

Sign Life Expectancy - Retroreflectivity

March 5, 2014



Agenda

- Project Objective
- Project Status
- Data Collection and Analysis
- Data Results and Conclusions
 - ASTM Type I
 - ASTM Type IV
 - ASTM Type IX
 - ASTM Type XI
 - Summary
- The Policy Issue
 - Minnesota Rural County Example
 - Policies in place around US
 - Potential Risk Management Approaches
- What's Next?

Project Objective

Identify Best Practices for suggested sign life and sign maintenance policies using a combination of engineering and law knowledge, national research and sign retroreflectivity data collected in Minnesota

Project Status

- Tasks 1- 4 complete; Task 5 in progress
 - Survey of Practice completed
 - Data Collection: initially successful, with some difficulties. More testing of control signs & deck
 - Test Deck installed at MnROAD in July 2013; As of March, 2014:
 - 30 New Type XI Panels
 - 61 (mixed) Salvaged Panels
 - More New & Salvaged Panels will be added (space for 500)
 - Info & Data on Website to be refined
 - Recommendations and Draft Report Next (May 1st)
 - Final TAP Meeting Spring 2014 (at MnROAD?)

Data Collection

- 379 valid Retroreflectivity readings provided by:
 - City of Eagan
 - City of Golden Valley
 - City of Brooklyn Center
 - Dakota County
 - St Louis County
 - Watonwan County
 - MnDOT Research
 - MnDOT Metro District
- Tried to focus on ASTM Type XI and South-facing signs
- Each sign has a single data point; need to track same sheeting over time (Test Deck)

