

MUTCD Sign Retroreflectivity Requirements

Peter Allain

June 2011

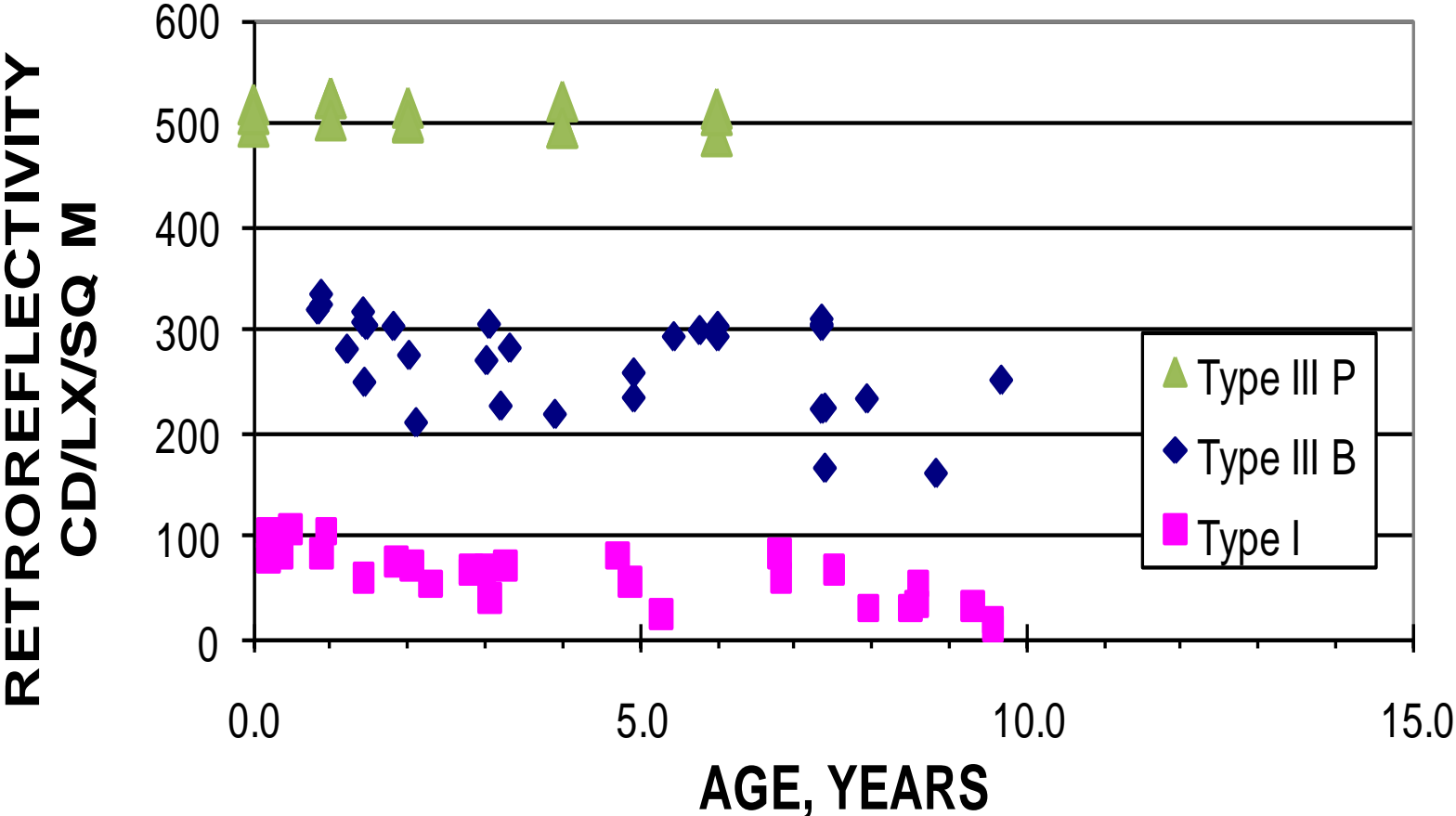
MUTCD Requirements

1. Adopt a Management Method by January 22, 2012
2. Replace regulatory, warning, and post mounted guide signs by January 22, 2015
3. Replace street name and overhead guide signs by January 22, 2018

Evolution of Sheeting

- ASTM Type I, Engineering Grade Sheeting
 - Started phasing out in 1986, stopped using in 1998
- ASTM Type III, High Intensity Beaded Sheeting
 - Stopped using in 2005
- ASTM Type III, High Intensity Prismatic Sheeting
- ASTM Type X, Prismatic Sheeting
 - DOTD Type X, Prismatic Sheeting

WHITE SHEETING



MUTCD Requirements

1. Adopt a Management Method by January 22, 2012
2. Replace regulatory, warning, and post mounted guide signs by January 22, 2015 -
3. Replace street name and overhead guide signs by January 22, 2018

2003 MUTCD

Guidance:

- 04 *Except for those signs specifically identified in Paragraph 6, one or more of the following assessment or management methods should be used to maintain sign retroreflectivity:*
- A. *Visual Nighttime Inspection—The retroreflectivity of an existing sign is assessed by a trained sign inspector conducting a visual inspection from a moving vehicle during nighttime conditions. Signs that are visually identified by the inspector to have retroreflectivity below the minimum levels should be replaced.*
 - B. *Measured Sign Retroreflectivity—Sign retroreflectivity is measured using a retroreflectometer. Signs with retroreflectivity below the minimum levels should be replaced.*
 - C. *Expected Sign Life—When signs are installed, the installation date is labeled or recorded so that the age of a sign is known. The age of the sign is compared to the expected sign life. The expected sign life is based on the experience of sign retroreflectivity degradation in a geographic area compared to the minimum levels. Signs older than the expected life should be replaced.*
 - D. *Blanket Replacement—All signs in an area/corridor, or of a given type, should be replaced at specified intervals. This eliminates the need to assess retroreflectivity or track the life of individual signs. The replacement interval is based on the expected sign life, compared to the minimum levels, for the*
 - E. *Control Signs—Replacement of signs in the field is based on the performance of a sample of control signs. The control signs might be a small sample located in a maintenance yard or a sample of signs in the field. The control signs are monitored to determine the end of retroreflective life for the associated signs. All field signs represented by the control sample should be replaced before the retroreflectivity levels of the control sample reach the minimum levels.*
 - F. *Other Methods—Other methods developed based on engineering studies can be used.*

