



MEMORANDUM

STATE OF ALASKA

Department of Transportation and Public Facilities
Central Region-Division of Design and Engineering Services
Traffic, Safety, & Utilities Section

To: Michael Coffey, Chief
Statewide M&O

Date: December 11, 2014

Thru: Randy Vanderwood, P.E., Chief ^{RDV}
Central Region M&O

File:

From: Scott E. Thomas, P.E. ^{SET}
Central Region Traffic Engineer

Subject: CR Sign Inventory
Findings & Recommendations

Central Region's HSIP funded Sign Inventory project was completed by USKH in 2013 for M&O with assistance from the HQ, Materials, and Traffic & Safety Sections. Surveying and engineering professionals accurately located signs and performed a review against federal and state sign standards.

Annual maintenance/upkeep of the sign inventory is not recommended for this Region. Sign replacement on a repaving or rehabilitation project life cycle is adequate. Annual "visual assessment" by M&O is adequate without inventory. A regionwide inventory is of greater value on a decade or longer schedule.

Project achievements

- GIS inventory - all signs on state roads as of 2012 (excludes overhead signs, new construction at that time and since, and any public/private sign replacements since that time)
- reviewed ~ 25,000 sign panels, ~13,000 posts, outside the Municipality of Anchorage
- translated ~ 65,000 signs in the Municipal inventory (delivered prior to 2006 with federal funds)
- delivered inventory to HQ M&O in Marshall GIS format. Translated Municipal data with help from HQ M&O and sign tablet vendor - Marshall.
- delivered sign inventory tablets and training to CR M&O
- performed a statistical sample of sign retroreflectivity ("retro") by sign type
- checked retro against MUTCD retro standards¹
- checked appropriate use of signs, legends, damage against ATM and ASDS standards
- launched CR HSIP project to replace all failing signs inventoried, and consistently install crossing warning signing in high crash areas (moose, pedestrians). Now in Final PS&E stage.

Lessons learned

- Locating to desired accuracy levels, retro checks, and engineering review is expensive.
 - ~\$750,000 dollars for 25,000 signs + MOA, 7-10 minutes per sign in the field.
- Inventory upkeep procedures and staffing are not in place.
 - Most signs are installed by others outside of M&O – D&C, other agencies, developers
 - Added duties would be \$100,000 per year in added staff and require more for oversight.
 - MOA's system demonstrated most of a supervisor's time and several full time entry staff.
 - DOT's newer inventory format was upgraded from the Municipal format in order to collect more data. The two databases are not directly compatible. The MOA data required significant effort to translate, and has less information available.
 - State road inventory TORA or contracting is not set up in the Municipality. DOT has one (1) dedicated sign crew member. The City tries to inventory state signs at intersections.

- Sign ownership and inventory at city/state intersections is not clear.
- Sign failures in the existing system are minimal. One important requirement is retro-reflectivity¹.
 - At the low end, 10 percent of sign panels are estimated to be below federal retro standards.
 - ~40 percent of sign posts/panel assemblies are estimated to fail due to age, condition, etc.
 - About \$1 million in signs need replacement each year, while more than \$2 million per year are scheduled with ongoing projects. This appears more than adequately scheduled.
 - One (1) yellow warning sign sampled failed federal retroreflectivity (“retro”) standards at 11 years of age. No other sampled signs failed. The oldest signs sampled were 17 years.
 - No white signs sampled failed federal retro standards – the oldest being 17 years.
 - One green guide sign legend failed federal retro standards at 14 years in age.
- Sign life is equivalent to project paving cycles typical of 1R to 3R projects.
 - USKH charts show **average** sign life is 16-20 years (= 1-2 times the life cycle of paving)
 - Greater 95%ile confidence signs meet retro standards at < 12-14 years age.

Conclusions

- Very few signs will fail during visual inspections outside of project replacement schedules
- Most signs average longer than 15 years of service life meeting retro-reflective needs.
- With greater confidence, sign life is typically 12-14 years, the life cycle of pavement surfacing.
- FHWA retro-reflectivity (“retro”) standards do not require an inventory.
- FHWA does require annual M&O inspection. Our Department has selected the Visual Inspection Method by a trained observer. This requires annual observation at night, which is being incorporated into routine M&O duties.

