



Maintenance Management

Program Management for Traffic Signals Systems
Professional Development Series Course NTOC 04

January 11, 2012

Course Objectives

- Demonstrate the importance of an effective preventative maintenance program and be able to formulate such a program
- Recognize the need for specialized staffing, training, and development in light of prevailing and emerging advancements in technology and applications

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- Identify the key components of an effective maintenance management program and recognize its benefits
- Determine performance measures specific to traffic signal maintenance and recognize their significance in funding justification and overall agency accountability

Course Context

Trends in Transportation Investment

- Focus increasingly on management and operations.
- Inability build capacity to alleviate recurring congestion.
- Fully operational and progressively more complex systems require a high state of good repair.
- Scarce personnel and financial resources.
- Increasing emphasis on performance management.

Maintenance Operations

Response Maintenance

Remedial Action taken in the event of a traffic signal or traffic signal system failing to operate according to the designed or intended function

Primary causes: acts of nature and/or equipment failure

Less common causes: vehicular accidents, vandalism, power fluctuations

Relatively high cost due to unpredictability
(overtime and standby pay)

Maintenance Operations

Response Maintenance Requirements

- Adequately trained staff (troubleshooting, repair, and replacement of component parts)
- Ample equipment and parts for anticipated tasks
- Documentation of designed/intended operation
- A reliable notification and tracking system (manual or computer based)

Maintenance Operations

Preventative Maintenance

A scheduled inspection and review of traffic signal equipment and their operation intended to identify worn or defective components prior to failure

A scheduled action designed to provide remedy prior to failure of the system or component part

Maintenance Operations

Preventative Maintenance

Major benefits:

- Reduced exposure to liability
- Reduced frequency and severity of malfunctions and failures
- Greater efficiency in use of agency resources

Maintenance Operations

Preventative Maintenance Requirements

- Trained staff equipped with proper testing equipment and procedures (i.e. conflict monitor and LED testing)
- Relevant operational thresholds for component parts (i.e. LED's, conflict/current monitors, etc.)
- Deployment of sampling methods
- Documentation - Documentation - Documentation

Maintenance Operations

Maintenance Categories

- Reactive/Response Maintenance - Fix When Broken
- Preventative Maintenance - Scheduled Maintenance
- Predictive Maintenance – Condition-based Monitoring
- Proactive Maintenance - Source Failure Detection

Source: "Increasing Equipment Efficiency and Planned Work" by Rey Marquez, Life Cycle Engineer

Maintenance Operations

Design Modifications

Required due to:

- Hardware/Software upgrades
- Changes in geometric/operational characteristics

Maintenance Operations

Design Modifications

Critical to the process:

- Documented request and approval
- Documentation of actual modification
- Documentation of any maintenance requirements resulting from the modification

Maintenance Operations

LED Maintenance

ITE specifications for circular, arrow, and pedestrian LED indications inclusive of light intensity across specific temperature ranges.

- VTCSH
- PTCSI

In addition:

- Caltrans
- MnDOT
- NYSDOT

Maintenance Operations

LED Maintenance

Maintenance Requirements:

- Staff training
- Established Sampling methods and/or
- Field testing equipment
- Inventory database/tracking system
- Documentation - Documentation

Maintenance Operations

ITS Maintenance Requirements

- Increased video detection and surveillance monitoring
- Telecomm. requirements for real-time reporting
- Proliferation of fiber-optic and spread spectrum based Ethernet configurations
- Increased use of wireless vehicle detection (speed, volume, occupancy and classification applications)

Maintenance Operations

Emerging maintenance requirements:

Connected Vehicle (formerly VII) initiative

- Multi-model in scope and application
- Providing connectivity between vehicles
and
- Connectivity between vehicles and infrastructure

Maintenance Operations

Potential benefits:

- Real-time traffic signal timing adjustments
- Advanced preemption capabilities
- Real-time, in-vehicle congestion warnings and alternate routing
- Real-time traffic volume data
- Real-time evaluation of systems performance

Maintenance Operations

Staffing & Training (FHWA-HOP-09-006)

Additional emphasis required:

- Network technology
- Telecommunications technology
- Systems analysis
- Systems engineering

Maintenance Operations

Staffing & Training

Categorized:

- Administrators
- Engineers
- Field Supervisors
- Mechanics/Technicians

Maintenance Operations

Training & Educational Resources

- IMSA: imsasafety.org
- ITE: ite.org
- TRB: trb.org
- FHWA: fhwa.dot.gov
- NTOC: ntoctalks.com

Maintenance Management

“... a systematic approach to the review of day-to-day maintenance activities for the purpose of improved efficiency in the allotment of available resources.”

