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Minnesota Manual on Uniform Traffic Control Devices – Background

- 23 Code of Federal Regulations (CFR), Part 655.603 adopts the MUTCD as the national standard for any street, highway or bicycle trail open to the public.

- Section 15 of the Uniform Vehicle Code adopts the MUTCD as the standard of the conformance of signs, signals, markings and other devices intended to regulate, warn or guide traffic.

- The Commissioner of Transportation has adopted the MN MUTCD for all public roadways [and private roadways open to the public] in Minnesota (Commissioner Order No. 92452 – December 15, 2011).

- MS 169.06 empowers the Commissioner and local road authorities to place and maintain traffic control devices on roadways within their jurisdiction, to regulate, warn, or guide traffic.

Yes, the MN MUTCD applies to your roads – it applies to all public roads and private roads open to the public in Minnesota.
Current Requirements

- Signs have always been required to be retroreflective. No minimum values had previously been required.
- Language adopted in the MN MUTCD requires all agencies that maintain roadways open to public travel to adopt a sign maintenance program designed to maintain traffic sign retroreflectivity at or above specific levels.
- All agencies responsible for maintaining traffic signs are required to comply with the new MN MUTCD requirements.
- **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 the MN MUTCD Table 2A-3 (page A-5).

**COMPLIANCE DATE:** June 13, 2014

Reminder

- In the MN MUTCD words have very specific meanings:
  1. **STANDARD** - a statement of required practice and the verb **SHALL** is used.
  2. **GUIDANCE** - a statement of recommended practice with deviations allowed based on engineering judgement. The verb **SHOULD** is used.
  3. **OPTION** - a statement of practice that is permissive. The verb **MAY** is used.
**Specified Levels of Retroreflectivity**

### Table 2A-3: Minimum Maintained Retroreflectivity Levels

<table>
<thead>
<tr>
<th>Sign Color</th>
<th>Bold Symbol Signs</th>
<th>Fire Symbol Signs - Symbol signs not listed as Bold Symbol Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>White on Green</td>
<td>W-1, -2 – Turn and Curve</td>
<td>W3-3 – Two-Way Traffic</td>
</tr>
<tr>
<td>Black on Yellow or Black on Orange</td>
<td>W-3 – Skip Ahead</td>
<td>W11-1 – Pedestrian Crossing</td>
</tr>
<tr>
<td>White on Red</td>
<td>W-4 – Lane Ends</td>
<td>W11-3 – 18 Pu. –22</td>
</tr>
<tr>
<td>Black on White</td>
<td>W-5 – Entering Roadway Merge</td>
<td>W11-5 – Farm Equipment</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-6 – Entering Enters</td>
<td>W11-7 – Snowmobile Crossing</td>
</tr>
<tr>
<td>Black on Gray</td>
<td>W-7 – Double Arrow</td>
<td>W11-9 – Snow Station</td>
</tr>
<tr>
<td>Black on Blue</td>
<td>W-8 – Chevron</td>
<td>W11-10 – Truck Crossing</td>
</tr>
<tr>
<td>Black on Yellow</td>
<td>W-9 – Reverse Turn and Curve</td>
<td>W11-12 – Double Arrow</td>
</tr>
<tr>
<td>Black on Red</td>
<td>W-10 – Intersection</td>
<td>W11-14 – Double Arrow</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-11 – Hairpin Curve</td>
<td>W11-16 – Flagger</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-12 – 270 Degree Loop</td>
<td>W11-18 – Worker</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-13 – Cross Road</td>
<td>W11-20 – Advance Warning</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-14 – 3, 4 – Side Road</td>
<td>W11-22 – Pedestrian Crossing</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-15 – Circular Intersection</td>
<td>W11-24 – Pedestrian Crossing</td>
</tr>
<tr>
<td>Black on Black</td>
<td>W-16 – 4, 8 – Double Side Roads</td>
<td>W11-26 – Pedestrian Crossing</td>
</tr>
</tbody>
</table>

**Additional Criteria**

- The minimum retroreflectivity levels are in units of Candela / lux / meter² measured at an observation angle of 0.2° and an entrance angle of -4.0°.
- All Regulatory, Warning and Guide signs and object markers are required to be retroreflective or illuminated to show the same shape and similar color by both day and night. The requirement for sign illumination is not considered to be satisfied by street, highway or strobe lighting. An agency may exclude the following signs from the retroreflectivity maintenance policy. Guide signs should be added to an agency’s policy as resources allow.
  - Guide Signs
  - Parking, Standing and Stopping signs (R7 and R8 series)
  - Walking/Hitchhiking/Crossing signs (R9 series, R10-1 through R10-6)
  - Adopt-A-Highway signs
  - All signs with blue (motor services) or brown (recreational) backgrounds
  - Bikeway signs that are intended for exclusive use by bicyclists or pedestrians
Comparison of Reflective Sheeting Material

Life Cycle Costs & Initial Retroreflectivity

<table>
<thead>
<tr>
<th>Sheeting Material (ASTM)</th>
<th>Type I</th>
<th>Type IV</th>
<th>Type IX</th>
<th>Type XI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Cost ($/SF)</td>
<td>$0.85</td>
<td>$1.20</td>
<td>$4.25</td>
<td>$3.50</td>
</tr>
<tr>
<td>Finished Sign Cost</td>
<td>$30</td>
<td>$25</td>
<td>$51</td>
<td>$45</td>
</tr>
<tr>
<td>Anticipated Life (years)</td>
<td>5 – 7</td>
<td>10-12</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Life Cycle Cost</td>
<td>$130</td>
<td>$50</td>
<td>$119</td>
<td>$45</td>
</tr>
<tr>
<td>Initial Retroreflectivity (white)</td>
<td>70</td>
<td>300</td>
<td>380</td>
<td>580</td>
</tr>
</tbody>
</table>

