Minnesota Toolkit Information for Local Agencies to meet FHWA’s Sign Retroreflectivity Guidelines

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Federal Requirements

First published on December 22, 2008 - FHWA’s sign retroreflectivity requirements and deadlines are as follows:

• **By January 2012:** Agencies must establish and implement a sign assessment or management method to maintain minimum levels of sign retro reflectivity.

• **By January 2015:** Agencies must replace regulatory, warning, and ground-mounted guide signs (except street name) that are identified using the assessment or management methods as failing to meet the established minimum levels.

• **By January 2018:** Agencies must replace street name signs and overhead guide signs that are identified using the assessment or management methods as failing to meet the established minimum levels.
FHWA Sign Retroreflectivity Guidebook

- Developed Sept 2009
- Available in hardcopy from local LTAP center and electronically on Mn/DOT State Aid Traffic Safety website
  http://www.dot.state.mn.us/stateaid/sa_traffic_safety.html
- Contents:
  - Retroreflectivity Requirements
  - Toolkit on CD-ROM
  - Summary of assessment/management methods
  - Budgeting
FHWA Sign Retroreflectivity Toolkit

- Interactive online version of the hardcopy guidebook [http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/](http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/)
- Identifies appropriate sign maintenance method
- Interactive budget estimation tool
Sign Retroreflectivity ▶ A Minnesota Toolkit

- Funded by the LRRB
- Contents:
  - County Letter
  - Other Agency Letter
  - MN MUTCD Requirements
  - Summary of FHWA guides:
    - Methods for Maintaining Traffic Sign Retroreflectivity (FHWA-HRT-08-026)
    - Know Your Retro 2007: New MUTCD Sign Retroreflectivity Requirements (FHWA-SA-07-020)
Sign Retroreflectivity - A Minnesota Toolkit

- Appendix A - Example sign inventories, inspection checklists and maps
- Appendix B - Example sign management policies
- Appendix C - Example sign maintenance agreement
Sign Reduction and Removal
More Signs Make Roads **Safer**, Right?

**1st Signing Program**

**Crash Data □ Mn/DOT Transportation Information System (T.I.S.)**

**Fatal Crashes Township Roads (1984 - 2008)**

- Number of Fatal Crashes
- Linear Trend of Fatal Crashes
Sign Removal
Guidebook Breakdown

- Part A
  Background
- Part B
  Maintenance Methods
- Part C
  Financial Budgeting
- Part D
  Policy Development
- Part E
  Implementation
- Part F
  Effectiveness of Traffic Signs
- Part G
  Summary of Key Points
Guidebook Breakdown

- Part A
  Background
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- Part G
  Summary of Key Points
Financial Budgeting – Cities under 5,000 Population (1/3)

A typical small city has approximately 50 miles of streets with an average of 25 regulatory and warning signs per mile plus 6 guide signs per mile (both directions).

A typical cost for replacing the regulatory and warning signs is $200 per sign and $250 per sign for the guide (street name) signs.

The total cost to upgrade/replace ALL of the signs in a typical small city would be:

25 signs/mile x $200/sign

50 miles

6 signs/mile x $250/sign

= $325,000

Annual Replacement Cost

100% of signs = $65,000
75% of signs = $49,000

All Regulatory, Warning signs and Ground Mounted Guide must meet retroreflectivity requirements by January 2015.

The rest of your signs (Overhead Guide and Street Names) must meet the retroreflectivity requirements by January 2018.

If you have to replace 100% of your signs the annual cost would be as high as $65,000. But if you only have to replace 75% of your signs, the cost would be $49,000 per year.

Consider reducing your inventory of signs.

* Replacement costs include sign blank, sheeting material, sign posts, and installation.
** See § 4 for exceptions.
Constant 2010 $
Financial Budgeting – Cities under 5,000 Population (3/3)

- If the typical small city selects the blanket replacement method and planned to replace 1/12 of the signs each year, the annual cost would be approximately $27,100.
- If you are interested in reducing your sign maintenance costs - consider reducing the number of signs in your inventory. (See Part D)

Initial Upgrade - 100% replacement over 5 year (Regular and Warning - $50,000/year) and 8 year (Guide - $9,400/year) period.

Total Annual Cost = $43,350/year

Blanket Replacement Cost = $27,100/year

Sign Face Vandalism Cost = $13,000/year

Sign Knock Down Cost = $3,250/year
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Model Sign Maintenance Policy

- Which sign maintenance method is adopted? (Blanket Replacement - replace 1/12 of signs/year)

- Which **Roads** are to be covered by the policy?
  - All
  - Low Volume
  - Roadway Classifications
    - Residential
    - Collector
    - Minor Arterial
    - Principal Arterial

- Which **Signs** are to be covered by the policy?
  - All
  - Regulatory
  - Warning
  - Guide
  - All signs must conform to MNMUTCD

- What is the **Objective** of the policy?
  - Document the maintenance method
  - Exclude certain types of signs from usage (Not Required, Not Effective, i.e., No warning signs on residential streets, speed limit signs only on collectors and arterials, no marked pedestrian crossings at uncontrolled intersections, etc.)