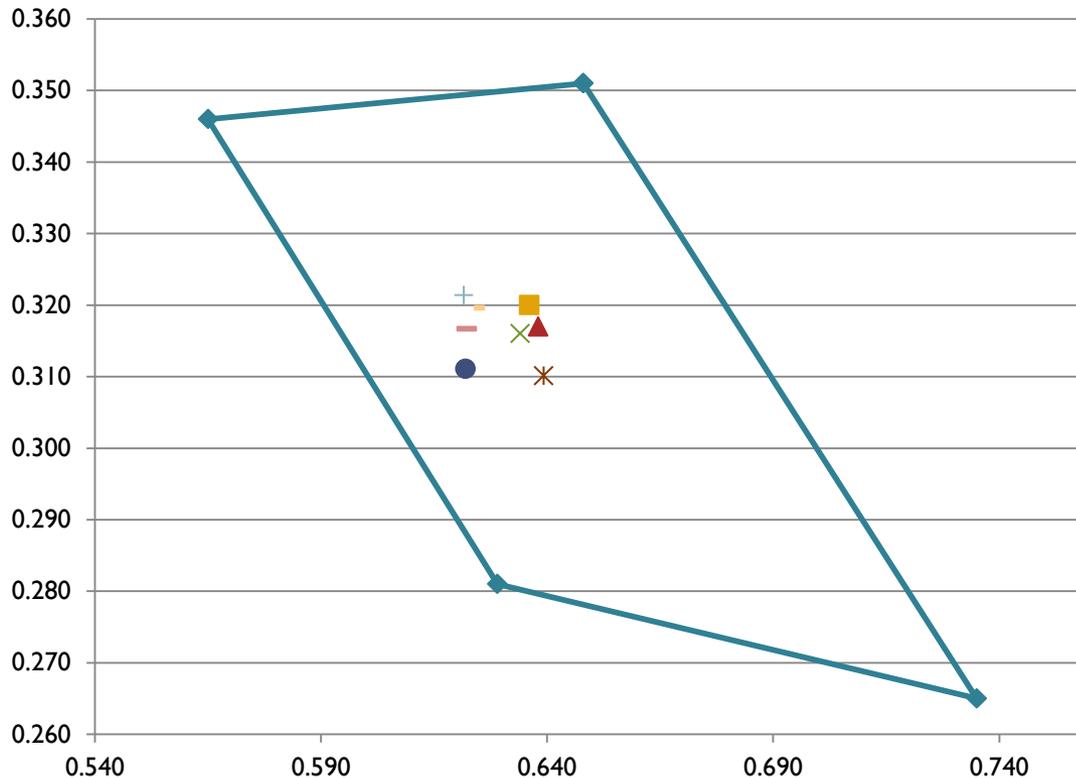
Data Analysis and Review

- Data compiled into Excel format and reviewed
- Modifications to Data (approx. 10% removed)
 - Data was corrected or removed if it was evident Background and Legend had been accidentally misidentified during the data recording process
 - Readings of zero on white sheeting, and high readings on black were removed (instrument may have been improperly placed on sign)
 - Signs more than 7 years old identified as Type XI sheeting were removed (Type XI sheeting was introduced 7 years ago)
- Only background retroreflectivity data was analyzed in colors: Red, Green, Yellow and White

Data Analysis and Review

- A linear trendline was added to the point plots to model (estimate) life expectancy of retroreflectivity based on approach to MNMUTCD specified minimum value
 - Sheeting types and colors remain separate due to their differentiating characteristics and minimum retroreflectivity values
- Separate MnDOT study on color degradation of signs

MnDOT Sign Color Data - Red



MnDOT is documenting and analyzing sign life with respect to color under another study.

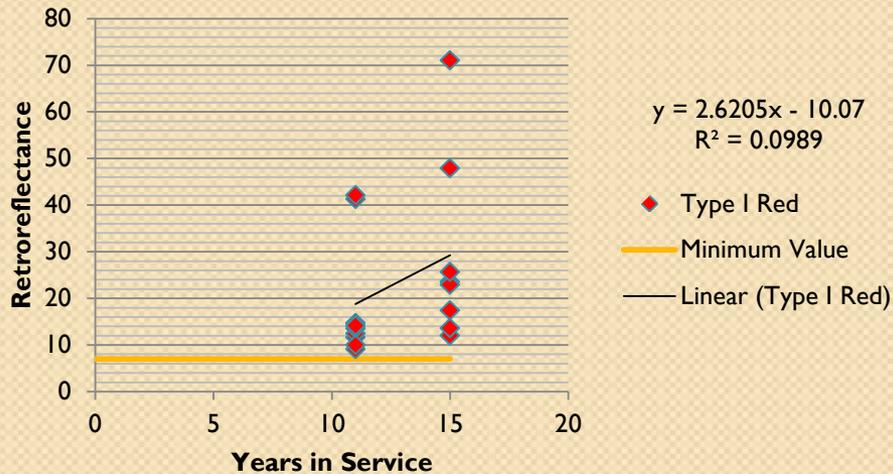
- 2013 DG3
- ▲ 11 R I D W 001
- × 11 R I D S 001
- * 11 R I D N 001
- 10 R I D E 001
- + 07 R I D W 001
- 07 R I D E 001
- 06 R I D N 001

Current data is within the color box. Continued study and analysis is required to determine when color is likely to fail.



MNDOT ASTM TYPE I SHEETING DATA

Type I Red

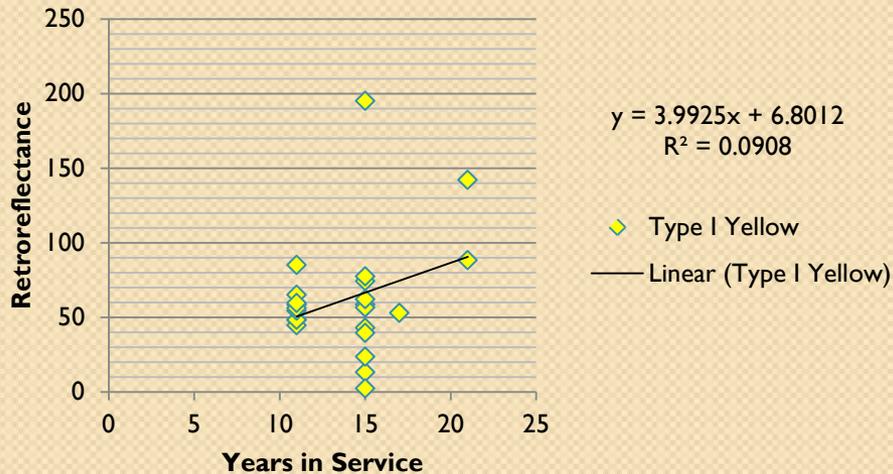


Data Key

of Signs: 17
 Agency: Golden Valley
 Min Retro Value: 7
 Signs < Min: 0
 Warranty: 7 Years

