

Traffic Signal Remedial Inspection and Condition Assessment

TRB Lectern Session 2002

Management and Operation of Traffic Signals:
Scrambled Transportation Systems Management
and Operations For Assets

January 8, 2024



Typically, When We Talk About Traffic Signals...

- Systems Engineering
- Communications Requirements
- Advanced Control Systems (Adaptive)
- Optimization
- ATSPM
- Benefit/Cost Analysis
- User Cost Savings
- Fuel Savings and Emissions Reductions

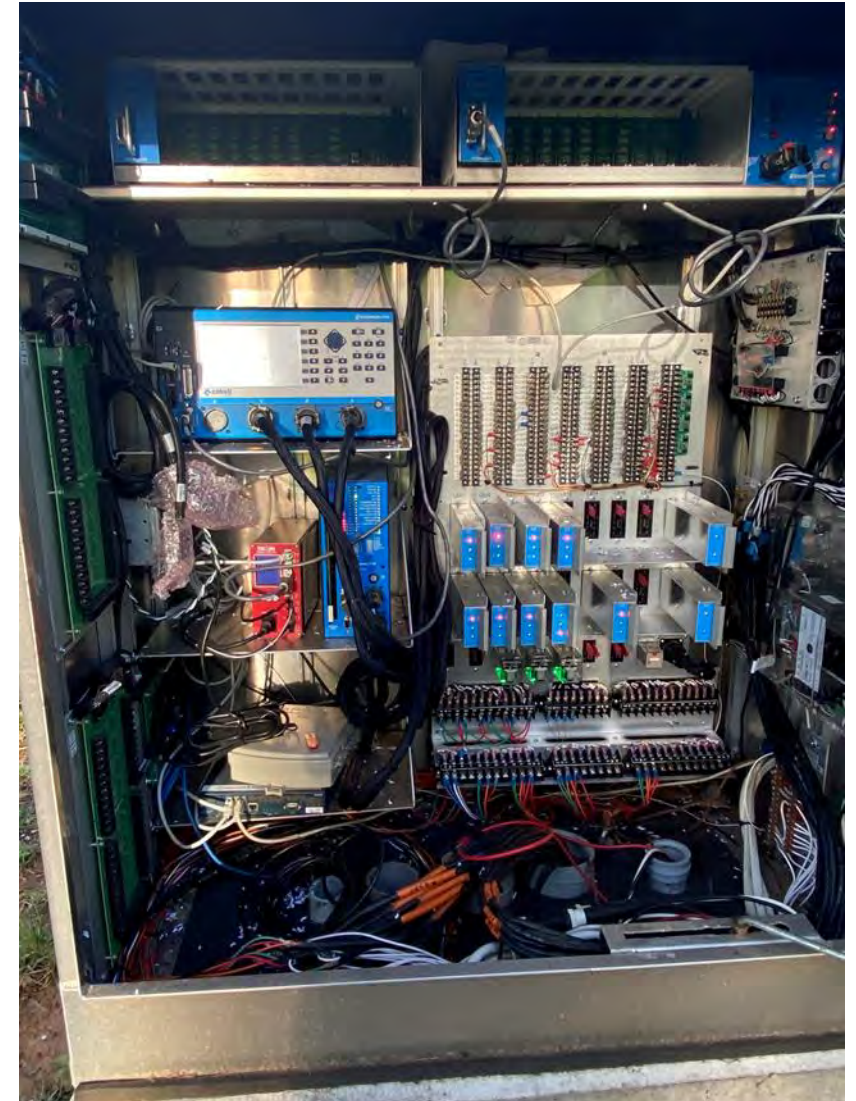


Unfortunately, we do not talk about remedial inspections and/or condition assessment

Heart of a Traffic Signal

Most people think that if a traffic signal is cycling through its colors efficiently, everything is OK!