EDSM VI.2.1.11

1. Role of District Sign Crews

- a) Primary responsibility for signing;
- b) Replace all damaged signs and all signs over 15 years old;
- c) Straighten or replace leaning posts;
- d) Straighten or replace bent posts;
- e) Straighten or replace bent signs;
- f) Straighten or replace missing signs;
- g) Clean or replace dirty signs;
- h) Clean or replace defaced signs;
- i) Bring all old post to the District Headquarters and straighten;
- j) Do not leave short posts or stubs above the ground;
- k) Trim, cut or spray with herbicide vegetation that will block the sign; and
- l) Provide Parish Maintenance Superintendents with a small supply of important warning and regulatory signs;
- m) Record installation and maintenance dates on the back of the sign with a permanent paint marker.

Engineering Directives and Standards		Read Only Mode
EDSM No:	VI.2.1.11	Volume: VI Chapter 2 Section: 1 Directive: 11
Subject:	SIGN INSTALLATION AND MAINTENANCE - GENERAL REQUIREMENTS	
Effective:	Last Revision: 03/04/2008	

1. PURPOSE:
This directive establishes the Department's policy for sign installation and maintenance. This policy shall serve as a supplement to and not replace the requirements of the Manual of Uniform Traffic Control Devices (MUTCD), Standard Plan HS-03 and the Louisiana Standard Specifications for Roads and Bridges.

2. SCOPE:
This policy applies to all signs installed within the DOTD highway right of way.

3. POLICY:

A. Scheduling Work:
The sign foreman shall:

- a) Survey the road section to log the location of signs to be replaced and installed;
- b) Obtain all required materials at least a week in advance;
- c) Assign work crews a full days work; and
- d) Ensure at the beginning of each work day the crews have all materials.

B. Position:
Documentation shall be provided when the MUTCD is not followed.

C. Installation

1. Non-Interstate Highways:
 - a) Use a 2.5 lb. "U" channel or 2" square post;
 - b) Drive the post vertically using a tubular mechanical driver with handles or place in an augured hole;
 - c) Post should be at a minimum depth of 30-36 inches in the ground;
 - d) Do not splice the post unless necessary for required height;
 - e) Use a hand level to ensure true vertical alignment;
 - f) Horizontally bolt a short section of post cut from an old post to signs mounted on two or more posts to form an assembly. This short section shall not extend beyond the outside edges of the assembly; and
 - g) Do not use diagonal braces driven into the ground or "U" channel posts bolted back to back.
2. Interstate Highways
 - a) Use a 6X6 maximum wood post, 2.5 lb. "U" channel post, 2" square post or on round or wide flange shapes with a breakaway base;
 - b) For delineators use 1.1 lb. "U" channel or suitable salvaged section of 2.5 lb. "U" channel posts;
 - c) Use flexible type delineators in areas with a high rate of loss;
 - d) Notify statewide crews when the sign is beyond the capabilities of District forces.

D. Maintenance

1. Role of District Sign Crews
 - a) Primary responsibility for signing;
 - b) Replace all damaged signs and all signs over 15 years old;
 - c) Straighten or replace leaning posts;
 - d) Straighten or replace bent posts;
 - e) Straighten or replace bent signs;
 - f) Straighten or replace missing signs;
 - g) Clean or replace dirty signs;
 - h) Clean or replace defaced signs;
 - i) Bring all old post to the District Headquarters and straighten;
 - j) Do not leave short posts or stubs above the ground;
 - k) Trim, cut or spray with herbicide vegetation that will block the sign; and
 - l) Provide Parish Maintenance Superintendents with a small supply of important warning and regulatory signs and posts for emergency repairs.
 - m) Record installation and maintenance dates on the back of the sign with a permanent paint marker.
2. Role of Parish Maintenance Superintendents
 - a) Secondary responsibility for signing;
 - b) Report all emergency repairs of signs to the District Traffic Operations Specialist or Sign Shop foreman; and
 - c) Report all damage and knocked down signs to the District Traffic Operations Specialist or Sign Shop foreman each work day.

E. Inspection and Inventory

1. Perform an annual day inspection and
2. Forward information to the District Traffic Operations Engineer.

4. OTHER ISSUANCES AFFECTED:
All directives, memoranda or instructions issued heretofore in conflict with this directive are hereby rescinded.

