

Traffic Control Device Inventory & Management Systems

Paul Valliere – RMS Specialist for 3M™ Roadway Maintenance Services



Complying with the
FHWA Minimums

What You Need to Know

Agenda

- ***The Rule***
 - *MUTCD Minimum Retro-Reflectivity Requirements for Traffic Signs and recent proposed amendments*
 - *What is Driving this change*
- ***Sign Management Challenges, Methods and Systems***
 - *How to meet the rule requirements*
 - *What Method(s) will be right for your Agency*
- ***Traffic Sign Replacement Strategies***
 - *Agency Experiences and Examples*

History of the Rule

- Minimum Maintained Retroreflectivity Levels



Legislation - 1993 DOT Appropriations Act

“The Secretary of Transportation shall revise the MUTCD to include a standard for a minimum level of retroreflectivity that must be maintained for traffic signs and pavement markings which apply to all roads **open to public travel.**”

Maintaining the Minimum Retroreflectivity

- Original Deadlines/Compliance Dates from January 2008
 - **2012 for implementation and continued use of an assessment or management method** to maintain traffic sign retroreflectivity at or above the established minimum levels,
 - **2015 for replacement of regulatory, warning, and ground-mounted guide (except street name) signs** that are identified using the assessment or management method as failing to meet the established minimum levels and
 - **2018 for replacement of street name signs and overhead guide signs** that are identified using the assessment or management method as failing to meet the established minimum levels.

Newly Proposed Amendments recently Published in Federal Register

- Published on August 31, 2011
- Proposed changes to Table I-2 (published in 2009 MUTCD)
 - *eliminating, extending, revising many of the 58 listed compliance dates*
- 60-day comment period
 - *ends November 1*
 - *<http://www.regulations.gov>*

What Are “Compliance Dates”?

- Dates established by FHWA for compliance with new requirements, revised device designs, etc. that have been added to MUTCD ----
Established by rulemaking in Final Rules for revisions to the MUTCD (listed in Table I-2 of 2009 MUTCD)

What Do Compliance Dates Apply To?

- Not for Traffic Control Devices being newly installed or rebuilt
*These must comply immediately on Fed.-aid projects, and
All other new/rebuilt devices must comply once State adopts new MUTCD (within 2 yrs)*
- Dates are for replacement of existing Traffic Control Devices in field that do not meet the new requirements
Generally based on estimated service lives

What If There Is No Compliance Date?

- Jurisdictions expected to upgrade devices over time to meet new requirements
 - *“Systematic upgrading program”*
- Agencies can prioritize and schedule based on relative safety needs, resources, etc.
 - *Can decide to wait until noncompliant device wears out – replace with compliant device*

Original and Proposed Compliance Dates relating to Sign Retroreflectivity

- Original:
- **2012 for implementation and continued use of an assessment or management method** to maintain traffic sign retroreflectivity at or above the established minimum levels, (reg, warn, SNS, guide, etc)
- Proposed:
- *Extend date to 2 years after effective date of final rule of this revision of MUTCD – and limit date to regulatory & warning signs only*

What this means:

MUTCD language requiring agencies to have and use a method is not changing, but:

Additional 1-2 years to implement and start using management/assessment method for regulatory & warning signs

No specific date to implement method for guide & other signs -- Agencies could decide when their resources and priorities will allow them to add to their sign retroreflectivity management/assessment systems.

Original and Proposed Compliance Dates relating to Sign Retroreflectivity

- Original:
- **2015 for replacement of regulatory, warning, and ground-mounted guide (except street name) signs** that are identified using the assessment or management method as failing to meet the established minimum levels and
- **2018 for replacement of street name signs and overhead guide signs** that are identified using the assessment or management method as failing to meet the established minimum levels.
- Proposed:
- *Eliminate both dates*

What this means:

