





TOPIC 13: MAINTENANCE

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	 <h1 style="text-align: center;">Traffic Signals 101</h1> <h2 style="text-align: center;">Topic 13 Maintenance</h2>	<p>In this topic you will be introduced to:</p> <ul style="list-style-type: none"> <li>• Traffic Signal Maintenance Categories</li> <li>• Maintenance Responsibilities</li> <li>• Definitions of Responsibilities</li> <li>• Actions</li> <li>• Signal Retiming</li> </ul>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="text-align: center;">Maintenance</h2> <p>➤ <b>Traffic Signal Maintenance can be divided into three categories</b></p> <ul style="list-style-type: none"> <li>– Preventative Maintenance</li> <li>– Response Maintenance</li> <li>– Design Modification</li> </ul> 	<p><b>Preventative Maintenance</b> practices involve inspecting, cleaning, and adjusting signals at regular intervals and replacing components as necessary.</p> <p><b>Response Maintenance</b> involves procedures that are undertaken when traffic signal and control equipment fails, either fully or partially.</p> <p><b>Design Modification</b> involves changing the signal display, timing plans, or equipment to reflect changed traffic conditions.</p> <p style="text-align: right;">2</p>

## Maintenance

### ➤ Maintenance Responsibilities

- The Maintenance responsibilities are spelled out in the MINNESOTA DEPARTMENT OF TRANSPORTATION TRAFFIC CONTROL SIGNAL AGREEMENT
- Refer to Topic 2 regarding agreements



The agreement will have a number upon which other documents may refer to. The number will be in effect until another agreement is written, in which it will state that the new number super cedes and terminates the old agreement number.

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## Maintenance

### ➤ Maintenance Responsibilities

- The maintenance responsibilities will be outlined in this agreement
- The maintenance will be defined as to the entity responsible for the following:
  - Provide power to the traffic signal and streetlights
  - Maintain and keep in repair traffic control signal and streetlights



A quick and easy reference is the **signal responsibility list**, which is a report in the facility management system. This list can be generated by the District Traffic Offices, or requested by the Electrical Services Section (ESS) and they will generate a list.

The list contains an index that shows the responsibility types, the system types with abbreviations and has a format that makes the responsibility easily recognizable.

The handout at the back of this topic shows a sample agreement, a sample responsibility list and code definitions.

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**Provide power to traffic control signal and streetlights** means which entity shall provide necessary electrical power at its expense.

**Maintain and keep in repair traffic control signal and streetlights** means repair/replace all hardware and associated equipment to operate the signal system. This includes the cabinet and equipment within, the wiring to the equipment in the field, the signal heads, standards and luminaires, the loops, pedestrian push buttons, and all devices needed to operate the signal system.



## Maintenance

### ➤ Maintenance Responsibilities

- Relamp the traffic signals and streetlights
  - Incandescent
    - Average life: 6,000 hours
  - Light Emitting Diodes (LEDs)
    - Consuming 90% less energy than conventional incandescent light signals.
    - The life span of LEDs is up to 10 years, compared with less than two years for conventional signals, saving on purchase and maintenance costs

**Relamp the traffic control signal and streetlights** means to replace any burnt out lamp or replace the lamps at given intervals.

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## Maintenance

### ➤ Maintenance Responsibilities

- Clean and paint the traffic control signal, cabinet and luminaire mast arm extensions
- Maintain signing
- Signal Interconnect
- Timing of traffic control signals




**Clean and paint** means to paint the cabinet, the signal heads and standards, and the luminaire mast arm extensions on an as needed basis.

**Maintain signing** means to repair/replace any missing signing, due to vandalizing or weather and insure the signs are legible at all times.

**Maintain signal interconnect** means to keep the needed wiring and associated equipment in operation at all times.

**Timing of traffic control devices** means to establish the timing scheme for the operation of the signal control system.

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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="background-color: #4a86e8; color: white; padding: 5px;">Maintenance</h2> <p>➤ Actions</p> <ul style="list-style-type: none"> <li>  <span style="margin-left: 20px;">– <b>Upon notification of a signal malfunction,</b> use the Signal responsibility list to establish which agency is responsible to repair the problem</span> </li> </ul>	<p>The Statewide Signal Responsibility List identifies who is responsible to act on a signal malfunction.</p> <p>If the problem is identified as another agency ie: lamp out, contact that agency.</p> <p>If the problem is the State responsibility, either respond to the reported problem or notify the proper Maintenance personnel to make the repairs.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Office of Traffic, Safety &amp; Technology</p> 	<h2 style="background-color: #4a86e8; color: white; padding: 5px;">Maintenance</h2> <p>➤ Actions</p> <ul style="list-style-type: none"> <li>– <b>If a system is reported black,</b> try to confirm that the signal is in fact all black, not just a black head, caused by a lamp burnout</li> </ul>	<p>When established, call the Power Company supplying the power, using the <b>Xformer</b> address and report the outage.</p>



## Maintenance

### ➤ Actions

- **If the Power Company acknowledges that a general power outage is in the area, try to get a estimated length of the outage**

If the power company gives a time in which the outage is over two hours, call to have temporary stop signs put up. **Another step is to have the signal put to a flash operation** using the switch in the police panel door. This is important so when the power is established the signal will flash, rather than go into operation with the stop signs in place, giving conflicting directions. **When the signal is taken out of police panel flash**, make sure the stop signs are removed, or turned so the motorists cannot see them.