5. EFFECTIVE DATE:
This directive will become effective immediately upon issuance.



MUTCD Requirements

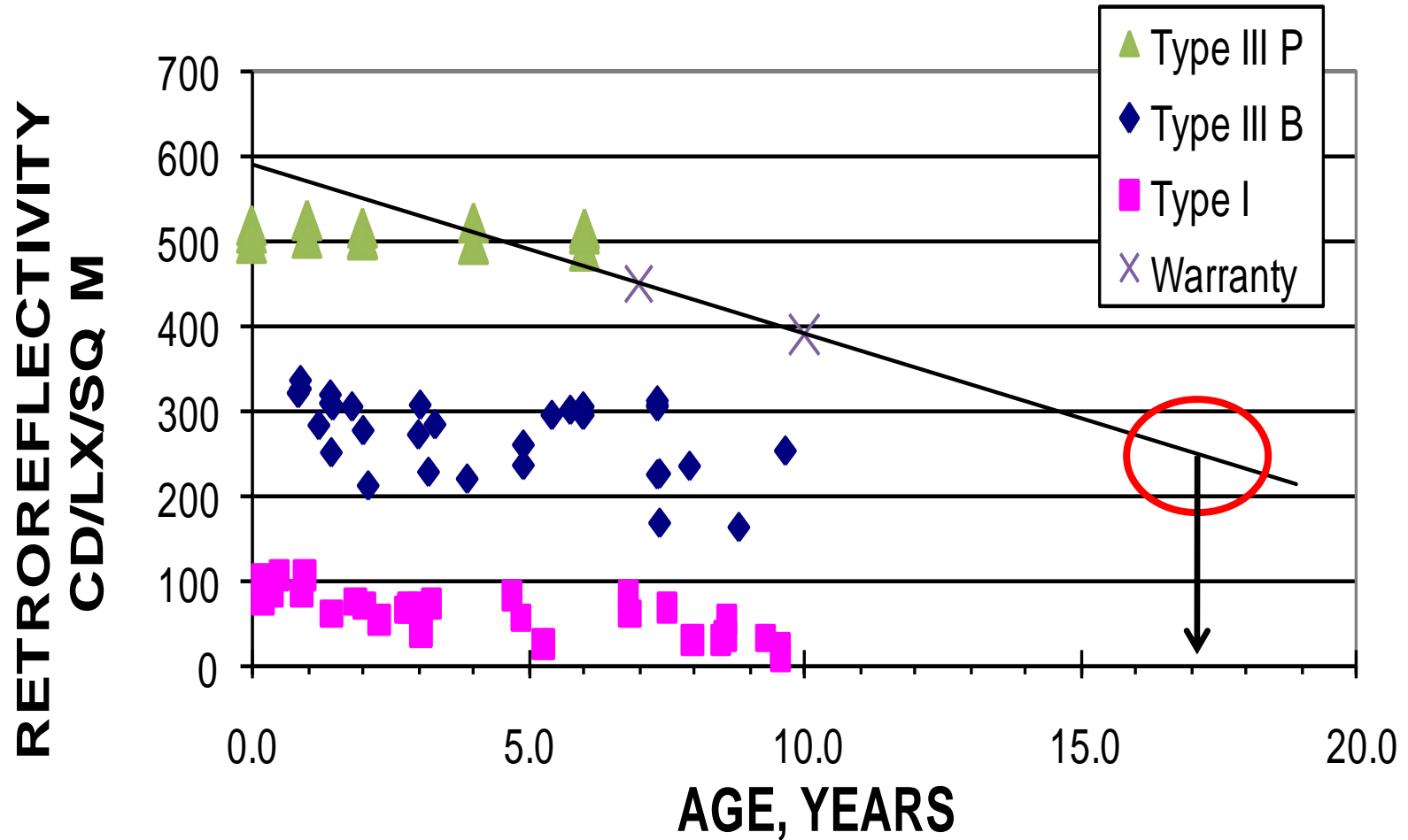
1. Adopt a Management Method by January 22, 2012 – **Expected Sign Life Method but need sign life curves.**
2. Replace regulatory, warning, and post mounted guide signs by January 22, 2015 -
3. Replace street name and overhead guide signs by January 22, 2018

Why not ask the manufacturer how long their sheet will last?

Peter, it was great seeing you again this week. You had requested a graph of the lifetime performance of our DG3 and HIP product lines. I requested this from our Lab but **due to proprietary reasons we do not share this information** although on our technical data sheet we address this clearly. Please see the attached.

The attachment included warranty values for 7 and 10 years.