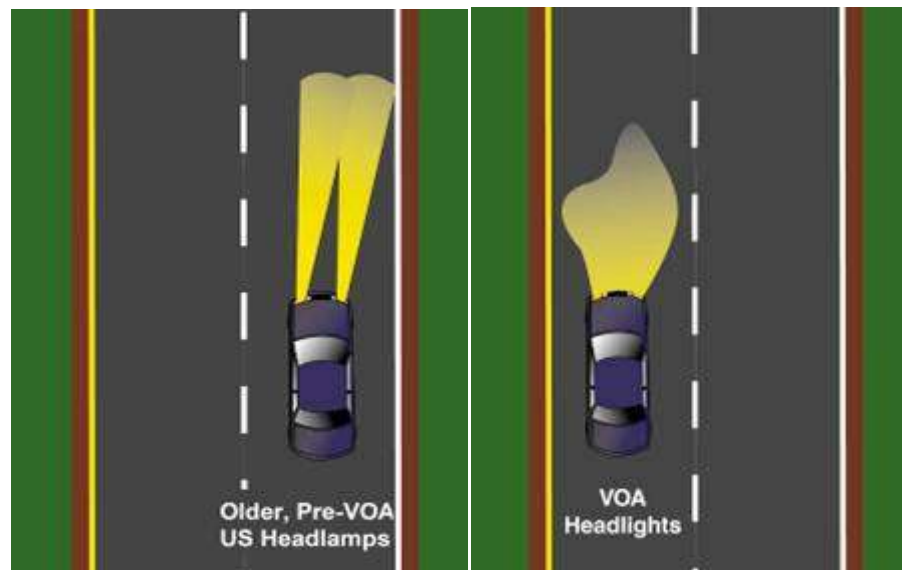
- Any sign a jurisdiction identifies as not meeting the established min. retroreflectivity levels would still need to be replaced, but:
- No specific date to replace
- Flexibility to determine when the replacement would be scheduled.
- The jurisdiction would need to be prepared to defend its replacement scheduling decisions if liability issues arise.

Funding Options for Sign Inventory and Assessment

- Chapter 90 Program Funds - excerpts
 - *Traffic controls*
 - *Direction and Warning signs (must comply with the MUTCD)*
 - *Engineering services and expenses related to highway and mass transportation purposes*
 - *Pavement management systems, development and maintenance*
- FHWA 402 Grant program (sub part of the SAEFTEA-LU program)
- Highway Safety Improvement Program (HSIP) verbiage influence?
- Capital and Operation Funding methods
- MPO & TPO Funding sources

Why do we have required minimum levels of retroreflectivity?

- The driving environment has changed
 - More aging drivers
 - Altered headlamp performance
 - Implies Sign Retroreflectivity efficiency needed to increase to maintain effectiveness of signs today
 - Diverse vehicle sizes.
 - Nighttime Driving Safety is an issue
 - Nighttime fatal crashes are 3X than daytime conditions with much lower traffic volume
 - Adverse Weather conditions

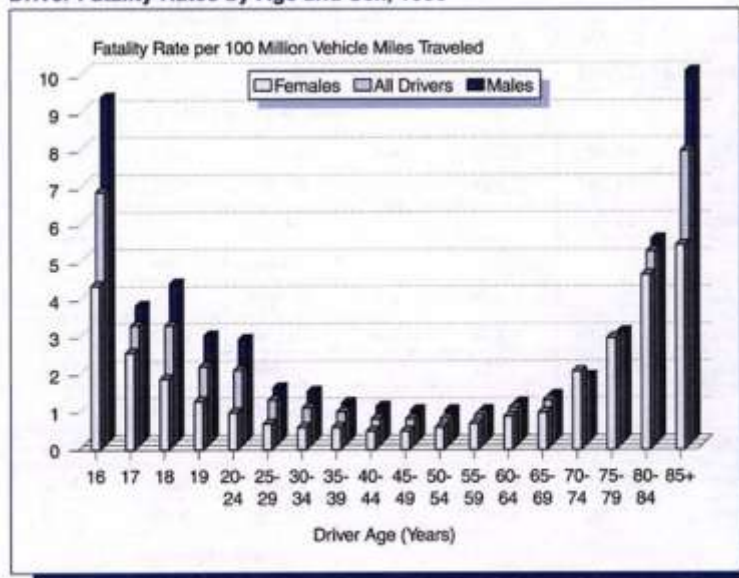


Reason for the Change - Aging Drivers

- By 2020, the US Census Bureau reports that more than 50 million drivers will be **over 65 years old, about one in 5 drivers.**