Source: 3M Traffic Safety Systems Division, August 2014

Typical Installation Cost

<table>
<thead>
<tr>
<th></th>
<th>Stop (36x36)</th>
<th>Warning (36x36)</th>
<th>Regulatory (24x30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>See $240</td>
<td>$240</td>
<td>$240</td>
<td>$240</td>
</tr>
<tr>
<td>See $240</td>
<td>$260</td>
<td>$260</td>
<td>$260</td>
</tr>
<tr>
<td>See $230</td>
<td>$230</td>
<td>$230</td>
<td>$230</td>
</tr>
</tbody>
</table>

Source: MnDOT

Sample Degradation Curve
Type IX Yellow

A comparison of the types of reflective sheeting material suggests:

- The low initial cost material would meet most of the minimum retroreflectivity levels but would be expected to degrade quickly below minimum levels.
- The higher performance sheeting, initially more expensive, provides a much longer anticipated life, much higher levels of retroreflectivity and superior life cycle costs.

The fairly narrow range of typical sign installation costs (sign blank + sheeting + posts + labor) suggests that agencies would pay a premium of between 5% to 15% for using higher performance sheeting.

Additional installation cost information provided by a number of agencies indicates that quantity discounts could reduce the per sign cost by 20% to 30%.
Traffic Sign Life Expectancy

- Regarding the anticipated life of signs – there is a high level of interest in establishing a specific value for each type of sheeting material. However, current research suggests that available data is inconclusive, but supports a life expectancy range of 12 to 20 years for beaded sheeting material (Types I, II and III) and 15 to 30 years for prismatic sheeting (Types III, IV, VI, VII, VIII, IX, X, XI). A summary of this research is provided in a recent report published by MnDOT (Traffic Sign Life Expectancy – Report No. 2014-20).

- MnDOT Report No. 2014-20 analyzed retroreflectivity readings from approximately 400 signs in Minnesota and concluded that the results were similar to those reported in other states, but that the small sample size was not sufficient to produce statistically reliable results.

- As part of this study, MnDOT established a sign sheeting test deck at the MnROAD facility and has indicated that they intend to maintain the test deck and continue recording the retroreflectivity until the sheeting material degrades below the established thresholds. This effort would help define the expected life of sheeting material in Minnesota.
Retroreflectivity Compliance Dates

- May 14, 2012 - 2009 MUTCD compliance dates revised (most eliminated).
- June 13, 2014 – All agencies must implement and use an assessment or management method that is designed to maintain Regulatory and Warning traffic sign retroreflectivity at or above the established minimum levels.
- ALL signs must now be at or above minimum retroreflectivity levels or illuminated to show the same shape and similar color by both day and night.
- Existing signs must be compliant as outlined in the sign assessment or management method.
Maintenance Methods

What Are The Choices?
- Assessment Methods
  - Visual Nighttime Assessment
  - Calibration Signs Procedure
  - Comparison Panels Procedure
  - Consistent Parameters Procedure
  - Measured Sign Retrorreflectivity
- Management Methods
  - Expected Sign Life
  - Blanket Replacement
  - Control Signs
- Combination or Other Methods
  - Blanket Replacement & Expected Sign Life
  - Visual Nighttime Inspection & Control Signs
  - Other Methods documented in an Engineering Study

How Do I Decide?

Management
- Expected Sign Life
- Blanket Replacement
- Control Signs

Assessment
- Visual Nighttime Assessment
- Measured Sign Retrorreflectivity

Some examples include:
- Blanket Replacement & Expected Sign Life
- Visual Nighttime Inspection & Control Signs
- Other Methods documented in an Engineering Study
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:

\[
25 \text{ signs/mile} \times 50 \text{ miles} \times $200/\text{sign} + 6 \text{ signs/mile} \times 50 \text{ miles} \times $250/\text{sign} = $325,000
\]

All signs must be retroreflective or illuminated. Only Regulatory and Warning signs must be a part of your assessment or management method. Add Guide signs as resources allow.

Consider reducing your inventory of signs.

* Replacement costs include sign blank, sheeting material, sign posts, and installation. Constant 2014&.
Maintaining your system of signs has always been a good idea, but now it’s a required action.

Given the minimum level of required maintenance, agencies should re-evaluate their sign maintenance budgets.

Annual sign maintenance budget = cost to address retroreflectivity + cost to address vandalism, knockdowns and mother nature.

A study from the North Carolina Department of Transportation\(^1\) found that approximately 2.4% of signs are vandalized or knocked down in a year.

Annual cost to address degradation of retroreflectivity (Assuming a 15 year replacement cycle) = $21,650

Annual cost to address damage by vandalism and knockdowns = $7,800

A typical small city annual sign maintenance budget = $29,450

Reduce the sign maintenance budget by removing signs that are NOT required.

\(^{1}\) North Carolina Department of Transportation, “Designing an Efficient Nighttime Sign Inspection Procedure to Ensure Motorist Safety”

\* Constant 2014\$
Financial Budgeting – Cities over 5,000 Population (1/2)

- A typical large city has approximately 200 miles of city 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 large city would be:

\[
\text{25 signs/mile} \times \text{200 miles} \times \text{SPEED LIMIT 35} \times \$200/\text{sign} = \$1,300,000
\]

\[
\text{6 signs/mile} \times \$250/\text{sign}
\]

- All signs must be retroreflective or illuminated. Only Regulatory and Warning signs must be a part of your assessment or management method. Add Guide signs as resources allow.
- Consider reducing your inventory of signs

* Replacement costs include sign blank, sheeting material, sign posts, and installation.