- What **Actions** are required to implement the policy?
  - Inventory
  - Sign Replacement
  - Sign Removal
  - Engineering Study
  - Notification of Decisions/Actions
  - Sign Sheeting Material
  - Establish Budget
Case Study #1: Monnens vs. City of Orono (3/3)

- Minnesota tort law provides for Discretionary Immunity where actions are found to be consistent with policies enacted by the highest decision making body of an organization (City Council, County Board, etc.) AND where there is evidence that the body considered social and economic issues.

- The Court issued the Summary Judgement – agreed that curve warning signs are NOT required and that the action (of not installing the curve warning sign) was consistent with the city’s ordinance and was in fact covered by Discretionary Immunity.

**LESSON LEARNED** → The establishment of ordinances and/or policies that restrict the use of traffic control devices are a proven method for managing risk associated with actions that are consisted with the adopted ordinances.
<table>
<thead>
<tr>
<th>Part A</th>
<th>Part B</th>
<th>Part C</th>
<th>Part D</th>
<th>Part E</th>
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<td>Summary of Key Points</td>
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</table>
Engineering Study / System Consideration Example - Rural Curves (2/2)

- A sample system curve warning policy could include:
  - Curves > 2,000 foot radius (low crash risk/at system average crash rate) ➔ No advance warning signs
  - Curves between 1,500 and 2,000 foot radii (moderate crash risk/2 x system crash rate) ➔ Advance warning sign
  - Curves < 1,500 foot radius (high crash risk/5 x system average crash rate & 90% of fatal road departure crashes) ➔ Advance warning signs and Chevrons

- To support ANY system wide approach to consistently sign curves, an inventory of your curves is required including estimating either the radius or degree of curvature (Radius = 5729.6/Degree of Curve).

- It is NOT necessary to have a precise measurement of the radius of every curve - the curve research in Minnesota estimated curve radii using measurements from aerial photography. Other methods could include using as-built plans, county maps, information for a county surveyor or the measuring feature on Google Earth.

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[Graph showing crash rate against radius with data points indicating percentage and crash rate for different radius ranges.]
## Which Signs are Required by the MNMUTCD?

<table>
<thead>
<tr>
<th>Regulatory</th>
<th><img src="image" alt="Speed Limit 50" /></th>
<th><img src="image" alt="One Way" /></th>
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</thead>
<tbody>
<tr>
<td>- Speed Limits IF a speed zone (other than a statutory limit) has been established.</td>
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<tr>
<td>- ONE-WAY &amp; DO NOT ENTER where applicable.</td>
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<tr>
<td>- The ALL-WAY STOP plaque at All-Way Stops.</td>
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<td>- Prohibition signs where applicable</td>
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<thead>
<tr>
<th>Warning</th>
<th><img src="image" alt="Rail Road Advance Warning" /></th>
<th><img src="image" alt="Clearance" /></th>
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</thead>
<tbody>
<tr>
<td>- Rail Road Advance Warning and No Train Horn (if quiet zone established)</td>
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<tr>
<td>- Clearance IF clearance is less than 13'-6&quot; (12&quot; above the statutory clearance height)</td>
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<tr>
<td>- Advance Traffic Control IF there is limited sight distance.</td>
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<tr>
<td>- Minimum Maintenance</td>
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<thead>
<tr>
<th>Guide</th>
<th><img src="image" alt="Route Numbers" /></th>
<th><img src="image" alt="Junction Assembly" /></th>
<th><img src="image" alt="Advance Route Turn Assembly" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Route Numbers on ALL numbered highways</td>
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<td></td>
</tr>
<tr>
<td>- Junction Assembly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Advance Route Turn Assembly</td>
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</table>

- If you have Low Volume roads, only the Warning signs listed above are required.
- Bottom Line – out of the hundreds of signs contained in the MNMUTCD – 13 types of signs are actually required.
- This suggests that if you decide to put up a sign – most of the time that action will be based on exercising your judgement and NOT on the requirements in the MNMUTCD.
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Effectiveness of Warning Signs – Children at Play

- A research synthesis prepared for the Wisconsin Department of Transportation\(^1\) found that there is no evidence that special warning signs of this sort either change driver behavior (reduce travel speeds) or improve safety (reduce crash frequency).

- The synthesis supplements the research with common sense observations that such signs:
  - Do not give clear and enforceable guidance to drivers.
  - Provide a false sense of security to parents and children that may increase risk.
  - Give the false impression that areas without signs do not have children.
  - Represent an unnecessary cost that then propagates as additional signs are requested.
  - Violates the principle that signage should be based on engineering, not political judgement.