Driver Fatality Rates by Age and Sex, 1996

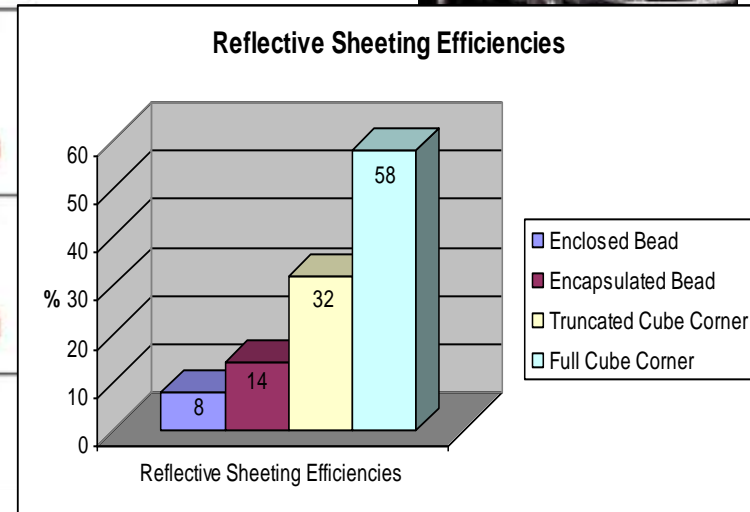
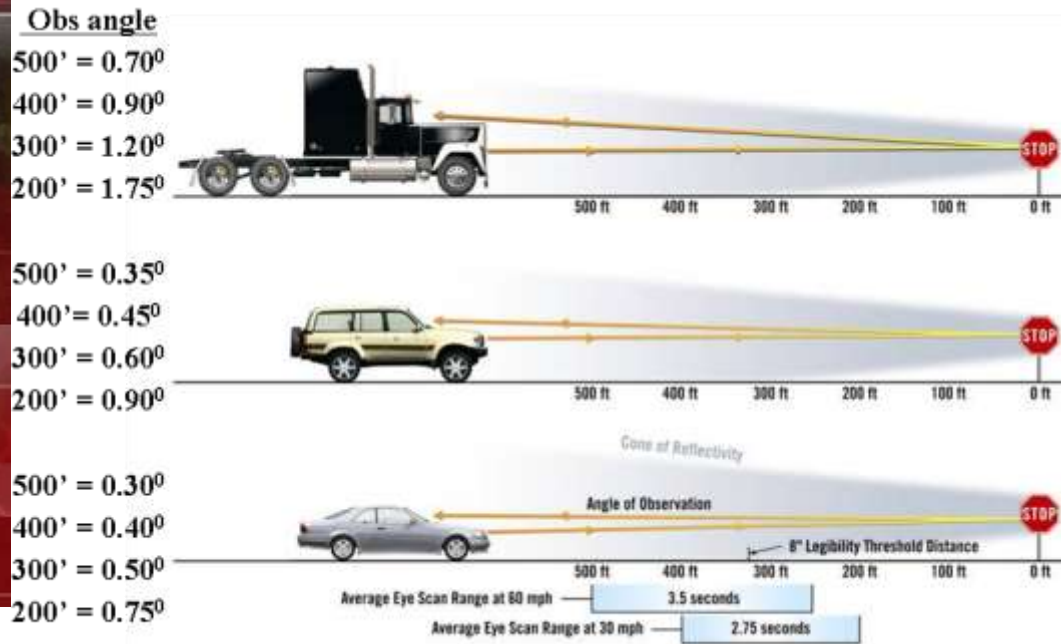


Source: National Highway Traffic Safety Administration (NHTSA), 2000

- Persons age 75 or older have a higher motor vehicle fatality rate than any other age group except persons younger than 25
- About half of fatal crashes involving drivers 80 years and older occur at intersections and involve more than one vehicle.

Diverse Vehicles Sizes:

- The number of large trucks on the road have **increased 60%** while the number of passenger cars have remained unchanged.



- Drivers of larger vehicles are disadvantaged due to the **increased observation angles to view the signs**. Lower grade sign sheeting does not meet the needs of these higher observation angles.