Trendline inconclusive

Type I Yellow



Data Key

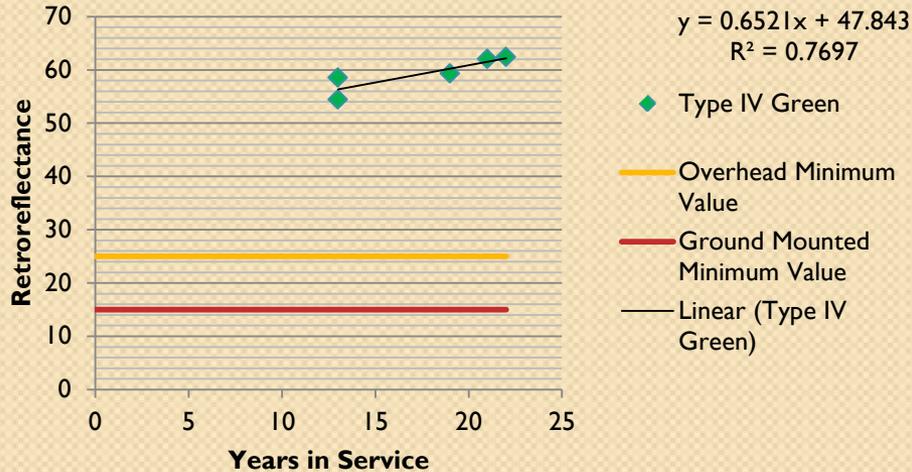
of Signs: 23
 Agency: Golden Valley
 Min Retro Value: Do Not Use
 Signs < Min: N/A
 Warranty: 7 Years

MNMUTCD new table states EG Sheeting should not be used for black on yellow signs



MNDOT ASTM TYPE IV SHEETING DATA

Type IV Green

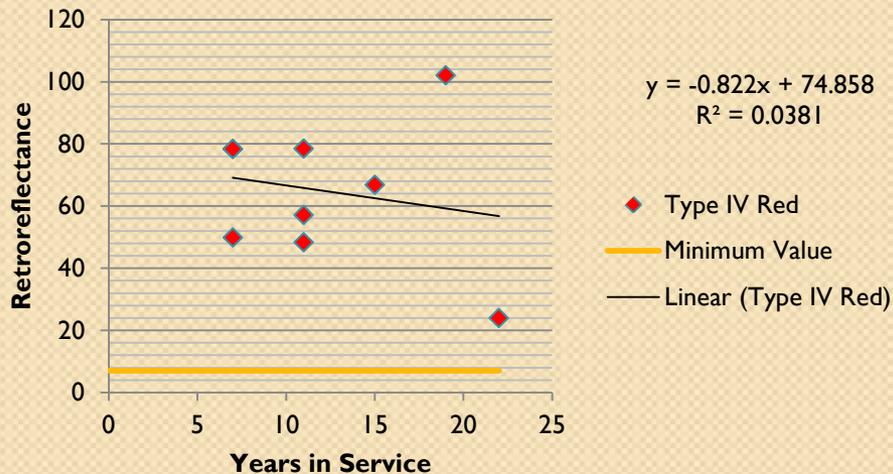


Data Key

of Signs: 5
 Agency: MnDOT Lab
 Min Retro Value: 25, 15
 Signs < Min: 0
 Warranty: 10 Years

