
<td>Y ≥ 50; O ≥ 50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Y*; O*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White on Red</td>
<td>W ≥ 35; R ≥ 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black on White</td>
<td>W ≥ 50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
* This sheeting type shall not be used for this color for this application.

To Identify Sheeting Types see, [http://www.trafficsign.us/signsheet.html](http://www.trafficsign.us/signsheet.html)
Standard:

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.
Except for those signs specifically identified in Paragraph 6, one or more of the following assessment or management methods **should** be used to maintain sign retroreflectivity:
A. Parking, Standing, or Stopping Signs (R7 and R8 series)

B. Walking/Hitchhiking/Crossing signs (R9 and R10-1 through R10-4b series)

C. Acknowledgement signs

D. All signs with blue or brown backgrounds

E. Bikeway signs that are intended for exclusive use by bicyclists or pedestrians
Reflectivity Assessment or Management Methods

A. Visual Nighttime Inspection
B. Measured Sign Reflectivity
C. Expected Sign Life
D. Blanket Replacement
E. Control Signs
F. Other Methods
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 identified below minimum retroreflectivity levels should be replaced.
Measured Sign Retroreflectivity

• Sign retroreflectivity is measured using a retroreflectometer.

• Signs with retroreflectivity below the minimum levels should be replaced.
Expected Sign Life

• When signs are installed, the installation date is labeled or recorded so that the age of the 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.
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 affected signs.
Control Signs

• Replacement of signs in the field is based on the performance of a sample of control signs.

• The control signs are monitored to determine the end of retroreflectivity life for the associated signs.

• All field signs should be replaced before the retroreflectivity levels of the control sample reach the minimum levels.
Other Methods

Other methods developed based on engineering studies can be used.
Contact LTAP for more information on technical assistance to help your agency prepare to comply with the new regulations, portions of which begin to take effect in 2012.
Traffic Engineering 101

Thank You!

See you on July 26th at 2:00PM for Access Management