Summary – Major Impacts of Minimum Retroreflectivity

- Retro requirements for all colors
- Overhead Guide Signs (white) **must be Prismatic**
- Ground Mounted Street Name Signs (white) **can not be EG (Type I)**
- Warning Signs (Yellow &/or Orange) **can not be EG (Type I)**
- Regulatory Signs (Black on White), white ≥ 50 cd/lx/m² (EG initial values are 70 cd/lx/m², **life of EG signs will be short**)
- Minimum Sign Contrast Ratio $\geq 3:1$ for Stop Signs (white refl. red refl.)
 - A lot of **older stop signs will be noncompliant due to ink fading** – especially if those signs are south facing)

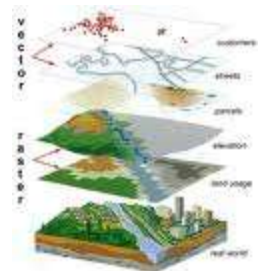


How will we determine which of our signs are deficient?

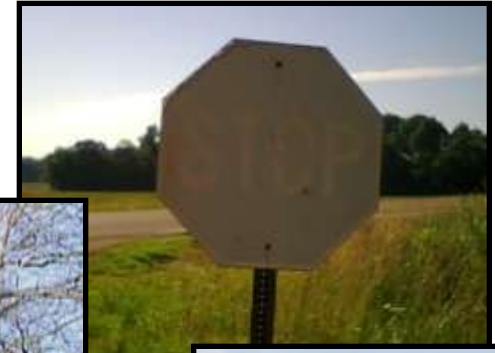
Various levels of approach to sign management

It all starts with knowing "what you have out there!"

- Agency employee: the valued "historian" that "houses" the data in their brain.
- Agency has the "filing cabinet" of historical documents-
- Agency creates a excel "list" of their inventory
- Agency creates a dBase based on intersection/cross street data
- Agency has GIS/GPS overlay layer with signs



Sign Management Challenges and Methods



Assessment / Management Phase

“Public Agencies or officials having jurisdiction shall use an assessment or management method to maintain traffic sign retroreflectivity at or above the minimum levels established”

One or more of the following assessment or management methods should be used to maintain traffic sign retroreflectivity:

ASSESSMENT METHODS:

1. Visual Nighttime Inspection
2. Measured Sign Retroreflectivity

Determine what you have

MANAGEMENT METHODS:

3. *Expected Sign Life*
4. *Blanket Replacement*
5. *Control Signs*

Manage what you have

Highway agencies may exclude the following signs:

(1) Parking, Standing and Stopping Signs – R7 & R8 Series, (2) Walking/ Hitchhiking/ Crossing signs - R9 Series, R10-1 through R10-4b, (3) Adopt-a-Highway Signs, (4) All signs with blue or brown backgrounds, (5) Bikeway signs that are intended for bicyclists

Assessment Method – Visual Night Assessment

- 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.
 - *Calibration Signs Procedure, Comparison Panels Procedure and Consistent Parameters Procedure.*
 - Probably the most consistent with the current practices of most agencies
 - General Guidance:
 - *Agencies develop guidelines and procedures for the inspector to follow*
 - *Inspection is conducted at normal roadway operating speeds*
 - *Inspection is conducted using the low-beam headlights*
 - *Signs are evaluated at a normal viewing distance*

In addition to the preceding guidance, one or more of the following procedures can be used to support the connection between visual inspections and reflectivity...

Assessment Method – Visual Night Assessment

Advantages:

- ***Inexpensive method*** to inspect and monitor signs
- Can be ***done relatively quickly***, at a fraction of the time required to directly measure reflectivity¹

Disadvantages:

- *Annual process – resource requirements to effectively implement*
- *Proper training and calibration of data recorders is essential*
 - *Can be very subjective, observers can make incorrect decisions in one study²*
 - *FHWA accepts method – **training is the key!***

(1) "Sign Retroreflectivity: Fiscal Impact of Proposed Minimum Retroreflectivity Values on Local Governments in Indiana and Investigation of the Accuracy of Nighttime Inspections." The Indiana LTAP Center, Aug 2006.

(2) Lagergran, E.A. "Traffic Sign Retroreflectivity Measurements Using Human Observers.", Report No. WA-RD-140.1, Washington State Transportation Center, 1987

(3) Hawkins, H.G. and P.J. Carlson. "Results of Visual Evaluations of Sign Retroreflectivity Compared with Minimum Retro Recommendations." TRB, National Research Council, Washington, DC, 2001, pp. 11-20.