Trendline inconclusive

Type IV Red

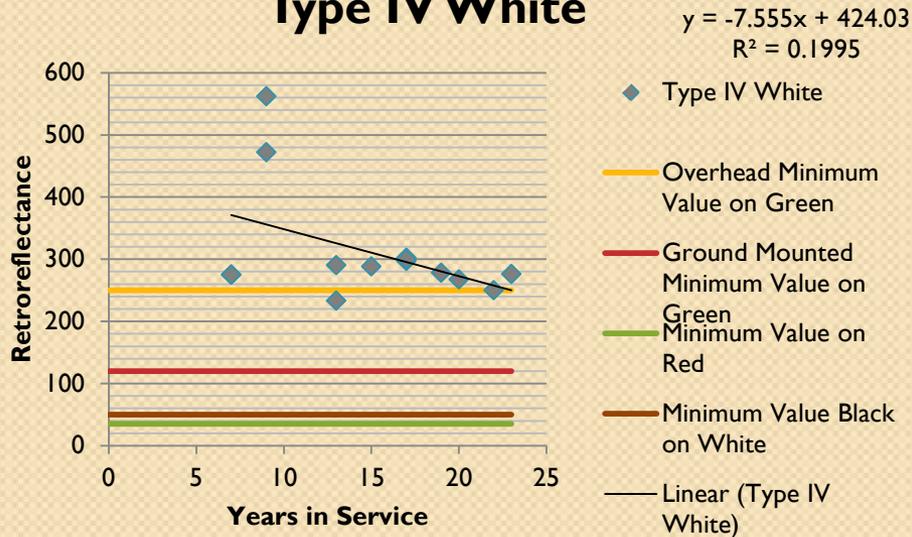


Data Key

of Signs: 9
 Agency: MnDOT Lab,
 Golden Valley,
 Eagan
 Min Retro Value: 7
 Signs < Min: 0
 Warranty: 10 Years

Trendline crosses minimum value at 82.5 years

Type IV White



Data Key

of Signs: 14
Agency: MnDOT Lab, Watonwan, Eagan
Min Retro Value: 250, 120, 50, 35
Signs < Min: 1 (13 Years)
Warranty: 10 Years

Trendline crosses minimum values at:
 23.0 years (250), 40.2 years (120), 49.5 (50),
 51.4 (35)

Type IV Yellow



Data Key

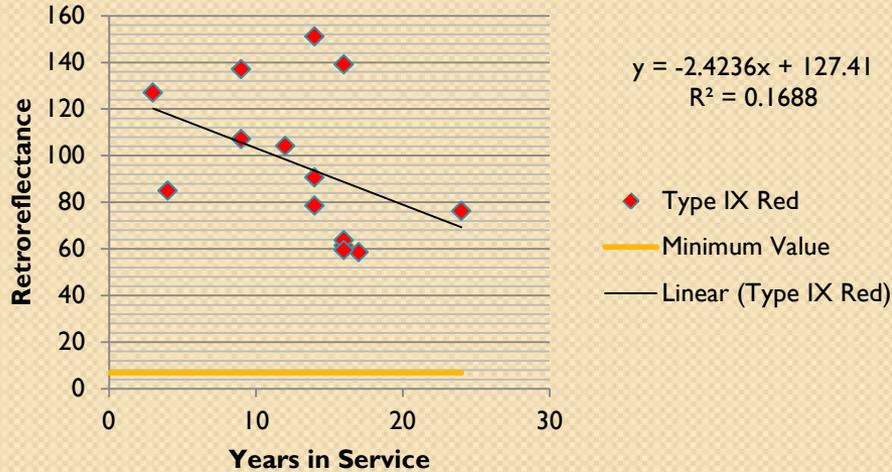
of Signs: 11
Agency: MnDOT Lab, MnDOT Metro, Watonwan, Eagan
Min Retro Value: 75, 50
Signs < Min: 1 (24 Years)
Warranty: 10 Years

Trendline crosses minimum values at:
 24.1 years (75), 25.8 years (50)