- The cabinet and controller may be state-of-the art but the traffic signal may still be in poor health
- Proactive: conduct periodic traffic signal inspection and find and address minor issues before they become major problems
- Reactive: explain to the media, public, etc. how and why a failure happened



If You Don't Do Your Due Diligence...This Is How You May Find Out



Source: <https://www.wsbtv.com/news/local/cobb-county/cobb-co-officials-trying-figure-out-why-traffic-light-collapsed-major-intersection>



Source: <https://robertdyer.blogspot.com/2021/07/traffic-signal-collapses-at-woodmont.html>

ITE Traffic Signal Maintenance Handbook, 2010

- “Preventive maintenance should be performed at regularly scheduled intervals. As a minimum, it should be performed once a year.” (pg. 105, Planning and Scheduling)

Today's subject goes beyond preventive maintenance and will deal with long term health of the asset and helping an agency prioritize limited funds for traffic signal replacement.

Remedial Inspection



The care and servicing by personnel for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.



“before they occur or before they develop into major defects.”

Remedial Inspection and Condition Assessments

Over the course of the past 7-8 years, Mead & Hunt has performed several Remedial Inspection and Condition Assessments for various agencies throughout Maryland

- Agency A – 2016
- Agency B - 2018
- Agency C -2019
- Agency D – 2021
- Agency A – 2023 (2nd Cycle)

Each agency had limited funds available for traffic signal reconstruction and was looking to both prioritize where those funds were allocated, and to justify additional funds.

The Inspection Process

- Key Structural Elements...poles and foundations, mast-arms, and span wires
- Supplemental Items...cabinet and controller, MUTCD requirements, and accessibility issues (button placement)
- Maintenance Items...signing and marking, rodent/bug infestation, LED degradation, and is everything tight
- Complete Photographic Inventory

Structures

STRUCTURES:				POINTS	SCORE
Signal Age:	0-10 yrs: 0 pts.	11-20 yrs: 5 pts.	>20 yrs: 10 pts.	0-10	0
Design Type:	(mast-arm = 0 pts, span wire = 5 pts)			0-5	0
Pole Type:	(painted = 5 pts, galvanized = 0 pts)			0-5	0
General condition of the poles:	(good = 0 pts, fair = 5 pts, poor = 10 pts)			0-10	0
Any abnormal bending or pole rake?	(moderate = 5 pts, severe = 10 pts)			0-10	0
Pole back guys in use?	(1 back guy = 3 pts, 2 back guys = 5 pts, 3 or more back guys = 10 pts)			0-10	0
Is the pole base welded steel or cast iron?	(cast iron = 10pts)			0-10	0
Any signs of cracking at or near base plate welds?	(10 pts any signs of cracking)			0-10	0
Any abnormal bending or sagging of the mast arms?	(yes = 5 pts, no = 0 pts)			0-5	0
Any signs or rust or corrosion at or near the mast arm mounting plates?	(yes = 5 pts, no = 0 pts)			0-5	0
Any abnormal sagging of the span wires?	(1 span = 5 pts, 2 or more spans = 10 pts)			0-10	0
Any signs of rust on the span wires?	(surface area: 25% or less = 5 pts, 25%-50% = 10 pts, greater than 50% = 15 pts)			0-15	0
Any span wire splices?	(1 splice = 5 pts, 2 splices = 10 points, 3 or more splices = 15 pts)			0-15	0
Any signs of erosion around any of the pole bases?	(yes = 5 pts, no = 0 pts)			0-5	0
Base plate mounted directly to foundation with no leveling nuts?	(yes = 5 pts, no = 0 pts)			0-5	0
Rust or corrosion on the base plate, anchor bolts, or nuts?	severe 25 pts, moderate 15 pts, light 5 pts, no 0 pts)			0-25	0
Any exposed rebar or abnormal exposure of the anchor bolts?	(yes = 5 pts, no = 0 pts)			0-5	0
Any abnormal cracking or spalling of concrete at any of the pole foundations?	(moderate = 3 pts, severe = 5 pts)			0-5	0
OTHER:					
Any apparent violations of the Maryland High Voltage Act?	(yes = 10 pts)			10	0
Any equipment obstructions to walking or biking paths?	(1 obstruction = 1 pt, 2 obstructions = 3 pts, 3 or more = 5 pts)			0-5	0
Cabinet conduit capacity:	(Below = 0 pt, At = 3 pts, Above = 5 pts)			0-5	0
Overall condition of the hand boxes:	(Good = 0 pt, Fair = 3 pts, Poor = 5 pts)			0-5	0
Conduit fill capacity in hand boxes:	(Below = 0 pts, At = 3 pts, Above = 5pts)			0-5	0
General condition of the electrical service:	(Good = 0 pts, Fair = 3 pts, Poor = 5pts)			0-5	0
OVERALL SCORE:				(Maximum Points = 200)	0

The Supplemental Score is a secondary score for non-critical items and is not included in the location's Overall Score.