Assessment Method – Measured Sign Retroreflectivity

The retroreflectivity is measured and directly compared to the proposed minimum level appropriate for that sign.

- ASTM E1709, Standard Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer, provides a standard method.



Assessment Method – Measured Sign Retroreflectivity

Advantages:

- **Accurate** way of *Evaluating Signs, when done properly*
- *May be advantageous for litigation purposes or signs in question*

Disadvantages:

- *Annual process*
- *10 to 25 percent difference in readings due to rotational sensitivity of prismatic sheeting*
- **Large Time and Resource commitment**
 - Example: 50,000 Signs x 3 minutes/sign = 2,500 hours
- *Can be expensive to capture this information*
 - Portable reflectometer cost: \$10,000 - 15,000 (not including maintenance)

Assessment Method Considerations

-If you have the following.....

- Significant quantities of Engineer Grade (EG) Signs
- Older High Intensity Beaded signs of certain types
- Significant Street Name signs that are out of compliance
 - *Letter Height*
 - *Sheeting*

.....you may be better off replacing without a costly assessment

Management Methods – Expected Sign Life

When signs are installed, the installation date is labeled or recorded so that the age of the sign is known. The age of the sign is compared to the expected life of the sign. 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 their expected life should be replaced.

- *The expected service life can be based on several factors, such as:*
 - Sign sheeting warranties,
 - Weathering deck results, or
 - Measurements of actual signs.

- *Methods to determine the age of individual signs include:*
 - A sticker or label attached to the sign that identifies its age
 - A sign management system that keeps track of the age of individual signs.

Management Methods – Expected Sign Life

Examples:



ID	Type	Size	Sheeting	Install	Expire	Signs
OKL 0049	P-5a	24x24	Type 10	2/16/2006	2/16/2018	
OKL 0029	O-3	8x...	Type 10	2/16/2006	2/16/2018	
OKL 0020	R1-1	8x...	Type 10	2/16/2006	2/16/2018	
OKL 0025	S2-1	10x30	Type 10	2/16/2006	2/16/2018	
OKL 0046	W16-79	10x15	Type 10	2/16/2006	2/16/2018	
OKL 0023	R1-1	10x30	Type 10	2/16/2006	2/16/2018	
OKL 0009	R1-1	24x30	Type 10	2/16/2006	2/16/2018	
OKL 0010	R1-1	8x24	Type 10	2/16/2006	2/16/2018	
OKL 0044	R2-1	10x24	Type 10	2/16/2006	2/16/2018	
OKL 0012	S4-2	10x24	Type 10	2/16/2006	2/16/2018	
OKL 0014	S2-1	10x30	Type 10	2/16/2006	2/16/2018	
OKL 0048	W16-79	10x15	Type 10	2/16/2006	2/16/2018	
OKL 0038	O-3-1	8x...	Type 10	2/16/2006	2/16/2018	
OKL 0017	O-3-1	8x...	Type 10	2/16/2006	2/16/2018	
OKL 0010	R1-1	10x30	Type 10	2/16/2006	2/16/2018	Webhook Ave H 700
OKL 0019	R2-1	10x24	Type 10	2/16/2006	2/16/2018	38 mph
OKL 0020	O-3-1	8x...	Type 10	2/16/2006	2/16/2018	Webhook Ave H 000
OKL 0023	O-3-1	8x...	Type 10	2/16/2006	2/16/2018	44.9579317 -92.979642
OKL 0022	R1-1	10x30	Type 10	2/16/2006	2/16/2018	44.9570431 -92.979653
OKL 0020	R1-1	10x30	Type 10	2/16/2006	2/16/2018	44.9577233 -92.979602
OKL 0024	W16-1	10x30	Type 10	2/16/2006	2/16/2018	44.9577233 -92.979602



Advantages:

- Once established **very easy to use and plan** replacements
 - Annual assessments are very minimal if at all
- Ability to utilize preexisting asset management systems to comply

Disadvantages:

- Does not consider signs that, based on certain conditions, might fail early or last longer than their expected life. i.e. – Hail/Snow damage

Management Method – 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 **shortest-life material used** on the affected signs.