MNDOT ASTM TYPE IX SHEETING DATA

Type IX Red

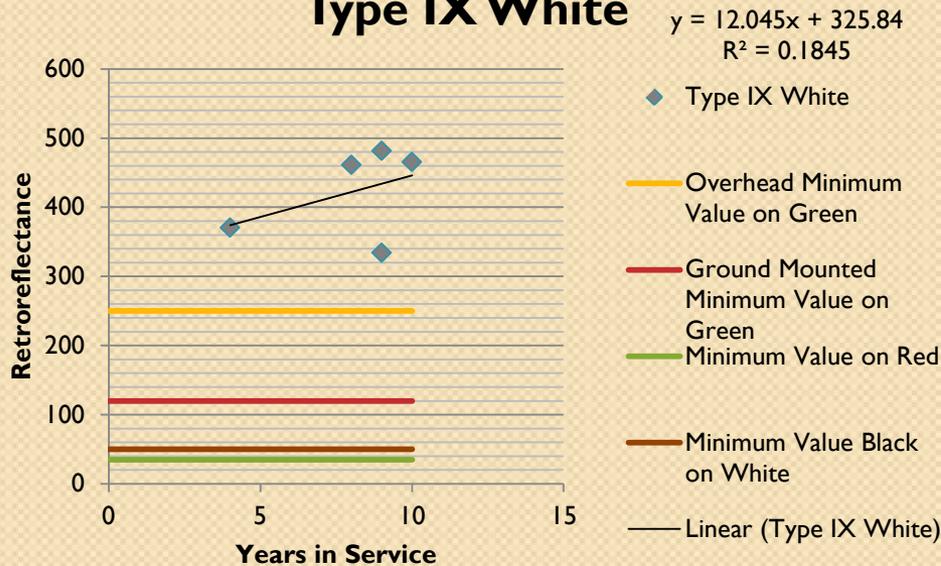


Data Key

of Signs: 14
 Agency: MnDOT Lab, Watonwan
 Min Retro Value: 7
 Signs < Min: 0
 Warranty: 12 Years

Trendline crosses minimum value at 49.6 years

Type IX White

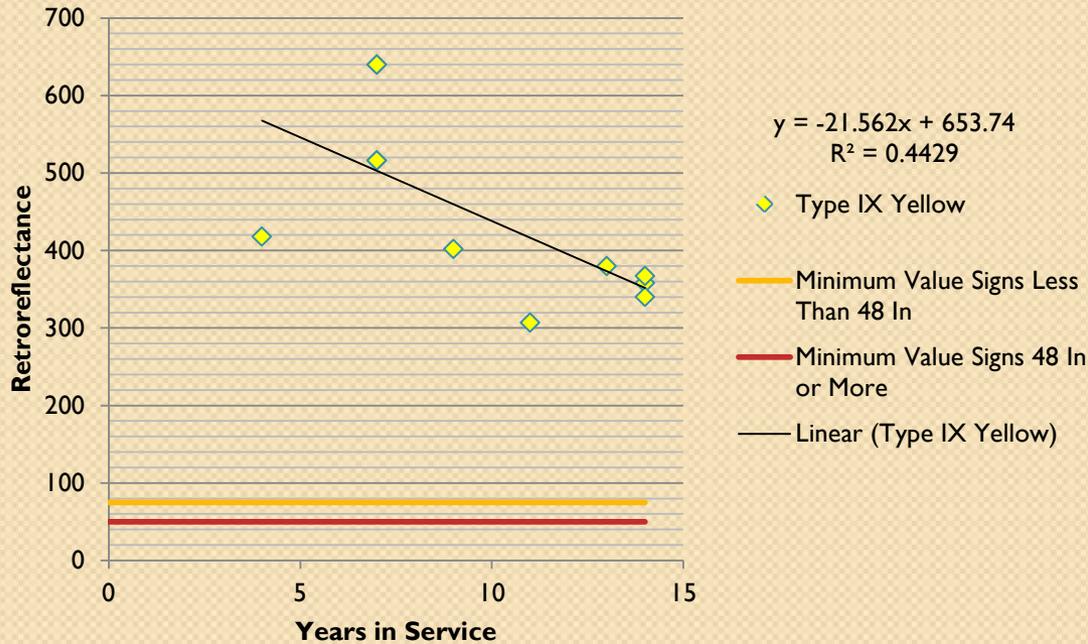


Data Key

of Signs: 5
 Agency: MnDOT Lab, Watonwan
 Min Retro Value: 250, 120, 50, 35
 Signs < Min: 0
 Warranty: 12 Years