“Maintenance management is a continuous process!”

Maintenance Management

FHWA-HOP-09-055

Case studies (Archetypes):

1. High- Activity (adequate staffing)
2. Infrastructure- Rich (limited staffing)
3. Well-Managed (limited resources)
4. Poorly Managed* (limited resources)
5. State Agencies (limited resources)

Maintenance Management

Successful Archetypes (FHWA-HOP-09-055)

- Strong concept of basic service
- Clear evaluation of objectives
- Close coordination of design, operations, and maintenance resources
- Good understanding of performance measures
- Commitment to staff development

Maintenance Management

Basic service (FHWA-HOP-09-055)

- Infrastructure reliability
- Minimized and balanced congestion
- “Smooth” flow
- Predictable and consistent operation
- “Broad-banded” timing solutions

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Traffic Signal Management Plan (FHWA-HOP-09-055)

“Who are we?”

Components:

- Objectives/Requirements/Constraints
- Response to complaints/user expectations
- Maintenance Strategies
- Operations Strategies
- Design Strategies

Maintenance Management

Maintenance strategies require an objective assessment of:

- Staffing and competency levels
- Tools and Equipment
- Inventory
- Geographic dispersal

Maintenance Management

Maintenance Management Components

- Accurate documentation
- Secure, robust storage
- Efficient and reliable retrieval system
- Relevant summation of information

Computerized or Manual System ?

Maintenance Management

Computerized Traffic Signal Maintenance Management Systems

- SIGNALview by CarteGraph
www.cartegraph.com
- SIMMS by Fortran Traffic Signal Limited
www.fortrantraffic.com
- VIMMS by Vulcan
www.vulcaninc.com
- PubWorks by Tracker Software Corp
www.pubworks.com

Maintenance Management

Benefits of Effective Traffic Signal Maintenance Management

Improved Efficiency in:

- Planning and scheduling
- Budgeting
- Allocating Resources
- Establishing/Evaluating Performance Measures

Maintenance Management

Performance Measures

(NCHRP Report 551: Performance Measures and targets for Transportation Asset Management, 2006)

- Quantifiable
- Specific Target Range or Value
- No Ambiguity
- Provide a Measure of Divergence from Target

Examples:

- Response Calls/Installation
- Response Time/Call
- Response Call Cost/Installation

Maintenance Management

Agency Asset Management and Accountability
("Signal Systems Asset Management State-of-the Practice
Review", FHWA, April 2004)

- Explicit identification of performance goals and measures;
- Ensuring that programs, projects and services are delivered in the most effective way available;
- Informed decision-making based on quality information and analytic tools;

Maintenance Management

Agency Asset Management and Accountability
("Signal Systems Asset Management State-of-the Practice
Review", FHWA, April 2004)

- Monitoring of actual performance and costs, and use of this feedback to improve future decisions; and
- Identification and evaluation of a wide variety of options for achieving performance goals - spanning multiple assets as well as management, operational, and capital investment approaches.

Review and Summary

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Review and Summary

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Course Context

2007 NTOC Traffic Signal Report Card

The objectives of the report card was to:

- Assess and bring attention to the current state of traffic signal management and operations
- Provide a tool for identifying areas requiring improvement
- Advocate for additional resources needed for the improvement process

Course Context

2007 NTOC Traffic Signal Report Card Results

▪ Management	D-
▪ Signal Operations at individual intersections	C
▪ Signal Operations in coordinated systems	D
▪ Signal Timing Practices	C-
▪ Traffic Monitoring and data collection	F
▪ Maintenance	C-
OVERALL	D

Review and Summary

Call to Action

2011 Traffic Signal Operations Self Assessment

Participants benefit by:

- Identifying strengths and opportunities
- Providing a benchmark for performance
- Increasing national awareness of the need for improved traffic signal operation
- Increasing local awareness of the need for improved traffic signal operation

“Traffic Signal Maintenance Management is a Continuous Process.”

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