Current 2014 $
Financial Budgeting – Cities over 5,000 Population (2/2)

- Maintaining your system of signs has always been a good idea, but now it's a required action.
- Given the minimum level of required maintenance, agencies should re-evaluate their sign maintenance budgets.
- Annual sign maintenance budget = cost to address retroreflectivity + cost to address vandalism, knock downs and mother nature.
- A study from the North Carolina Department of Transportation (Assuming a 15 year replacement cycle) found that approximately 2.4% of signs are vandalized or knocked down in a year.
- Annual cost to address degradation of retroreflectivity (Assuming a 15 year replacement cycle) = $87,000
- Annual cost to address damage by vandalism and knock downs = $31,000
- A typical large city annual sign maintenance budget = $118,000
- Reduce the sign maintenance budget by removing signs that are NOT required.

Total Annual Cost = $118,000/year

- Vandalism & Knockdowns = $31,000/year
- Blanket Replacement Cost = $87,000/year

---

1 North Carolina Department of Transportation, “Designing an Efficient Nighttime Sign Inspection Procedure to Ensure Motorist Safety”
Financial Budgeting – Counties (1/2)

- A typical county highway system consists of approximately 500 miles of rural roadways with an average of 20 traffic signs per mile (both directions).
- A typical sign replacement cost is $200 per sign*.
- The total cost to upgrade/replace signs in a typical County would be:

\[
500 \text{ miles} \times 20 \text{ signs/mile} \times \$200/\text{sign} = \$2,000,000
\]

- All signs must be retroreflective or illuminated. Only Regulatory and Warning signs must be a part of your assessment or management method. Add Guide signs as resources allow.
- Another strategy to consider in an effort to reduce your costs – reduce your inventory of signs.

* Replacement costs include sign blanks, sheeting material, sign posts, and installation. Constant 2014 $
Maintaining your system of signs has always been a good idea, but now it's a required action.

Given the minimum level of required maintenance, agencies should re-evaluate their sign maintenance budgets.

Annual sign maintenance budget = cost to address retroreflectivity + cost to address vandalism, knockdowns and mother nature.

A study from the North Carolina Department of Transportation\(^1\) found that approximately 2.4% of signs are vandaled or knocked down in a year.

Annual cost to address degradation of retroreflectivity (Assuming a 15 year replacement cycle) = $133,000

Annual cost to address damage by vandalism and knockdowns = $48,000

A typical county annual sign maintenance budget = $181,000

Reduce the sign maintenance budget by removing signs that are NOT required.

---

\(^1\) North Carolina Department of Transportation, "Designing an Efficient Nighttime Sign Inspection Procedure to Ensure Motorist Safety"
Real Life Sign Removals – Stevens County Townships

How do I get my agency on board with removing signs?

- In 2011 and 2012, MnDOT piloted a program with Townships in Stevens County to inventory signs and conduct an engineering investigation to determine which signs could be removed.
- The investigation identified 285 Regulatory, Warning and Guide Signs (28% of the total number of signs in these townships) as candidates for removal. The townships have agreed to the removals.

- Of 285 signs to be removed:
  - 93% are Warning (i.e., STOP/YIELD Ahead, Cross Road, T-Intersection signs)
  - 4% are Regulatory (i.e., YIELD, Speed Limit signs)
  - 1% are Guide (i.e., Street signs)

- The townships then benefit from long term savings by reducing costs for installation, along with yearly inventory and maintenance.
What Could This Mean for my Township Sign Maintenance Budget?

- Reducing your sign inventory by 28%, would result in a 28% savings in your annual sign maintenance budget.
- This is a representation of total savings in Townships. In jurisdictions with larger sign inventory, the savings would be even greater.

Old = $2,450/year
Old = $650/year
Old = $1,800/year

$680 Annual Savings
New Total Annual Cost = $1,770/year
New Vandalism & Knockdowns = $470/year
New Blanket Replacement Cost = $1,330/year

*Constant 2014 $
Financial Budgeting – Summary

- You probably found these suggested levels of investments necessary to maintain your inventory of signs as shocking as we did.
- These levels are likely to be 10 to 20 times more than you have previously spent.
- Please don’t walk away from this issue and either do nothing or merely continue on with your previous levels of replacement - from a risk management perspective, the stakes are too high.
- The only part of the cost formula that you can control is the size of your inventory.
- It appears that the best way to reduce your sign maintenance costs is to reduce the size of your inventory and that will require removing some signs.
- It also appears that the best way to manage your risk when removing signs is to bring your actions under two umbrellas of immunity (from liability)
  - Discretionary Immunity - policy driven
  - Official Immunity - exercise of engineering judgement
- Another way to reduce your sign maintenance costs is to group your agency’s signs with another or multiple agencies to perform maintenance and get a bulk savings.
- Intrigued? Please continue...
Model Sign Maintenance Policy

- Which sign maintenance method is adopted? (Blanket Replacement - replace 1/15 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 MN MUTCD

- 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

The following pages provide examples of signing policies from around Minnesota. Additional examples can be found in the Appendix.
Regulatory Sign Usage (3/3)

- Understand the difference in the levels of guidance provided in the MN MUTCD.
- In the category – Regulatory Signs – the only signs that are required are:
  - Speed Limits (if in an established speed zone)
  - ONE WAY / DO NOT ENTER
  - Turn Prohibitions
  - ALL-WAY STOP supplementary plaque
  - STOP or YIELD* at at-grade passive railroad crossings (railroad responsibility)

- All other Regulatory signs may be used based on your agency’s policies, system considerations, and the results of an engineer (or their designated representative) exercising their judgment.