Trendline inconclusive

Type IX Yellow



Data Key

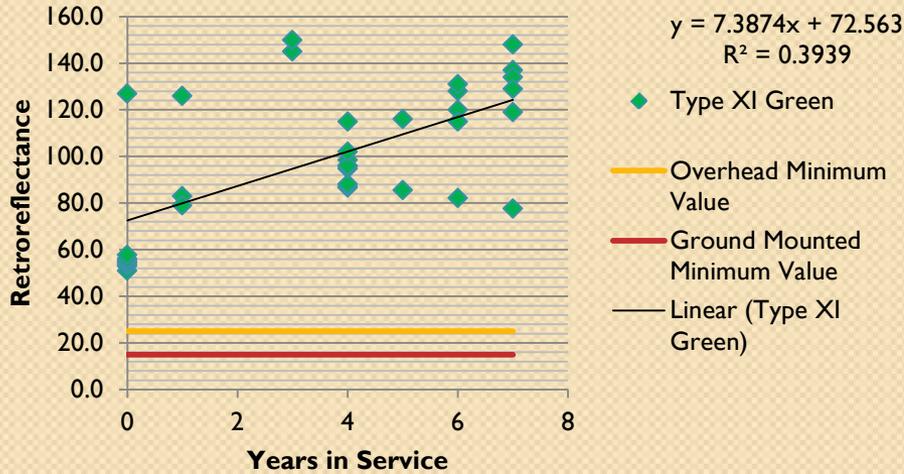
# of Signs:	11
Agency:	MnDOT Lab, MnDOT Metro, Watsonwan, Eagan
Min Retro Value:	75, 50
Signs < Min:	0
Warranty:	12 Years

Trendline crosses minimum values
at:
26.8 years (75), 28.0 years (50)



MNDOT ASTM TYPE XI SHEETING DATA

Type XI Green

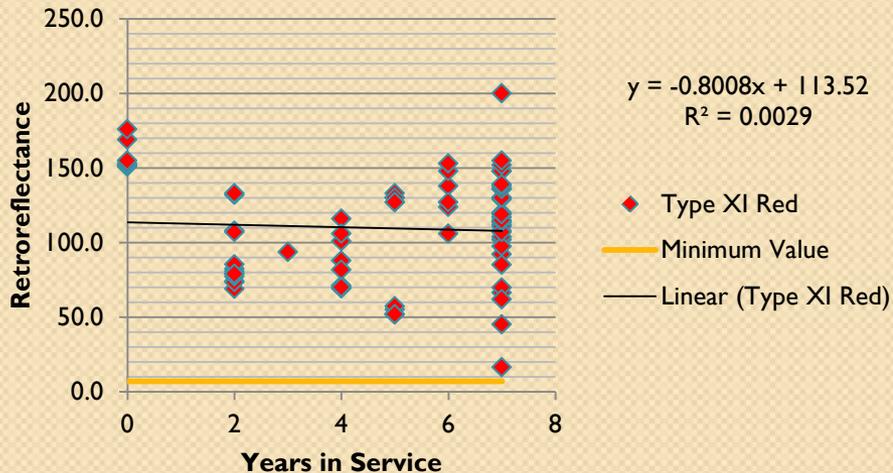


Data Key

of Signs: **35**
 Agency: **MnDOT Lab, MnDOT Metro, St. Louis Co, Dakota Co, Watonwan Co**
 Min Retro Value: **25, 15**
 Signs < Min: **0**
 Warranty: **12 Years**