WHITE SHEETING

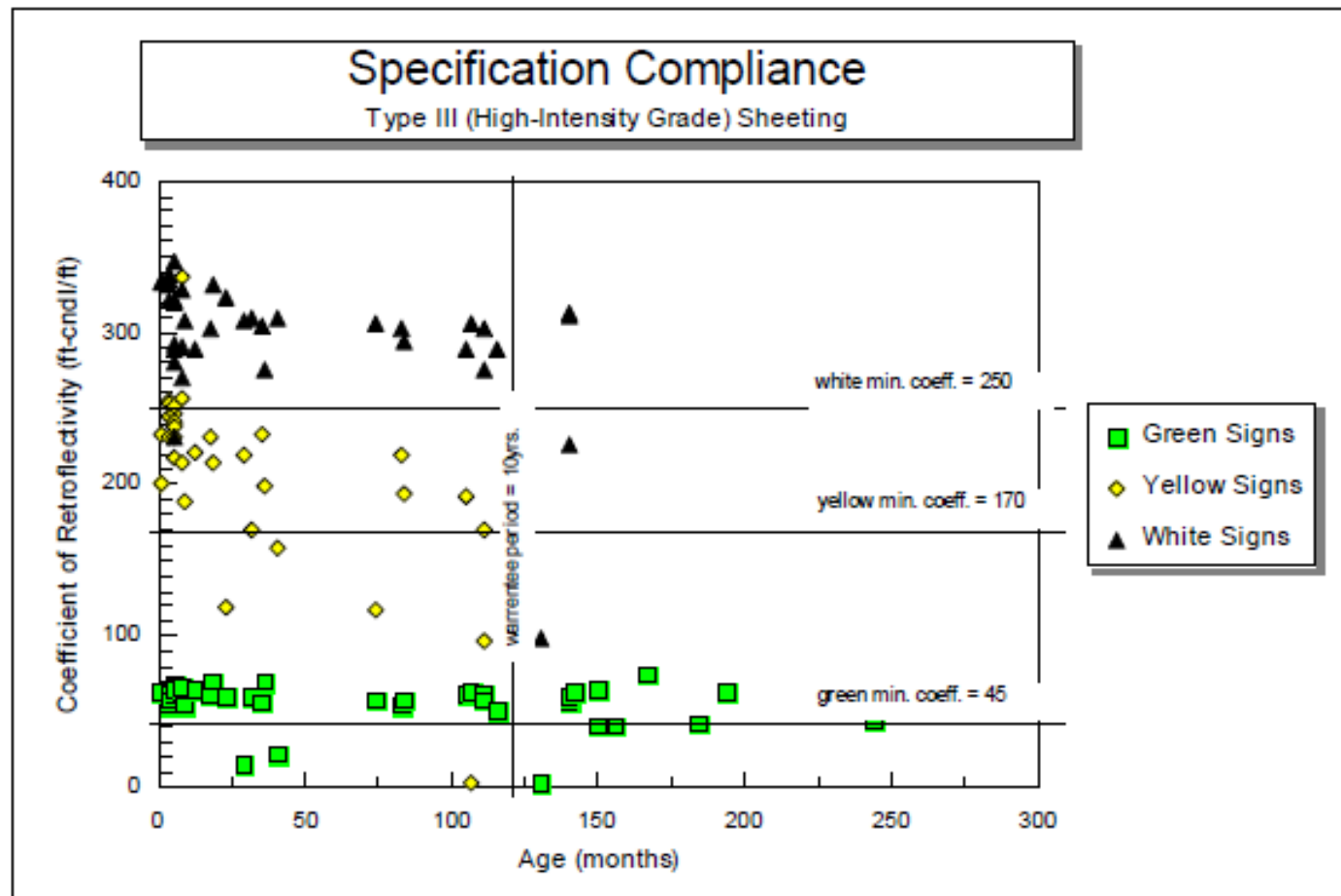


Analysis and Predictive Modeling of Road Sign Retroreflectivity Performance

Wolshon, Degeyter, and Swargam

16th Biennial Symposium on Visibility and Simulation, June 2 - 4, 2002, Iowa City, IA, USA

Figure 2. Sign Compliance Distribution – Type III Sheeting



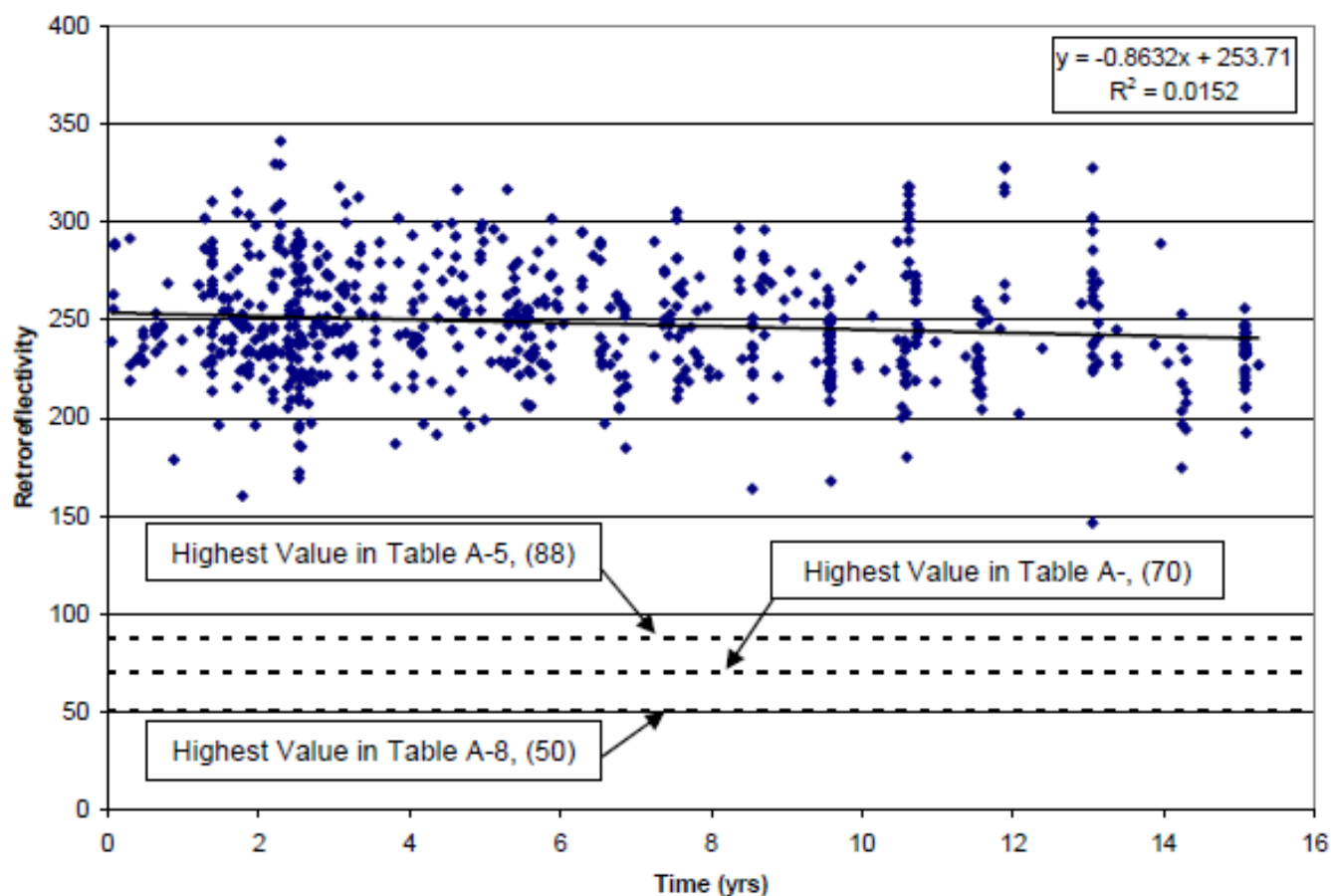
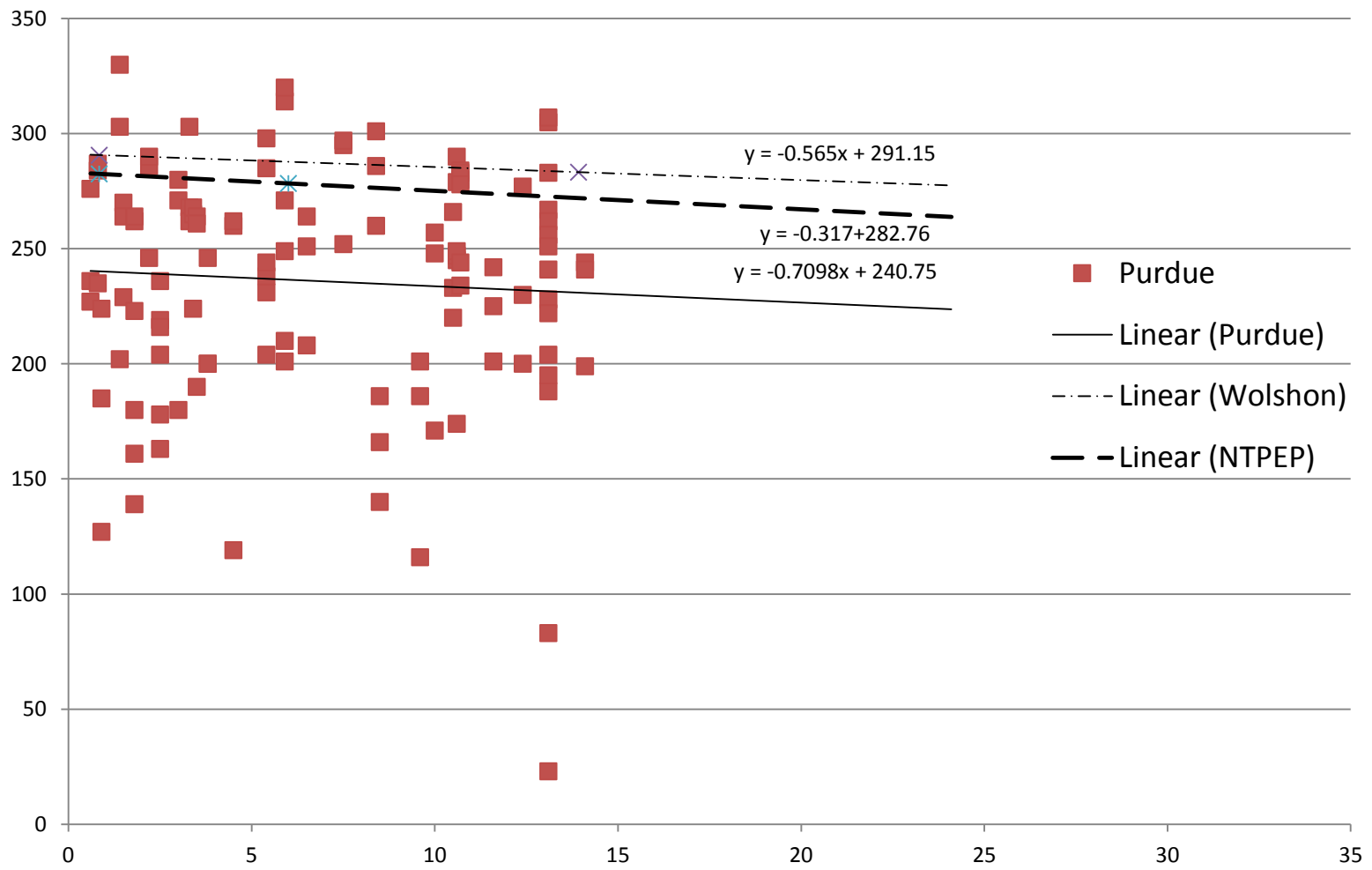