Advantages:

- *No Need to Track Individual Signs or Assess Retroreflectivity*
- ***Easiest Method to Manage***

Disadvantages:

- *Could be **replacing good signs that do not necessarily need it**, need some checks and balances in place to manage*
 - *Best program had 98% good signs, 2% critical*
 - *Worst program had 73% good signs, 27% critical*

Management Method – Control Signs

Control Environment

(Maintenance Yard)

- Exactly the Same Conditions as Field Signs
 - Each Facing Direction
 - Each Sign type or Color
 - Each Sheeting type
 - Etc.
- Correct number in order to have Statistical Significance



HIP (South)



HIP (North)

Represents

Represents

Field



Advantages:

- *Less costly and time consuming than monitoring all signs in the field*

Disadvantages:

- *Creating and Setting up the appropriate Control environment*
- *Based on a **sample which could create discrepancies.***
- ***Control signs will need to be protected** from vandalism/knock downs*



Sign Management Challenges, Methods and Systems

Sign Inventory Data Capture Equipment Options

- Trimble GeoXT with integrated GPS



■ = ~\$5,000

- Digital Camera



■ = ~\$200

- Barcode Scanner



■ = ~\$700

■ **Total = ~\$5,900**

PROS

- Trimble comes with ArcPad Mobile GIS software and post-processing software
- ~1 Meter Accuracy w/o post processing
- Sub meter accuracy w/post processing

CONS

- Camera not integrated
- Barcode scanner not integrated
- Need for 3 pieces of equipment is cumbersome

Commercially Available Assessment Methods

Vehicle-Mounted Camera Systems

Advantages:

- *Captures multiple assets all at once*
- *Less labor-intensive than feet-on-the ground*
- *Simple process for the agencies*



Disadvantages:

- *Less attributes captured than with feet-on-the-ground*
- *Trying to capture everything, no direct focus on signs*
- *Efficient collection requires planning/robust software/systems/technology*
- *Higher than acceptable error rate in readings have been identified*



Recommend agencies specify accuracy levels and audit results

Commercially Available Assessment Methods

Feet-on-the-Ground Services

- Complete work w/ Agency Forces, or
 - *Agency Internships*
 - *Contract Inspectors @ low labor rates*
- Need to provide a training program



Advantages:

- *Extensive attributes can be captured*

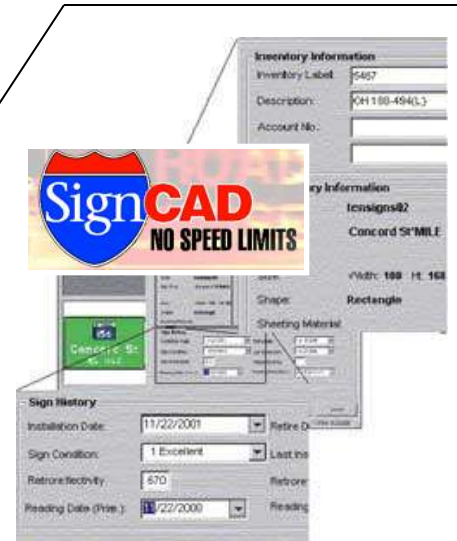
Disadvantages:

- *Equipment needed*
- *Time and cost intensive process (potential offset w/ low cost labor)*
- *If the agency uses a non-experienced inspector, could have data integrity issues*

Commercially Available Inventory Systems

Inventory Software Systems

- SignTRACK™ (SignCAD Systems, Inc.)
- Hansen Information Technologies
- SIGNview (Cartegraph Systems, Inc.)
- Misc. Software from:
 - *Sign Fabricators*
 - *Consultant Organizations – BETA Group*
 - *Other Government Agencies*



3M Roadway Maintenance Services

also maintains an active system for our agency customers



CarteGraph





Traffic Sign Replacement Strategies

Summary and Wrap-up

- *A sign inventory is the first step, if you don't know what signs you have and their locations*
- *If you know corridors have signs that need to be replaced, the inventory and information collected can be scaled back (or even completely abandoned)*
- *Consistent methods and systems will save time and money in the long run – Standardize your methods*
- *Choose your data management system carefully*
- *Be wary of trying to get too complex – keep methods simple and limited to how you will use data*
- *Keep things Functional and Simple*



Questions?

Thank you!