Trendline inconclusive

Type XI Red

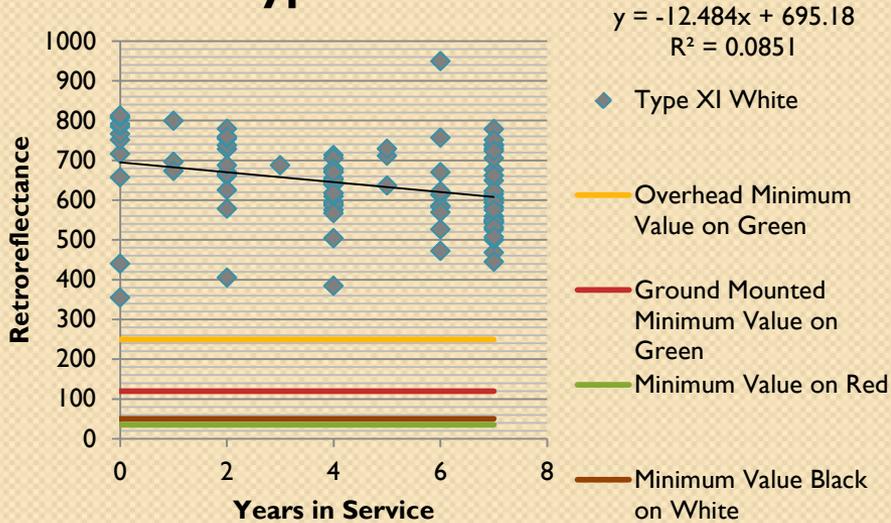


Data Key

of Signs: **78**
 Agency: **MnDOT Lab, MnDOT Metro, St. Louis Co, Dakota Co, Watonwan Co, Golden Valley, Brooklyn Center, Eagan**
 Min Retro Value: **7**
 Signs < Min: **0**

Trendline crosses minimum value at 133.0 years

Type XI White



Data Key

of Signs: 91

Agency:

MnDOT Lab, MnDOT Metro, St. Louis Co, Dakota Co, Watonwan Co, Golden Valley, Brooklyn Center, Eagan

Min Retro Value:

250, 120, 50, 35

Signs < Min:

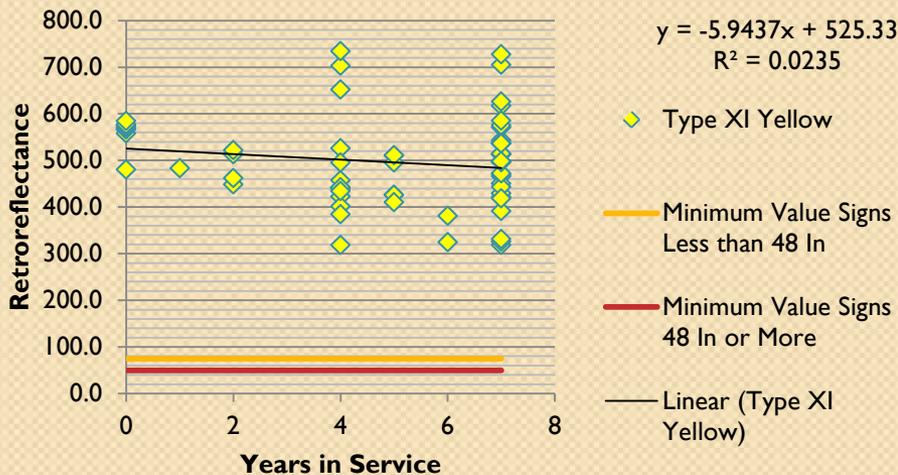
0

Warranty:

12 Years

Trendline crosses minimum values at:
 35.6 years (250), 46.0 years (120)
 51.6 years (50), 52.8 years (35)

Type XI Yellow



Data Key

of Signs: 65

Agency:

MnDOT Lab, MnDOT Metro, St. Louis Co, Dakota Co, Watonwan Co, Golden Valley, Eagan

Min Retro Value:

75, 50

Signs < Min:

0

Warranty:

12 Years

Trendline crosses minimum values at:
 75.7 years (75), 79.9 years (50)

MN Data Summary

- Not enough Minnesota data to credibly conclude an exact value for sign life
- Different agencies have different experience with sign life (i.e. vandalism, knock downs, etc)
- Data (including national research) suggests a range of 15 to 30 years for prismatic sheeting and 10 to 20 years for beaded sheeting
- Color (especially red) may fall below adopted thresholds prior to retroreflectivity

The Policy Issue

- Highway agencies are required to develop and adopt a traffic sign maintenance policy
- The best practices for policy development include documenting an agency's Method of Sign Maintenance (Assessment or Management) and specifying when signs will be replaced
- There is a financial incentive for agencies to adopt a longer sign life – reduced annual replacement costs



Are there any risks for agencies if they select a longer (than the warranty) sign life?
Are there any best practices approaches to managing the risk?