Figure 4-5: White ASTM Type III Average Unwiped Background Retroreflectivity versus Time
Excluding the Crawfordsville Bonepile (n = 683)

National, Louisiana, and NTPEP Data



Is there enough data to develop service life curves?

High Intensity Beaded Sheeting

1. >30 yrs experience by DOTD
2. Louisiana & National data in Research
3. NTPEP Test Data

High Intensity Prismatic Sheeting

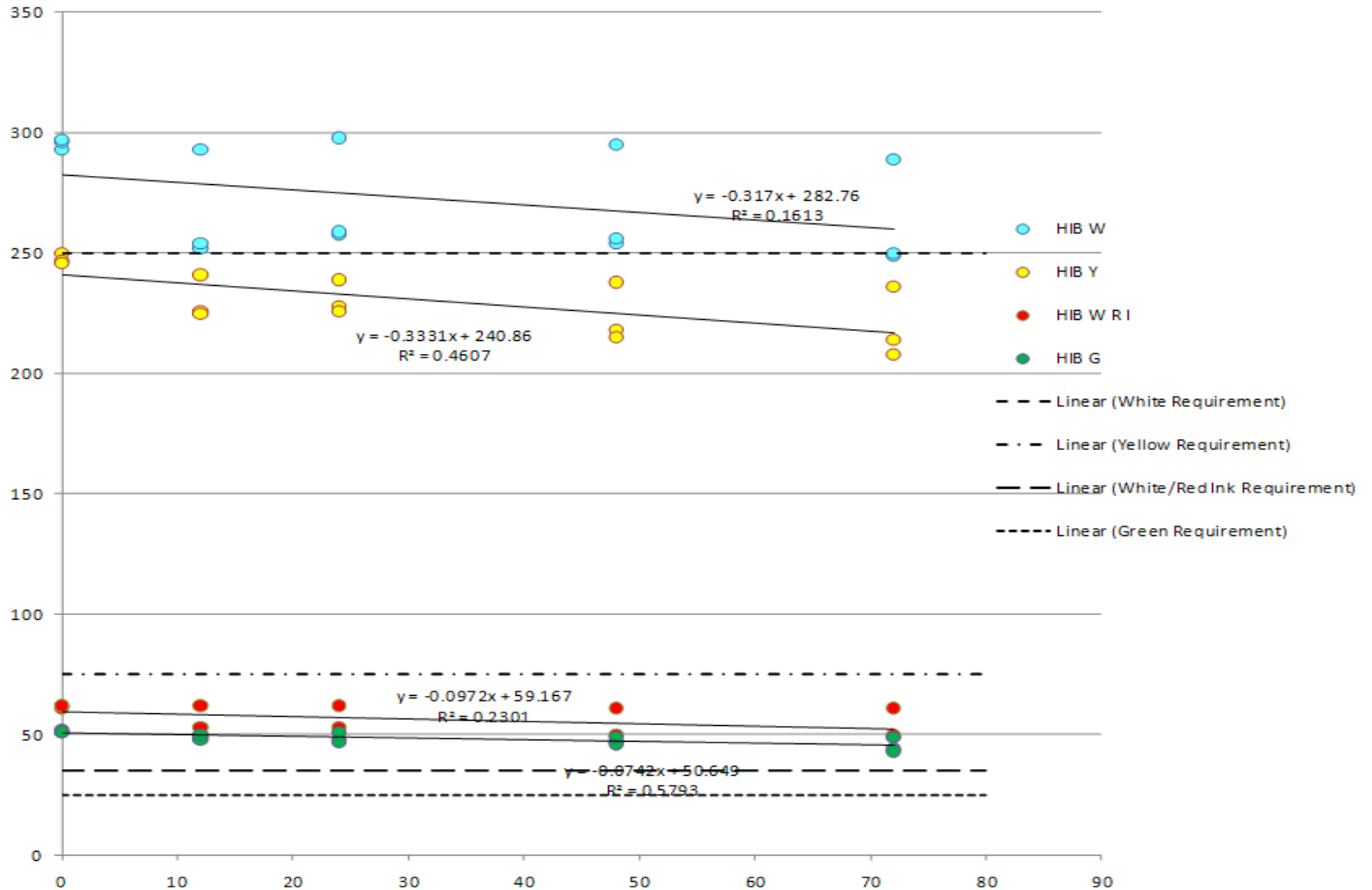
1. <5 yrs experience by DOTD
2. No Research
3. NTPEP Test Data