- This is not an error – STOP signs are NOT required. The MN MUTCD states that STOP signs SHOULd be used based on the results of an engineering study and that one of the suggested applications should be at a street entering a “through highway.” Minnesota Statute §169.30 says that the through highway is generally the approach with the highest traffic flow. Minnesota Statute §169.30 also says that normally it is desirable to erect STOP signs at all public entrances to highways.

<table>
<thead>
<tr>
<th>STANDARD (Shall)</th>
<th>GUIDANCE (Should)</th>
<th>OPTION (May)</th>
<th>SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Limits</td>
<td>Stop</td>
<td>Yield</td>
<td>No Parking</td>
</tr>
<tr>
<td>One Way Do Not Enter</td>
<td>Road/Bridge/ Sidewalk Closed</td>
<td>Slower Traffic Keep Right</td>
<td>End Speed Zone</td>
</tr>
<tr>
<td>Turn Prohibition</td>
<td>Pass With Care</td>
<td>Wrong Way</td>
<td></td>
</tr>
<tr>
<td>All Way (Stop) Supplementary Plaque</td>
<td>Intersection Lane Control</td>
<td>Cross Traffic Does Not Stop</td>
<td></td>
</tr>
<tr>
<td>Stop or Yield* at at-grade passive railroad crossings (railroad responsibility)</td>
<td>Two-Way Left Turn Lane</td>
<td>Advance Intersection Lane Control</td>
<td></td>
</tr>
<tr>
<td>Right/Left Turn Lane</td>
<td>Stop For Peds In Cross Walk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Law Signs</td>
<td>Do Not Pass</td>
<td></td>
<td></td>
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<tr>
<td>Speed Reduction</td>
<td>Keep Off Median</td>
<td></td>
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<tr>
<td>Traffic Signal (Clarifications)</td>
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<tr>
<td>Pedestrian Crossing</td>
<td></td>
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</tr>
<tr>
<td>Weight Limits</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*Determination of a STOP or YIELD sign is based on a site visit with MdDOT, the railroad and road authority.
Warning Sign Usage (3/4)

- In the category – Warning Signs – the only signs that are required are:
  - Railroad Crossing
  - Low Clearance
  - Advance Traffic Control (if sight distance to the device is limited or impaired)
  - No Train Horn
  - Horizontal Alignment series on roads with more than 1,000 AADT

- All other Warning signs may be used based on your agency's policies, system considerations and the results of an engineer (or their designated representative) exercising their judgment.

<table>
<thead>
<tr>
<th>STANDARD (Shall)</th>
<th>GUIDANCE (Should)</th>
<th>OPTION (May)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railroad Crossing</td>
<td>Hill</td>
<td>No Passing Pennant</td>
</tr>
<tr>
<td>Low Clearance (Less Than 12 In. Above Legal Max. Height)</td>
<td>Road/Bridge Narrows</td>
<td>Horizontal Alignment</td>
</tr>
<tr>
<td>Advance Traffic Control (Limited Sight Distance)</td>
<td>Divided Highway</td>
<td>Next XX Miles Distance Plaque</td>
</tr>
<tr>
<td>No Train Horn</td>
<td>Bump/Dip</td>
<td>Advisory Speed Plaque</td>
</tr>
<tr>
<td>Horizontal Alignment series on roads with more than 1,000 AADT</td>
<td>Pavement Ends</td>
<td>One Direction Large Arrow</td>
</tr>
<tr>
<td>Speed Bump/Hump</td>
<td>Chevron Alignment</td>
<td></td>
</tr>
<tr>
<td>Soft Shoulder</td>
<td>Dead End/No Outlet</td>
<td></td>
</tr>
<tr>
<td>Added Lane</td>
<td>Slippery When Wet</td>
<td></td>
</tr>
<tr>
<td>Lane Ends</td>
<td>Prepare To Stop</td>
<td></td>
</tr>
<tr>
<td>Two Direction Large Arrow</td>
<td>Crossings (Pedestrians, Bicycles, Snowmobiles, Etc.)</td>
<td></td>
</tr>
<tr>
<td>Two-Way Traffic</td>
<td>Merge</td>
<td></td>
</tr>
<tr>
<td>Two-Way Traffic</td>
<td>Cross Traffic Does Not Stop</td>
<td></td>
</tr>
<tr>
<td>Playground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intersection Warning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advance Traffic Control (General Application)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Guide Sign Usage (3/3)

In the category – Guide Signs – the only signs that are required are:
- Route Numbers (on all numbered highways)
- Junction Assembly (i.e., Jct US 63)
- Advance Route Turn Assembly

<table>
<thead>
<tr>
<th>STANDARD (Shall)</th>
<th>GUIDANCE (Should)</th>
<th>OPTION (May)</th>
<th>SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Numbers (On All Numbered Highways)</td>
<td>Street Names</td>
<td>Reference Location (Mile Markers)</td>
<td>Destination and Distance</td>
</tr>
<tr>
<td>Junction Assembly (Jct US 63)</td>
<td>City Name Marker</td>
<td></td>
<td>Confirming Assemblies</td>
</tr>
<tr>
<td>Advance Route Turn Assembly</td>
<td></td>
<td></td>
<td>County Name Marker</td>
</tr>
</tbody>
</table>
Low Volume Road Sign Usage (1/3)

- Low volume roads are defined in the Manual as:
  - Having fewer than 400 vehicles per day
  - Not being on a designated State road system
  - Being in a rural area outside of towns and cities
  - Not a neighborhood street or a freeway frontage road
- “Low Volume Roads” there are few usage requirements:
  - Only STOP or YIELD signs are required at passive railroad crossings – several should/may be used based on engineering judgment.
  - Three types of Warning signs are required – Advance Intersection Traffic Control, Rail Road Crossing signs and MINIMUM MAINTENANCE ROAD signs.