Recommendations:

An ongoing inventory is more intensive to maintain with little return on investment and no guarantees of accuracy. Ongoing M&O visual assessment and replacement with routine repaving is recommended. A total renewed inventory cycle could be considered once every 10 or more years. A reassessment inventory could be delayed to 15-20 years based on sign life determinations found in this 2012 HSIP Inventory work.

Attachments: CR HSIP Sign Inventory Report Recommendations, Retroreflectivity charts

cc: Ocie Adams, M&O Specialist, HQ Maintenance & Operations
Joel St. Aubin, Director, Construction & Operations, Central Region
Jim Amundsen, P.E., Chief, Highway Design Section
Ken Morton, P.E., Regional Preconstruction Engineer
Stephanie Mormilo, P.E., Municipal Traffic Engineer, Anchorage
Jeff Jeffers, P.E., State Traffic Engineer, HQ
Pam Golden, P.E., Regional Traffic Engineer, Northern Region
David Epstein, P.E., Regional Traffic Engineer, Southeast Region

¹ MUTCD Section 2A.07 Retroreflectivity and Illumination.



By visually inspecting signs, only the signs that are in unacceptable condition or that fail to meet retro-reflectivity standards would be targeted for replacement. This scheme would enable the use of signs throughout their full life, since no sign would be replaced until it was no longer meeting standards. For budgeting purposes, this means using the average retro-reflectivity life, rather than the 95 percent confidence interval value. That would change the annual replacement quantity to about 1,600 panels, for an annual replacement cost of about \$1 million.

The benefits of this replacement method are that it has the lowest cost and is most likely to maintain signs to the published standards. Since this method is not directly driven by sign age, it would also be the most compatible in the case of a large quantity of signs being replaced at once as a result of this inventory project. It also means that replacement would not rely on statistical assumptions, although these could be used for budgeting purposes. The disadvantages are that it requires actively monitoring the condition of the signs and will result in a mix of new and old signs along a corridor.

3 CONCLUSIONS

3.1 Overall Project Conclusions and Recommendations

Analysis of the data collected during the sign inventory indicate that that majority of the Central Region signs have been in the field for more than 15 years, but that most of the signs are still in serviceable condition. However, federal retro-reflectivity requirements mean that signs will have to be replaced on a regular basis to ensure compliance.

Overall, we expect that about 53 percent of the 12,927 sign installations meet current standards. We know that 37.3 percent of the sign assemblies fail to meet standards due shortcomings on to 7,932 posts and/or panels. Based on our retro-reflectivity samples, we assume another 9.7 percent of sign assemblies currently include panels that fail to meet retro-reflectivity requirements.

It is unlikely that it will be feasible to immediately replace 47 percent of the signs in the region. The replacement effort should focus first on signs and posts that are in unacceptable condition. Non crashworthy posts should also be a priority. As these safety issues are addressed, the replacement effort should refocus on signs that are known to not meet retro-reflectivity requirements, then moving on to signs that are too small.

Going forward, there are several inventory management methods that would help ensure the deployed signs continue to meet the needs of the road users and meet federal standards. Of those methods, the most cost effective would be to visually inspect all of the signs on a regular basis and replace signs as they degrade to an unacceptable condition or fail to meet retro-reflectivity standards. Even with the expense of drive-by inspections (assuming a few weeks using a two-person team), this is still the most cost effective method considered. Overall, we anticipate about \$1 million worth of signs needing to be replaced annually. This would vary significantly. Over the next 5 years we anticipate nearly \$10 million worth of sign replacement as over-aged signs are replaced. Going forward, the sign replacement needs would be less since so many of the signs would be new. Sign replacement breakdowns are included in Appendix D.

After documenting all of the signs in the region, it became apparent that some signs should be considered for inclusion in the ASDS. Specific recommendations include a generic 6-inch-tall destination plate, similar to a D9-



308; waste transfer center barrel signs, similar to D9-103; arrows for parking signs, potentially smaller sized D9-301 signs; pathway milemarkers; and a variety of Alaska State Parks signs (i.e. Lake Stocked, Lake Access, etc.).

3.2 Data Maintenance and Updates are Necessary to the Continuing Relevance of this Project

This study represents a static or ‘snapshot’ inventory of sign assets. The physical attributes recorded for each sign and vital engineering assessments are only valid for the time of the analysis. With the passage of time, attributes such as sign condition, retro-reflectivity reading, and all engineering assessments are subject to change. These attributes should be considered dynamic in nature and users of the sign inventory geodatabase should be aware of the potential problems that may arise if outdated data is relied upon for safety-critical purposes. In order to protect the validity of this investment and invaluable tool, it should be recognized that maintenance of the component dataset and periodic updates of the engineering analysis are essential for relevant results.