NTPEP

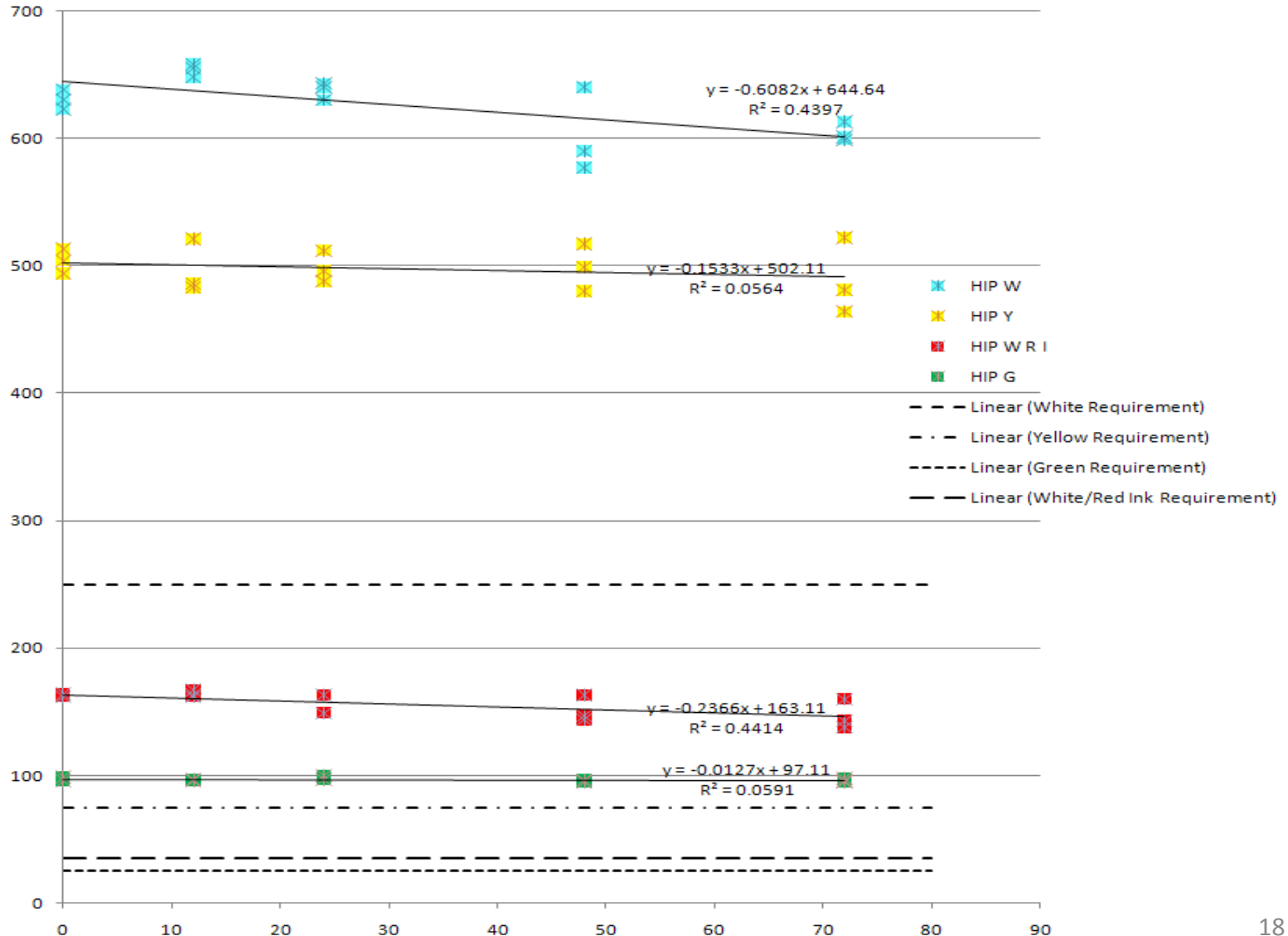
National Transportation Product Evaluation Program

- Environmental sheeting testing since 1994
- Sponsored by AASHTO
- 4 Nationwide test decks
- One test deck is located in Louisiana
- Used to evaluate new products
- Extensive online database of test results