*These are the only signs REQUIRED by the MN MUTCD. Other signs may be used based on Engineering Judgment.*

<table>
<thead>
<tr>
<th>Regulatory Signs</th>
<th>STANDARD (Shall)</th>
<th>GUIDANCE (Should)</th>
<th>OPTION (May)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP or YIELD at passive railroad crossing</td>
<td>STOP YIELD Traffic Movement Traffic Prohibition</td>
<td>Speed Limit No Parking</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Warning Signs</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP Ahead (Limited Sight Distance)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YIELD Ahead (Limited Sight Distance)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail Grade Crossing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail Advance Warning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINIMUM MAINTENANCE ROAD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ONE LANE BRIDGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crossings (vehicular)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal Alignment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intersections</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrow Bridge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAVEMENT ENDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crossings (Pedestrians)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advisory Speed Plaque</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEAD END/NO OUTLET</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Guide Signs</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Destinations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Which Signs are Required by the 2014 MN MUTCD?

<table>
<thead>
<tr>
<th>Regulatory</th>
<th>Warning</th>
<th>Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Regulatory Signs" /></td>
<td><img src="image" alt="Warning Signs" /></td>
<td><img src="image" alt="Guide Signs" /></td>
</tr>
<tr>
<td>- Speed Limits $\text{LE}$ a speed zone (other than a statutory limit) has been established.</td>
<td>- Rail Road Advance Warning and No Train Horn (if quiet zone established)</td>
<td>- Route Numbers on ALL numbered highways</td>
</tr>
<tr>
<td>- ONE-WAY &amp; DO NOT ENTER where applicable.</td>
<td>- Clearance $\text{LE}$ clearance is less than 14'-6&quot; (12&quot; above the statutory minimum clearance height)</td>
<td>- Junction Assembly</td>
</tr>
<tr>
<td>- The ALL-WAY STOP plaque at All-Way Stops.</td>
<td>- Advance Traffic Control $\text{LE}$ there is limited sight distance.</td>
<td>- Advance Route Turn Assembly</td>
</tr>
<tr>
<td>- STOP or YIELD $\text{LE}$ at a passive railroad crossing</td>
<td>- Horizontal Alignment $\text{LE}$ more than 1,000 AADT</td>
<td></td>
</tr>
<tr>
<td>- Prohibition signs where applicable</td>
<td>- Minimum Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

Note: The determination as to which signs in the MN MUTCD are required is based on the 2014 version. Subsequent editions may result in additions to or deletions from the list.

- 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 MN MUTCD – 15 types of signs are required.
- This suggests that if you decide to put up a sign – most of the time that action will be based on exercising your judgment and NOT on the requirements in the MN MUTCD.
How to Measure Effectiveness?

- In order to determine the effectiveness of signs — you have to ask what is the Performance Measure?
- The most commonly cited measure is **CRASHES**, but that is a very difficult piece of information to work with because only a very few signs are related to safety and there are too few crashes at most locations to produce statistically reliable results.
- It appears that a second (and possibly better) measure of effectiveness would be **DRIVER BEHAVIOR**. Did the sign change behavior in the desired way? Was the response consistent among drivers?
Effectiveness of Regulatory Signs – Speed Limit

Drivers select a speed they perceive as safe based on their reaction to actual conditions, presence of pedestrians, road width, parked vehicles, etc.) along a roadway.

Speed limit signs have never proven to change driver behavior.

Drivers only comply with speed limits (and the signs) if the posted limits are consistent with a driver’s perception of the road environment and their selection of a safe speed, that is approximated by the 85th percentile speed.

Lower speed limits are frequently requested in order to improve safety. There is one very substantial problem with this theory – it is NOT consistent with actual crash data. Analysis of a sample of urban, conventional roads found that crash rates decreased with increased speed limits.

| Study Location | Before | After | Sign Change | 95% Before | Change
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TH 65</td>
<td>SPEED</td>
<td>40</td>
<td>-10</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>30</td>
<td></td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>TH 86</td>
<td>SPEED</td>
<td>50</td>
<td>-10</td>
<td>44</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>40</td>
<td></td>
<td>44</td>
<td>46</td>
</tr>
<tr>
<td>Amana CSAH 1</td>
<td>SPEED</td>
<td>45</td>
<td>-5</td>
<td>48</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>40</td>
<td></td>
<td>48</td>
<td>49</td>
</tr>
<tr>
<td>Amana CSAH 24</td>
<td>SPEED</td>
<td>40</td>
<td>+15</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>45</td>
<td></td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>Amana CR 51</td>
<td>SPEED</td>
<td>40</td>
<td>+5</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>45</td>
<td></td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Hertr. CSAH 4</td>
<td>SPEED</td>
<td>50</td>
<td>-10</td>
<td>62</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>40</td>
<td></td>
<td>62</td>
<td>51</td>
</tr>
<tr>
<td>Nokota Ave.</td>
<td>SPEED</td>
<td>35</td>
<td>+5</td>
<td>37</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>40</td>
<td></td>
<td>37</td>
<td>40</td>
</tr>
<tr>
<td>50th Ave. N</td>
<td>SPEED</td>
<td>35</td>
<td>-5</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>30</td>
<td></td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Mes. St.</td>
<td>SPEED</td>
<td>30</td>
<td>+5</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>LIMIT</td>
<td>35</td>
<td></td>
<td>39</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TH 210 Baxter</th>
<th>Before</th>
<th>After</th>
<th>Posted</th>
<th>Percentage</th>
<th>% Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55</td>
<td>45</td>
<td>57</td>
<td>57</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>88%</td>
<td>88%</td>
<td>88%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>66</td>
<td>66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TH 316 Hastings</th>
<th>Before</th>
<th>After</th>
<th>Posted</th>
<th>Percentage</th>
<th>% Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45</td>
<td>35</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>88%</td>
<td>88%</td>
<td>88%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>66</td>
<td>66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Unpublished MnDOT Data