It is hoped that this document along with the .xml file that accompanies the deliverable, will provide valuable insight that will help DOT&PF assess the quality and relevance of the collected data.

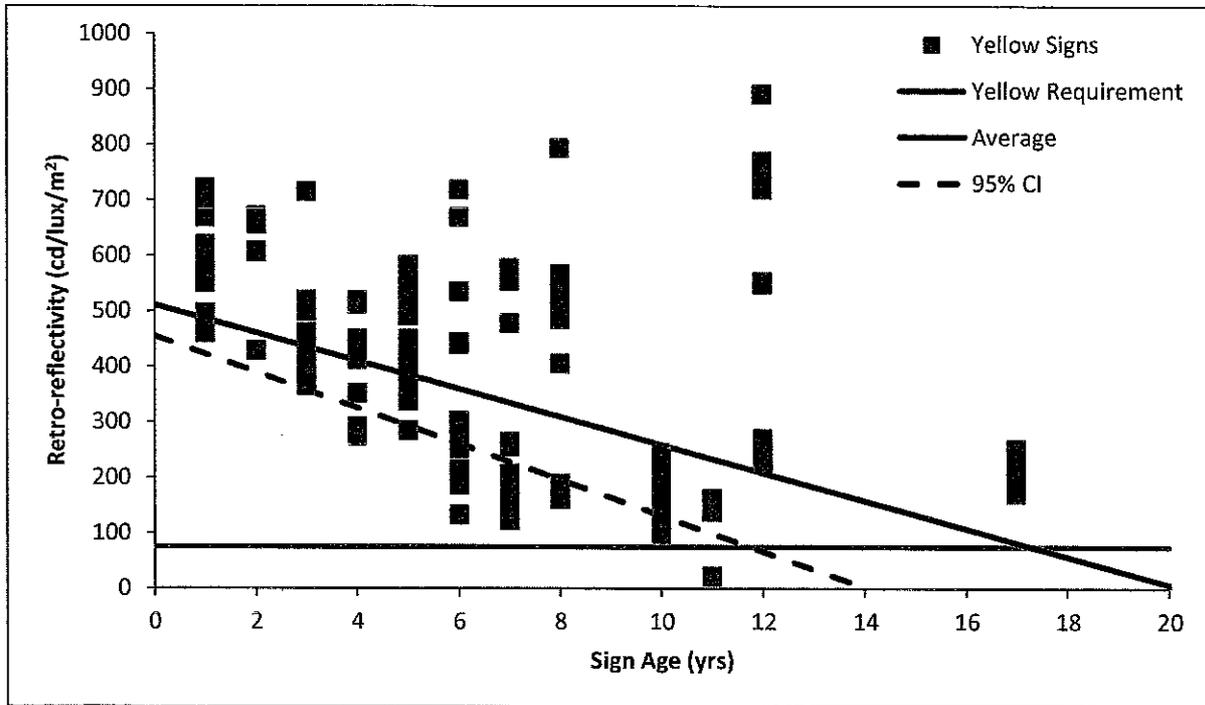


Figure C 1 - Yellow Sign Retro-reflectivity

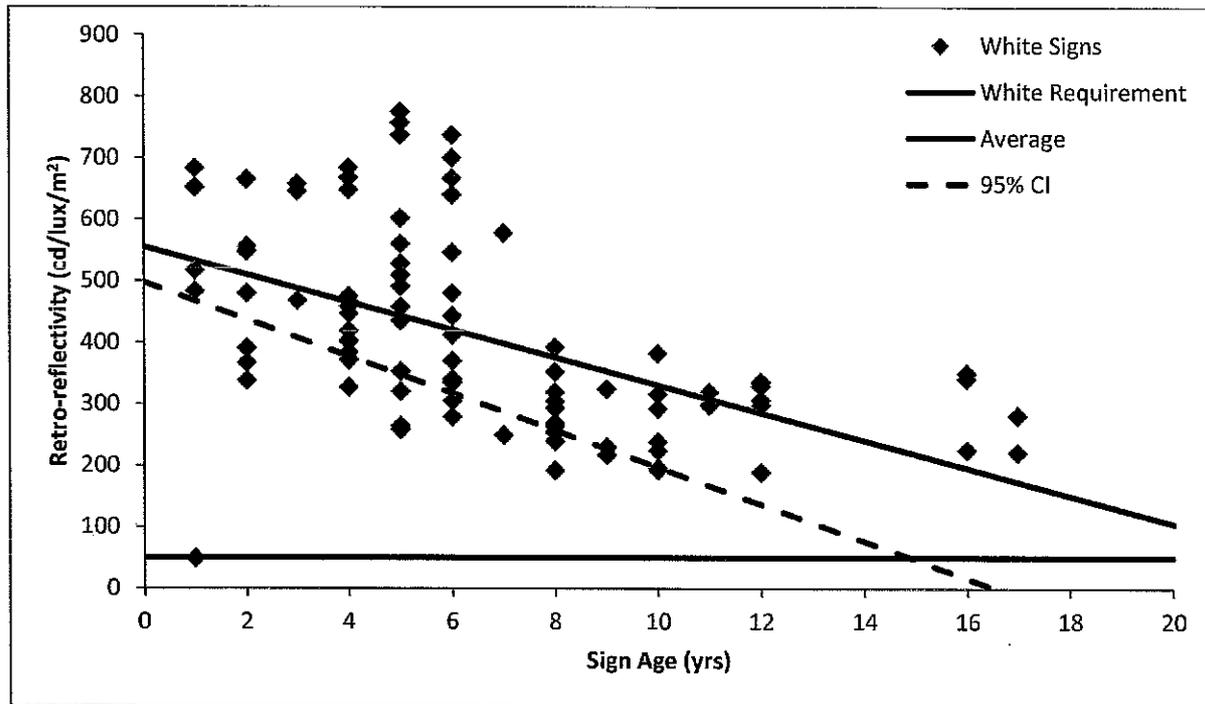


Figure C 2 - White Sign Retro-reflectivity

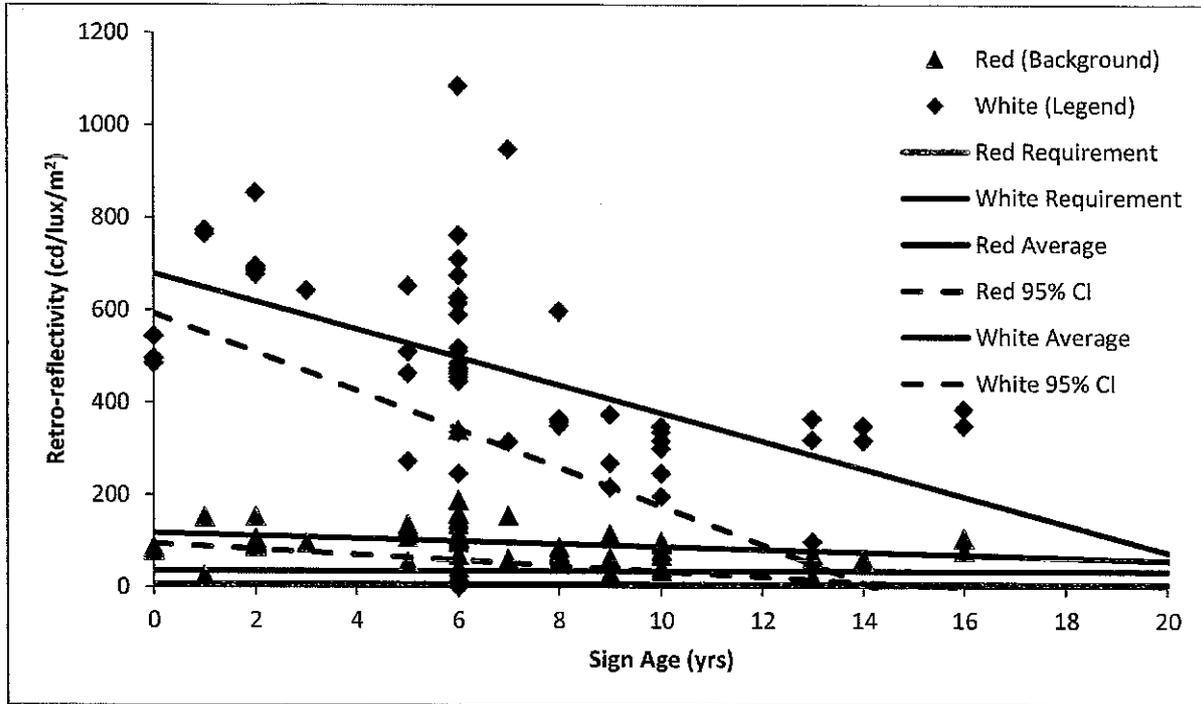


Figure C 3 - Red Sign Retro-reflectivity