High Intensity Beaded Sheeting



High Intensity Prismatic Sheeting



Real Service Life Curves

Degradation Equations based NTPEP Data					
Sign Color	Equation of Reflectivity over Time		MUTCD Req	Service Life (Years)	
	Beaded	Prismatic		≥	Beaded
White (Overhead)	$y = -0.317x + 282.76$	$y = -0.6082x + 644.64$	250	8.6	54.1
White (Ground)	$y = -0.317x + 282.76$	$y = -0.6082x + 644.64$	120	42.8	71.9
Green (Overhead)	$y = -0.0742x + 50.649$	$y = -0.0127x + 97.11$	25	28.8	473.2
Green (Ground)	$y = -0.0742x + 50.649$	$y = -0.0127x + 97.11$	15	40	538.8
Yellow	$y = -0.3331x + 240.86$	$y = -0.1533x + 502.11$	75	41.5	232.2
White with Red Ink	$y = -0.0972x + 59.167$	$y = -0.2366x + 163.11$	35	20.7	45.1

Calculated Service Life

Color/Location	MUTCD Requirement	Service Life (Years)	
		Beaded	Prismatic
White (Overhead)	250	8.6	54.1 >50
White (Ground)	120	42.8	71.9 >50
Green (Overhead)	25	28.8	473.2 >50
Green (Ground)	15	40	538.8 >50
Yellow	75	41.5	232.2 >50
White with Red Ink	35	20.7	45.1

MUTCD Requirements

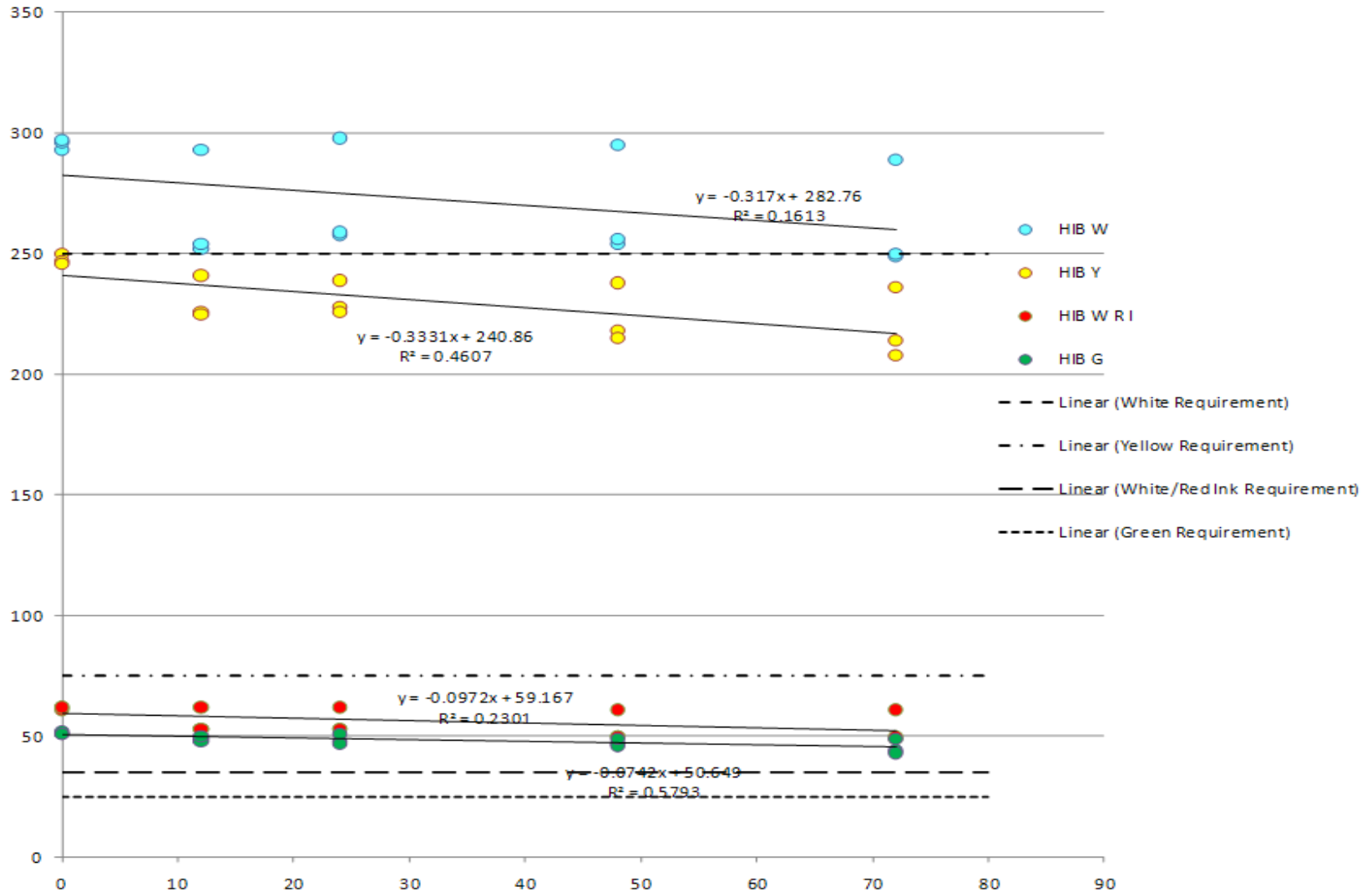
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3. Replace street name and overhead guide signs by January 22, 2018

2003 MUTCD

Table 2A-3. Minimum Maintained Retroreflectivity Levels¹

Sign Color	Sheeting Type (ASTM D4956-04)				Additional Criteria
	Beaded Sheeting			Prismatic Sheeting	
	I	II	III	III, IV, VI, VII, VIII, IX, X	
White on Green	W*; G ≥ 7	W*; G ≥ 15	W*; G ≥ 25	W ≥ 250; G ≥ 25	Overhead
	W*; G ≥ 7		W ≥ 120; G ≥ 15		Post-mounted
Black on Yellow or Black on Orange	Y*; O*		Y ≥ 50; O ≥ 50		2
	Y*; O*		Y ≥ 75; O ≥ 75		3
White on Red			W ≥ 35; R ≥ 7		4
Black on White			W ≥ 50		—