[illegible]

Photographic Inventory – Asset Management



Pole Bases



Sometimes the structural damage is immediately visible.

Pole Bases



Sometimes a deficiency is not immediately obvious. In this case removal of the decorative “shoebox” cover revealed major structural damage to the base of the pole.

Side by Side Comparison at 5 Years



March 2016



July 2021

Side by Side Comparison at 5 Years



March 2016



August 2021

Our “Four-Legged Canine Friends”



Traffic Light Pole In Japan Snaps And Collapses After Dogs Constantly Peed On It - WORLD OF BUZZ

[Visit >](#)

Buried Foundations



Decorative Caps



Decorative anchor bolt caps which can trap moisture and roadway and sidewalk de-icing chemicals can also hide deterioration.

Follow-Up Structural Evaluation

Whenever a significant structural deficiency was identified by the inspection team a follow evaluation was conducted by a licensed Structural Engineer:

- Is the structure safe?
- Are there any immediate remedial actions that need to be taken?
- What is the life expectancy of the device?

Overhead Issues

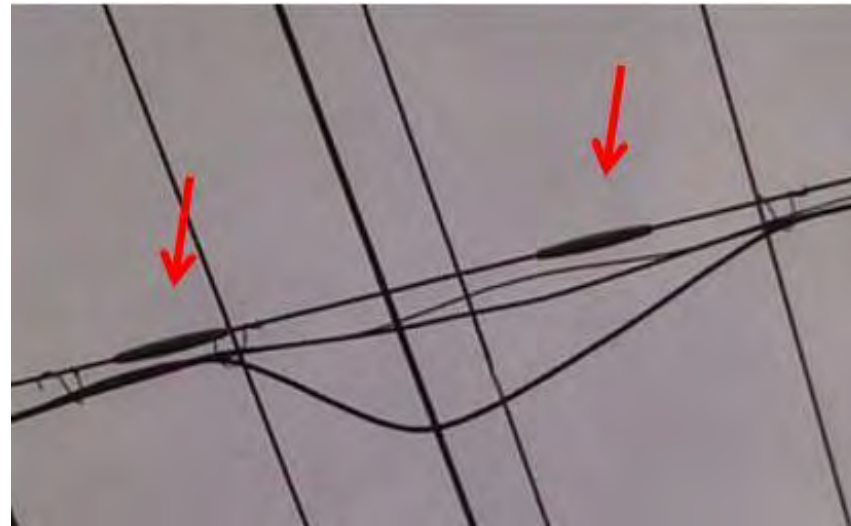


Incorrect mast-arm bolts not fully threaded, or not fully tightened.