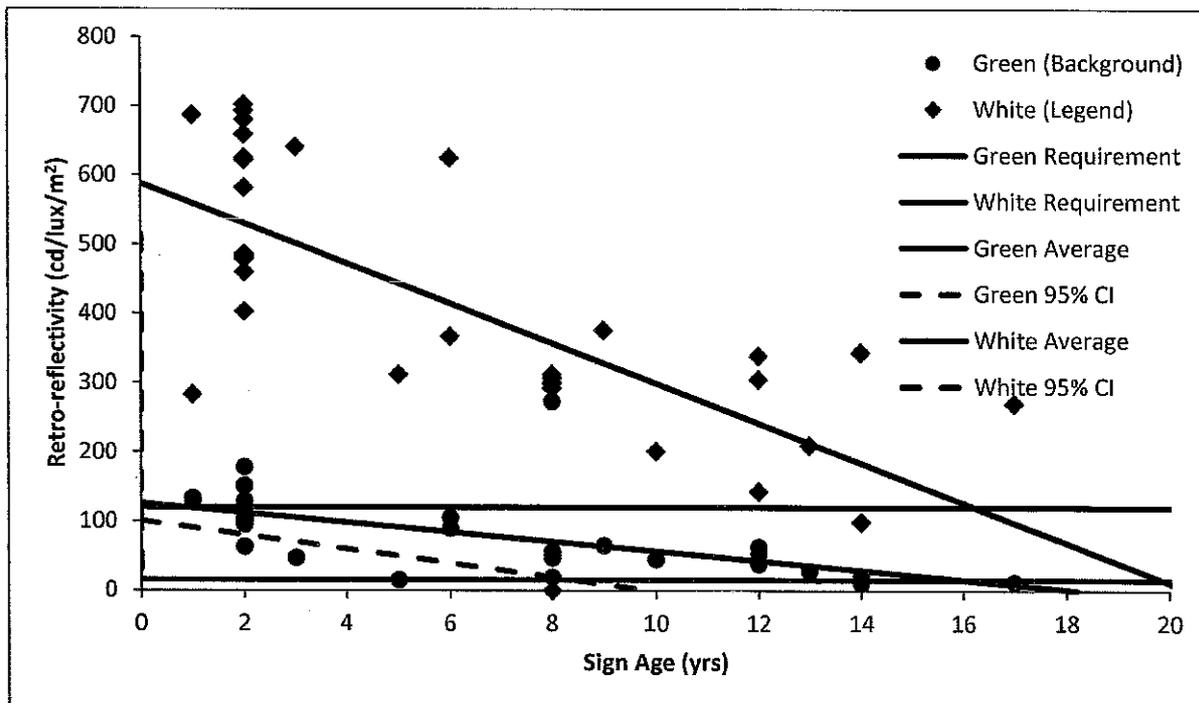


Figure C 4 - Green Sign Retro-reflectivity

Thomas, Scott E (DOT)

From: Adams, Ocie V (DOT)
Sent: Wednesday, December 10, 2014 1:21 PM
To: Thomas, Scott E (DOT)
Subject: RE: 14-11-10CRFindingsandRecommendations.doc

Good afternoon Scott,

I reviewed your report and I agree with most of your conclusions. The only thing I would mention is that the inventory does not include new road construction to extend two roads in Anchorage or the replacement of more than 640 signs by M&O. Otherwise I think you are gold.

Ocie Adams

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"Keep Alaska Moving through service and infrastructure."

From: Thomas, Scott E (DOT)
Sent: Monday, December 08, 2014 12:30 PM
To: Adams, Ocie V (DOT)
Subject: 14-11-10CRFindingsandRecommendations.doc

Ocie,

I would like to clear up the status of Sign Inventory in this Region. Would you like to look this over, take a call on it, or email comments?

Scott