MN Urban Roadway Crash Rates vs. Posted Speed Limits

Effectiveness of Regulatory Signs – STOP signs

A comprehensive study of a sample of low volume rural intersections with STOP, YIELD and NO CONTROL found that the number of crashes was NOT related to the degree of control.¹

Summary of Significant Data¹

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Number of Intersections</th>
<th>Average Volume (vpd)</th>
<th>Average Crashes/int</th>
<th>Intersections w/NO Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stop</td>
<td>Yields</td>
<td>No Control</td>
<td>Statistical Significance</td>
</tr>
<tr>
<td>Number</td>
<td>48</td>
<td>48</td>
<td>44</td>
<td>—</td>
</tr>
<tr>
<td>Average</td>
<td>2,530</td>
<td>2,380</td>
<td>3,800</td>
<td>—</td>
</tr>
<tr>
<td>Major Roadway</td>
<td>200</td>
<td>150</td>
<td>120</td>
<td>—</td>
</tr>
<tr>
<td>Minor Roadway</td>
<td>0.44</td>
<td>0.42</td>
<td>0.32</td>
<td>—</td>
</tr>
<tr>
<td>Intersections</td>
<td>69%</td>
<td>83%</td>
<td>95%</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Driver Behavior

<table>
<thead>
<tr>
<th></th>
<th>Voluntary Stops</th>
<th>Slow Entries (&lt; 5mph)</th>
<th>Fast Entries (&gt; 5mph)</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19%</td>
<td>65%</td>
<td>16%</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>8%</td>
<td>70%</td>
<td>13%</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>9%</td>
<td>80%</td>
<td>11%</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

Increasing levels of control at low volume intersections did NOT reduce the number of crashes.

The fraction of intersections with NO crashes is inversely related to the level of control – 95% of the intersections with No Control had no crashes compared to 69% for STOP controlled intersections.

STOP signs have proven to have only a marginal effect on driver behavior at the low volume intersections, where the need to stop (based on interacting with conflicting vehicles) may not be obvious. Fewer than 20% of vehicles voluntarily stopped at STOP signs (vs. 9% at No Control intersections) and the fraction of Fast Entries at STOP controlled intersections was 45% higher than at intersections with No Control.

A recent study of intersections in Iowa² found that at low volumes (less than 150 entering vehicles per day), there was no statistically significant difference between the safety performance of a STOP controlled versus an uncontrolled intersection.

St. Louis County, MN recently added flags to an ALL-WAY STOP intersection and studied driver behavior. There was no statistical difference in STOP sign violations from before, during or after the flags were in place.

Summary of Previous Research on Driver Behavior at STOP Signs¹

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Stops</td>
<td>47%</td>
<td>45%</td>
<td>38%</td>
<td>20%</td>
<td>17%</td>
<td>22%</td>
<td>12%</td>
</tr>
<tr>
<td>Partial Violation (Rolling Stop)</td>
<td>42%</td>
<td>34%</td>
<td>42%</td>
<td>68%</td>
<td>69%</td>
<td>48%</td>
<td>60%</td>
</tr>
<tr>
<td>Full Violation (No Stop)</td>
<td>11%</td>
<td>21%</td>
<td>20%</td>
<td>14%</td>
<td>14%</td>
<td>30%</td>
<td>28%</td>
</tr>
</tbody>
</table>

¹ Strockton, Beckford and Moutrice, “STOP, YIELD and NO CONTROL at Intersections, Report No. FHWA/IN/02/04, 1981.
Effectiveness of Warning Signs – Children at Play

- A research synthesis prepared for the Wisconsin Department of Transportation found that there is no evidence that special Warning signs of this sort either change driver behavior or improve safety.

- MnDOT and the LRRB published research\(^2\) that found no evidence that Playground Warning signs reduced vehicle travel speeds. Instead, at these locations, vehicle speeds appeared to be related to the number of cars parked along the street.

- Traffic control devices are intended to change driver behavior and improve safety – these special Warning signs have not been found to do either.

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Effectiveness of Warning Signs – Horizontal Alignment

- The most frequently used Horizontal Alignment Warning signs include the Advanced Curve Warning and the Speed Advisory.

- FHWA’s Desktop Reference for Crash Reduction indicates that the standard Advance Curve Warning signs have been found to reduce road departure crashes by about 20 to 30% and the use of enhanced delineation (Chevrons) reduced crashes by 20 to 50%.

- A study of a sample of approximately 200 curves in Minnesota found the crash reduction associated in the Advanced Curve Warning was limited to curves with radii between 1,000 and 1,800 feet.

- The analysis of approximately 19,000 curves along highways in Minnesota Counties (part of the MnDOT sponsored project to prepare safety plans for all counties) found that 70% of severe crashes occurred in curves with radii between 500 and 1,200 feet. This same analysis also found that longer radius curves present a much lower total crash risk and very short radius curves a much lower severe crash risk. This kind of information can be used to prioritize curves across a system and aid in the development of a system wide approach to deploy horizontal alignment signs.

- A recent study of the effect of enhanced delineation – Chevrons in Connecticut and Washington found crash reductions in the range of 20-30% and a benefit/cost ratio of 8:1.