High Intensity Beaded Sheeting



MUTCD Requirements

1. Adopt a Management Method by January 22, 2012 –
2. Replace regulatory, warning, and post mounted guide signs by January 22, 2015 – **Type III beaded Sheeting exceeds the minimum values.**
3. Replace street name and overhead guide signs by January 22, 2018

MUTCD Requirements

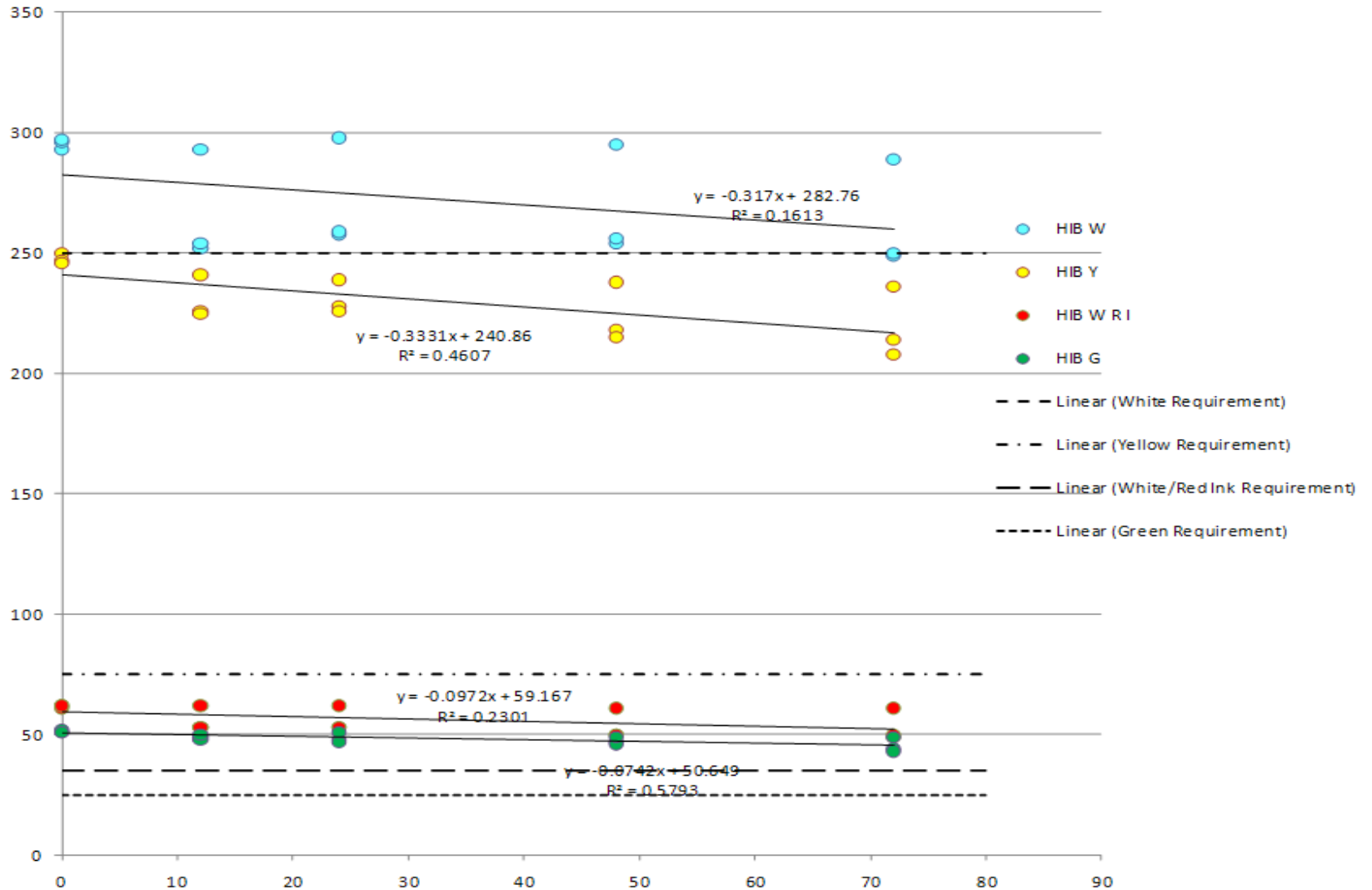
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	W*; G ≥ 7	W ≥ 120; G ≥ 15			Post-mounted
Black on Yellow or Black on Orange	Y*; O*	Y ≥ 50; O ≥ 50			2
	Y*; O*	Y ≥ 75; O ≥ 75			3
White on Red	W ≥ 35; R ≥ 7			4	
Black on White	W ≥ 50			—	

High Intensity Beaded Sheeting



Overhead Guide Sign Replacements

PROJECT	SP	District	Letting Date	Letting Cost	Sq Ft
H.006650	737-90-0088	District 62	October 27, 2010	\$ 707,246.75	11,723.0
H.006688	737-92-0091	District 02	February 2, 2011	\$ 293,118.00	4,294.5
H.006711	737-93-0072	District 03	February 2, 2011	\$ 647,999.43	11,217.5
H.006739	737-94-0072	District 04	March 30, 2011	\$ 348,388.08	3,966.0
H.006751	737-95-0044	District 05	February 23, 2011	\$ 313,298.60	1,101.5
H.006771	737-96-0087	District 61	March 30, 2011	\$ 1,059,959.64	36,130.0
H.006793	737-98-0048	District 08	April 27, 2011	\$ 559,670.00	12,163.6
H.006782	737-97-0050	District 07	May 25, 2011	\$ 462,554.75	8,636.5
Totals				\$ 4,392,235.25	89,232.6

MUTCD Requirements

1. Adopt a Management Method by January 22, 2012 –
2. Replace regulatory, warning, and post mounted guide signs by January 22, 2015 –
3. Replace street name and overhead guide signs by January 22, 2018 – **In 2011 DOTD let 8 projects to upgrade 89,000 sq ft of overhead signs.**

Questions

MUTCD Sign Retroreflectivity Requirements

Peter Allain

June 2011