Span Wires



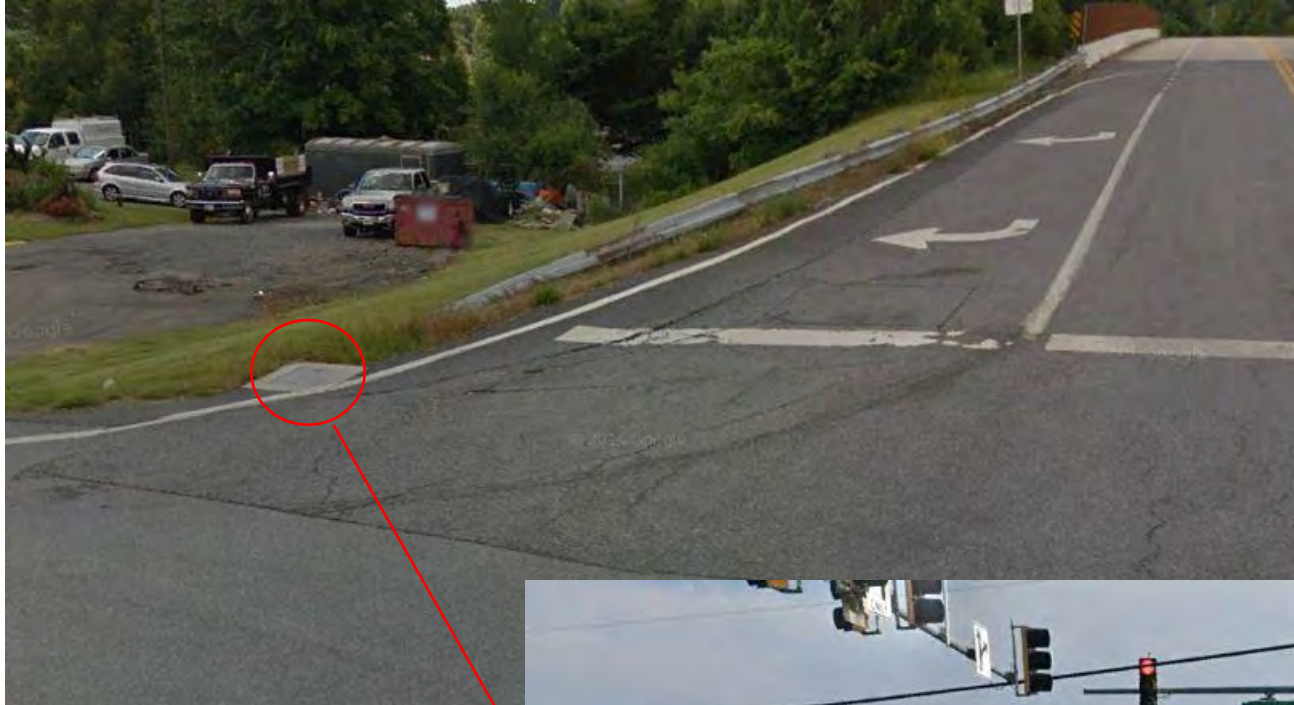
- Aged hardware
- Span wire splices
- Span wires with significant coercion
- Span wires in danger of being cut



Hand Holes



Hand Holes and Water Infiltration



Accident Damage



Deterioration That is Unknown to the Agency



Maintenance Issues

- Faded signs and worn pavement markings
- Loose anchor bolt tightening nuts
- Damaged hand boxes (shifted lids)
- Cabinet damage and/or rodent infestation
- Damage to electrical services
- Conduits not plugged
- Missing cabinet filters
- Paint coating failure
- Damaged pedestrian pushbuttons
- LED deterioration
- Missing or damaged tactile warning pads

Agency A

- 300 agency owned traffic signals
- First Inspection Cycle in 2016
- Developed a Top 25 List
- In 5 Years Completed Reconstruction of their Top 25
- Just wrapped up their 2nd complete inspection cycle
- New Top 25 List
- Asset Management Database

The inspection data was used to secure funding to reconstruct an additional 2-3 signals per year.

Agency B

- 100 agency owned traffic signals
- Completed their 1st inspection cycle in 2018
- Completed reconstruction of their Top 10 locations
- Completed remedial repairs to extend the life of several locations
- Asset Management Database



Agency C



- 25 agency owned traffic signals
- Condition evaluation to see if they had any major issues developing
- Used the inspection process as a training tool for their signal maintenance staff
- Used as an opportunity to evaluate and update their yellow change, all-red clearance, and pedestrian timing intervals
- Asset Management Database

Agency D

- 25 agency owned traffic signals
- Completed their 1st inspection cycle in 2021
- Prioritized list of needed repairs
- Began almost immediate design for full traffic signal reconstruction at their highest priority location
- Highest priority location had extreme pole deterioration, vehicle impact damage, crumbling hand holes, and a signal cabinet and controller that was aged and difficult to maintain
- New traffic signal at this location was recently activated
- Asset Management Database

Agency D



Agency D - Design Improvement



- New poles mounted on “T” Bases to mitigate potential damage from our four-legged friends
- It’s easier and more cost effective to replace the “T” base than it is to have to replace the entire pole
- “T” Bases also provide breakaway capability in case of vehicle impact

Final Thoughts

- Quite a bit of aging infrastructure...
- Just because its on and working **does not** mean its healthy!
- Take the time...spend the money
- Identify and correct the minor issues before they become major issues
- Useful for justifying funding
- Asset Management Tool

Pictures can be a shocking reality to an agency that thinks their assets are in good condition.

Thank you.