NEW STANDARD: In advance of horizontal curves on freeways, expressways, and on roads with more than 1,000 AADT that are functionally classified as arterials or collectors, Horizontal Alignment Warning signs shall be used in accordance with Table 2C-5 based on the speed differential between the roadway’s posted or statutory speed limit or 85th-percentile speed, whichever is higher, or the prevailing speed on the approach to the curve, and the horizontal curve’s advisory speed.

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2 Patel, Shankwitz, Preston and Barry: Benefit Cost Analysis of In-Vehicle Technologies and Infrastructure Modifications to Prevent Crashes along Curves and Shoulders, Min DOT Research Report 2009-4X, June, 2009
3 Techbrief, Safety Evaluation of Improved Curve Delineation, FHWA Report – HRT-09-046, November, 2009
Effectiveness of Signs (Pedestrians)

- One of the most commonly requested strategies to address pedestrian safety is the installation of a marked crosswalk accompanied by Pedestrian Crossing Warning signs.

- However, the results of two recent studies indicate that marked crosswalks (with pedestrian crossing warning signs) are NOT safety devices when used at uncontrolled intersections.

- A cross-sectional study of 2,000 intersections in 30 cities across the U.S. found that marked crosswalks at uncontrolled intersections resulted in higher pedestrian crash rates (than at unmarked/signalized crosswalks) and this effect is greatest for multi-lane arterials with traffic volumes over 15,000 vehicles per day.

- A Before vs. After study at over 500 intersections in San Diego and Los Angeles found a 70% reduction in pedestrian crashes following the removal of marked crosswalks at uncontrolled intersections.1

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1. Crash rate is the frequency of crashes divided by the number of pedestrians crossing at a particular location.
3. ITE (Institute of Transportation Engineers) Journal, September 2000

MINNESOTA'S BEST PRACTICES FOR TRAFFIC SIGN MAINTENANCE/MANAGEMENT HANDBOOK

F-8

October 2014
Effectiveness of Warning Signs

- A search of the safety research literature found NO documentation of crash reductions associated with any other Warning signs.
- It appears the use of Warning signs is more out of fear of litigation as opposed to the strategic application of a traffic control device to solve a specific problem at a specific location.
- The most comprehensive study\(^1\) of a Deer Crossing Warning signs found these signs did NOT either change driver behavior (reduce vehicle speeds) or reduce deer-vehicle crashes and concluded that in order to increase effectiveness, research should focus on developing a dynamic system that would provide accurate real time information.
- There appears to be a consensus among traffic engineers that static signs that warn of infrequent conditions or general possibilities – deer crossings, pavements that are slippery only when wet, rocks that may have fallen, low volume intersections and driveways with limited sight distances – are routinely ignored by drivers. This suggests that these signs would fail the effectiveness test because drivers do not choose to change their behavior based on information they determine to be either regularly wrong or of no value.

\(^1\) Knapp, K, Deer-Vehicle Crash Counter Measure Toolbox: A Decision and Choice Resource, University of Wisconsin. Report No. DVCIC-02, June 2004
### Sign Effectiveness Summary

- **OK, which signs have been proven effective at either reducing crashes or changing driver behavior?**
  - 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).
  - 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.
  - Guide Signs have been found to only have a minimal effect on intersection crashes but are assumed to improve way finding and navigation.
  - 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.
  - 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.

#### Table: Sign Effectiveness Summary

<table>
<thead>
<tr>
<th>Regulatory</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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Left Lane Must Turn Left</td>
<td>Speed Limit 50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slower Traffic Keep Right</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Warning    |                                      |                                                  |                                    |
|------------|-------------------------------------|--------------------------------------------------|                                    |
|            |                                      |                                                  |                                    |

| Guide      |                                      |                                                  |                                    |
|------------|-------------------------------------|--------------------------------------------------|                                    |
|            |                                     |                                                  |                                    |
Low Volume Road Sign Usage (3/3)

- We have established that most township roads likely meet the definition of Low Volume Roads, as a result very few signs (see E-27) are considered required.
- We’ve also established that the average annual sign maintenance cost for a typical township would be approximately $2,450 per year.
- If townships are unable to establish this level of funding in their annual budget, consideration should be given to conducting a sign inventory and study then removing signs that are not required.
- The Federal Highway Administration has suggested that sign reductions in the range of 25% should be easily achieved without any adverse effect on safety.
- The idea of sign reduction has been discussed with a number of township officials and many have been skeptical. A common response involves perceived concerns about safety – the signs were installed to address safety, if they are taken down there will be an adverse effect. In reality, the general safety effect of most signs is not well documented (See Part F) and in particular the effect on low volume township roads has never been studied. However, the graph of fatal crashes on township roads in Minnesota indicates that the long-term trend line is flat – even after the last major township signing initiative in the mid 1990’s.
  - This suggests that replacing signs on low volume township roads that are primarily used by local drivers does not appear to be associated with improved safety.
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.

- MnDOT 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.

- ONE WAY signs are not required in medians that are less than 30 feet wide if KEEP RIGHT signs are installed.

NOTE: On roads with 1,000 ADT or greater, the Horizontal Alignment sign series is required.
Potential Sign Removal Examples (1/5)

If you can’t think of any opportunities in your system to remove signs, consider these examples:

- The Children at Play sign isn’t required (it isn’t even listed in the MN MUTCD) and recent studies couldn’t find any history of either crash reduction or changed driver behavior. In other words, this sign has never been observed to have a positive effect and may even contribute to making the situation worse – giving the parents a false sense of security that the sign is somehow protecting their children.

- The Keep Right and Left Turn Lane signs in this photo are along a 30 mph, multi-lane city street that has continuous street lighting. These signs aren’t required. The Left Turn Lane sign is merely telling drivers what they should already know – they are in a turn only lane. The Keep Right sign might provide guidance at night (the median noses are entirely visible in daylight), however, all of the intersections have street lights. When asked why all these signs were installed, the response was – they are in the MN MNTCD (absolutely true) and State Aid would pay for them. But the local agency has to pay for ALL future costs forever.