Example Signing Policy – Rural County

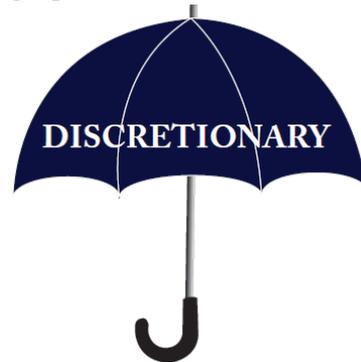
The _____ County Highway Department will complete a daytime inspection, twice a year, for traffic signs along the county roads, and complete E-911 daytime inspection once a year. In the process of “Maintaining Traffic Retroreflectivity” the County will use the Expected Sign life method and replace the traffic sign as follows:

Material Grade	From Installation
Engineering	8 Years
HI or HIP	10 Years (South Facing)
	11 Years (East/West Facing)
	12 Years (North Facing)
VIP or DG3	10 Years (South Facing)
	11 Years (East/West Facing)
	12 Years (North Facing)
E-911 Signing (HIP)	12 Years
E-911 Signing (DG3)	15 Years

Signs requested to be placed within the right of way, along the county roadway, must meet the requirement of the MNMUTCD and have the _____ County Highway Engineer’s approval. (See *Signing Request Policy*)

Approaches to Managing Risk

Bring your decisions under an umbrella of immunity



Generated by actions consistent with adopted policies and ordinances

- 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 and expected sign life
- Document the outcome of your actions relative to installing/replacing signs, consistent with the direction provided by your decision making body



Generated by exercising your engineering judgment as part of an engineering study and then documenting your actions

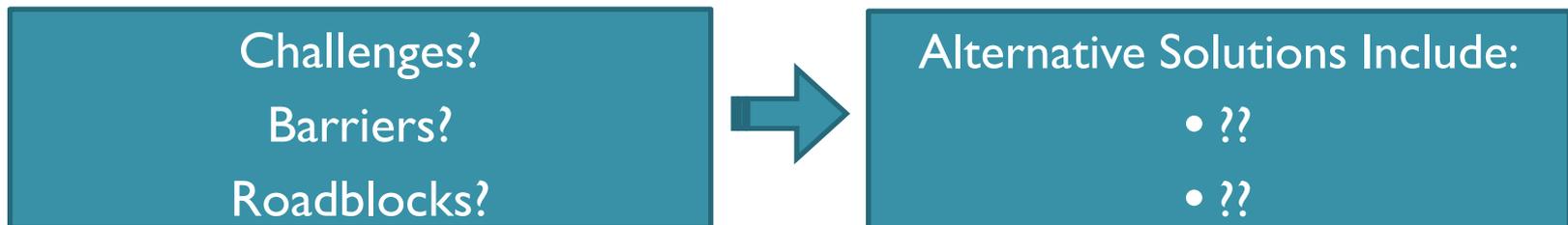
- Conduct an engineering study
- Document the applicable guidelines in the MNMUTCD
- Document the conditions in the field
- Document your decision

Policies in place around US

Location	Sheeting Type	Sign Life
Pennsylvania DOT	ASTM Type III	15 Years
Indiana DOT	ASTM Type III	18 years (20 Overhead)
WisDOT	Not specified	12 Years
Ohio DOT	Not specified	15 Years
Vermont DOT	Not specified	15 Years Red, 15- 20 for Others
Wright County, MN	DG3	15 Years
City of University-Heights, OH	HIP (ASTM Type IV)	12 Years

Policy Discussion Items

- Comments on Policy development?
- Comments on selecting a traffic sign management method?
- Comments on selecting/documenting a package of sheeting material?
- Comments on adopting a specific sign life?
- Comments on approaches to managing risk?



◦ **WHAT'S NEXT?**

- Receive Panel Comments (March 12th)
- CH2M HILL prepares summary of comments and sample “Best Practice” statements (April 2nd)
- CH2M HILL prepares Draft Report and circulates for review (May 1st)
- CH2M HILL receives Draft Report comments (May 16th)
- CH2M HILL prepares Final Report (End of June)