- The University of Minnesota is currently conducting a research project to determine the effects on driver behavior associated with placing a playground warning sign along a 30 mph city street in Bloomington. A Before vs. After speed study found this sign had no effect on the 85th percentile speed—it was 30 mph both before and after.\(^2\)

- Traffic control devices are intended to change driver behavior and improve safety – these special warning signs have been found to do neither.

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\(^1\) Wisconsin Department of Transportation, “Effectiveness of Children at Play” Warning Signs. Transportation Synthesis Report 2007

\(^2\) University of Minnesota, Knapp, K., Technical Memo, March 13, 2010

Note: Not MUTCD Compliant
## Sign Effectiveness Summary

<table>
<thead>
<tr>
<th></th>
<th>Signs that ARE proven to be effective</th>
<th>Signs that have not been tested for effectiveness</th>
<th>Signs that appear to be ineffective</th>
<th>Signs that are proven ineffective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory</td>
<td>LEFT LANE MUST TURN LEFT</td>
<td>SPEED LIMIT 50</td>
<td>STOP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLOWER TRAFFIC KEEP RIGHT</td>
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<tr>
<td>WARNING</td>
<td>LEFT-TURN</td>
<td>CAUTION還有 RIGHT</td>
<td>CHILDREN AT PLAY</td>
<td>E Main St</td>
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<tr>
<td>Bottom line</td>
<td>- OK, which signs have been proven effective at either reducing crashes or changing driver behavior?</td>
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<tr>
<td></td>
<td>- A search of the traffic safety literature found that the only types of signs that have been proven effective are the Horizontal Alignment Series (but only in a fairly narrow range of curve radii).</td>
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<td>- Research published by NCHRP found that pedestrian warning signs in combination with marked crosswalks at uncontrolled intersections in fact resulted in greater numbers of pedestrian crashes.</td>
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<td>- Guide Signs have been found to only have a minimal effect on intersection crashes but are assumed to improve way finding and navigation.</td>
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<tr>
<td></td>
<td>- Bottom line – If your decision to install a sign is based on an expectation of effectiveness – either reducing crashes or changing driver behavior – the literature in support is virtually non-existent.</td>
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<td>- It appears that most signs fall into a category of hope - hope they do some good and an expectation that at least they don't do any harm.</td>
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Sign Removal – Which Signs Are Candidates? (2/2)

- Static signs that warn drivers of hazardous conditions they rarely encounter quickly lose credibility and become part of the background noise that drivers tune out.

- Mn/DOT is removing DEER CROSSING Warning signs because they have not proven to be effective at reducing deer/vehicle collisions. (They also determined that the signs had proven ineffective at training the deer where to cross the highways.)

- Advance curve warning signs were found to be effective in only a fairly narrow range of curve radii – curves with radii between 1,000 feet and 1,800 feet. There was no safety effect in larger radius curves and in shorter radius curves it was found that a combination of Advance Curve Warning PLUS Chevrons was required to produce a crash reduction. Try to achieve consistency across your system. If you have curve warning signs in advance of long radius curves, those could be candidates for removal based on system wide considerations.

- A number of studies have found that marked pedestrian crosswalks and their advance warning signs are NOT safety devices when used at uncontrolled locations. Pedestrian crash rates are actually higher at marked locations.

- There is no evidence that special warning signs of this type either change driver behavior (reduce travel speed) or improve safety.
Sign Removal – Managing Risk

Why Consider Removing Signs
- Maintenance Costs
- Problem→Solution Link
- Effectiveness/Ineffectiveness
- System Considerations
- Safety-Crosswalks, Unnecessary STOP signs, Children at Play – these types of signs could actually increase the number of crashes.

Process to Follow – Manage Risk
- Bring your decisions under an umbrella of immunity.
- Discretionary Immunity is generated by actions consistent with adopted policies and ordinances.
- Official Immunity is generated by exercising your engineering judgment as part of an engineering study and then documenting your actions.

Discretionary
- Have the highest decision making body (City Council, County Commission, Township Board) adopt a policy or pass a resolution – specifying types of signs that will be installed and those that will not (candidates for removal)
- Document the outcome of your actions relative to installing/replacing signs vs. removing signs, consistent with the direction provided by your decision making body.

Official
- Conduct an engineering study.
- Document the applicable guidelines in the MnMNUTCD.
- Document the conditions in the field.
- Document your decision.
Available L/TAP Training

Dates and Locations

- **May 4, 2010** — Willmar Conference Center, 2100 East Highway 12, Willmar, MN 56201
- **May 6, 2010** — Red Roof Inn, 2115 South 6th Street, Brainerd, MN 56401
- **May 19, 2010** — Mankato City Center Hotel, 101 East Main Street, Mankato, MN 56001

Cost (includes lunch, coffee breaks, and program materials):
- $60 – Township & Tribal Representatives
- $70 – City, County, State, and Federal Representatives
- $150 – All Others

http://www.mnltap.umn.edu/Events/TrafficControl/SignMaintenance.html
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