- On the approach to this STOP sign located along a 30 mph city street, an Intersection Ahead and a STOP AHEAD sign are provided to help drivers comply with a STOP sign that is entirely visible along a road that is travelled primarily by residents that live in the area. The Intersection Ahead warning sign is not required and has never been proven effective at either reducing crashes or changing driver behavior. The STOP AHEAD sign would be required – if there was any sight restriction on the approach, which isn’t the case.
These signs were obstructed by tree limbs – if they are not important enough to trim the vegetation, they could be candidates for removal.

A 30 mph Speed Limit sign was installed along this narrow, winding residential street. The sign merely restates the statutory residential speed limit and was likely installed to placate residents. However it has been proven that speed limit signs have virtually no effect on driving behavior unless the limit is consistent with the driver’s perceptions of the road or there is a significant presence of law enforcement. (This city does NOT have a police force).

STOP signs have been routinely installed at hundreds of low-volume residential intersections where there is no compelling reason to stop. Also, there is no proof that these signs have ever accomplished anything other than wasting fuel. STOP signs could be removed if an engineering study determined that to do so did not result in an unusual level of hazard (or if an agency is uncomfortable with right-of-way at the intersection being based on drivers exercising the rule of the right, the STOP signs could be replaced with YIELD signs).
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.

- Have the highest decision making body (City Council, County Commission, Township Board) adopt a policy or pass a resolution – specifying types of sheeting material you use, expected sign life, signs to 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.

- Conduct an engineering study.
- Document the applicable guidelines in the MN MUTCD.
- Document the conditions in the field.
- Document your decision.
In 2001, the City of Orono adopted a Community Management Plan that codified the City’s desire to maintain the natural, wooded private residential nature of the community and to provide that virtually all city streets be low volume, low speed roadways.

The Plan also identified general design (paved roads, narrow gravel shoulders, no curb and gutter and no traffic control devices that are NOT required by MN MUTCD) and maintenance practices (tree removal and trimming limited to sight line maintenance for motorists) intended to support the preservation of the natural, rural, residential character of the City.

In May 2001, Kristal Monnens was killed in a single vehicle crash that occurred along one of the local roads - North Arm Drive.
Case Study #1: Monnens vs. City of Orono (2/3)

- The vehicle in which Ms. Monnens was a passenger was drag racing and was estimated exceeding 60 mph. When the vehicle failed to negotiate a curve to the left, it veered off the roadway and collided with a tree.

- The expert for the plaintiffs testified that Orono’s failure to place a curve warning sign was the primary cause of the crash and was evidence of the City’s negligence because the MN MUTCD required the use of the warning sign.

- The City argued summary judgment - dismissal of the lawsuit based on three key facts.
  - First, the City’s Community Management Plan specifies that in order to support the rural, residential nature of their local roads, traffic control devices that are NOT required will NOT be used.
  - Second, none of the Horizontal Alignment series of Warning signs were required (a SHALL condition) by the MN MUTCD - they were all optional signs that could be used based on engineering judgment.
  - The City had consistently avoided the use of Warning signs along their local roads.
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 Judgment – agreed that Curve Warning signs were NOT required at that time 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.
Case Study #2: Ireland vs. Lengsfeld and Carver County (1/3)

**Background:**
- Design
- Crash History
- Issues

**Lessons Learned:**
- Importance of Documentation
- Application of Doctrine of Official Immunity Applied to Traffic Engineering
Case Study #2: Ireland vs. Lengsfeld and Carver County (2/3)

**Background**
- 55 MPH Speed Limit
- Curve Warning Sign in Place
- Stop Ahead Sign in Place
- Rumble Strips in Place/Partially Filled
- Crash Occurred in the Middle of a Clear, Bright Summer Day

**Issues**
- No Speed Advisory on Curve Warning Sign
- No Distance Plaque on Stop Sign Ahead Sign
- Stop Ahead Sign at 750 Feet instead of 450 feet
- Maintenance of Rumble Strips

**Crash History**
- 2 Crashes per Year
- Crash Rate = 0.5 Crashes/Million Entering Vehicles
- Statewide Average = 0.6 Crashes/Million Entering Vehicles
- Critical Rate = 1.3 Crashes/Million Entering Vehicles
Case Study #2: Ireland vs. Lengsfeld and Carver County (3/3)

Legal Process:
1. Criminal Trial
2. Civil Case
   - County’s Motion for Summary Judgement (Denied)
   - County’s Appeal (Reversed District Courts Decision)
   - Plaintiffs Appeal to State Supreme Court (Refused to Hear the Case - Appeals Court Decision Stands)

Court of Appeals Decision (CX-96-19)
1. Reversed District Court Decision
   - Affirmed the sign placement was discretionary
   - Acknowledged MN MUTCD’s express deference to the judgment of engineers in installing traffic control devices
   - Affirmed that rumble strip maintenance is discretionary
   - Extended the Doctrine of Official Immunity to the decision making of a traffic engineer
   - In the future, plaintiffs will have to demonstrate that the government employee engaged in willful or malicious acts

Lessons Learned ➔ Written documentation of decisions regarding the placement of traffic signs (including a clear understanding of the guidance, facts that caused you to vary from the guidance and your ultimate decision) is a proven method for managing risk associated with actions that may not be entirely consistent with the MN MUTCD. No one expects you to document every decision you make – you will need to exercise your judgment to decide which of your decisions are potentially controversial enough to make the added investment of your time worth the effort.
Questions?

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