If power will be out for more than 2 hours, the stops signs are required.

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## Maintenance

### ➤ Actions

- **Signal knockdowns**
  - When a signal is knocked down notify the responsible agency to make the repairs

If you can check it out and give any information to the agency it saves time for the repairs to be made. Also if there is not at least one signal head functioning in the phase of the knockdown, the intersection should be put to flash and stop signs should immediately be put up. If at least one signal head is visible, leave signal operating. Place a traffic cone over the wires.

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## Maintenance

### ➤ Actions

- **When a signal is to be taken out of flash, due to a malfunction** that had been repaired, make sure the traffic is at a level that it can be done safely

If you cannot get a break in traffic, you may have to call for assistance. This can be the local police, or someone trained in flagging traffic.

If an advanced warning flasher is out of service, cover the sign or turn the sign so it cannot be seen.

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## Maintenance

### ➤ Actions

- **When a new signal is placed into operation, a log book** should be put into the cabinet, along with field intersection layouts and cabinet prints

In this log book should be all entries of any maintenance performed and the date and time of arrival and departure. Also the persons name and agency. It is important this be legible as often this is accessed for accident investigations.

Also other people need to know what maintenance has taken place, especially when troubleshooting a persistent problem.

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## Maintenance

### ➤ Actions

- In the spring and fall of the year a system check should be done on all signal intersections

A system check is the maintenance and inventory of the system.

This consists of replacing the filter in the door, checking loop operations, checking timing of the controller and an overall look at the hardware in the field. This would be the pedestrian push buttons, the signal heads, pedestrian heads and signing. Check the alignment of the signal heads and any burned out bulbs. Notify the proper maintenance personnel of rodent damage or other items needing attention.

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## Maintenance

### ➤ Traffic Signal Timing

- Should be a routine, ongoing activity
- Often, timing plans remain in operation over the years and are outdated
- Timing strategies often evaluated only when forced
- The FHWA recommends retiming every two to three years

Traffic Signal Timing should be a routine, ongoing activity involving regular review of timings plans in light of actual traffic volumes and patterns.

Updating traffic signal control plans can be labor intensive. Due to this, it is often overlooked.

Often, traffic signal timing is evaluated when forced to, such as complaints or when congestion become unbearable.

The FHWA recommends retiming every 2 to 3 years or more often when necessary, such as due to significant changes in traffic patterns.

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# **Handout**

## **Sample Agreement and Sample Statewide Responsibility List**

# SAMPLE AGREEMENT

MINNESOTA TRANSPORTATION DEPARTMENT

TRAFFIC CONTROL SIGNAL

AGREEMENT NO. 73845

BETWEEN

THE STATE OF MINNESOTA, DEPARTMENT OF TRANSPORTATION

AND

THE COUNTY OF ANOKA

AND

THE CITY OF LINO LAKES

TO

Install a new Traffic Control Signal with Street Lights, Emergency Vehicle Pre-emption and Signing on Trunk Highway No. 49 (Hodgson Road) - County State Aid Highway No. 10 (North Road) at Trunk Highway No. 49 (Lake Drive) - County State Aid Highway No. 23 (Lake Drive) in Lino Lakes, Anoka County, Minnesota.

S.P. 0204-12  
S.A.P. 02-610-09 and 02-623-07

Prepared by Traffic Engineering

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ESTIMATED AMOUNT RECEIVABLE	AMOUNT ENCUMBERED
Anoka County	\$5,000.00
<u>City of Lino Lakes</u>	<u>\$5,000.00</u>
	<u>\$68,580.00</u>

# SAMPLE STATEWIDE RESPONSIBILITY LIST

## STATEWIDE SIGNAL RESPONSIBILITY LIST

### Responsibility Types

SM = State Maintenance  
 CM = County Maintenance  
 CC = County Reimbursement  
 PC = State Pays the County  
 CO = Contractor Maintenance  
 AC = County Reimbursement  
 PC = State Pays the County  
 OT = Other does Maintenance

### System Types

AFL = Advanced Warning Flasher  
 DU = Traffic Signal with Dial Up Capability  
 HCV = HOV Lane Control  
 ISU = Free Running Isolated Traffic Signal  
 MCB = Master Controller in a separate Cabinet  
 MFL = Miscellaneous Flasher  
 MSC = Master Controller in a Local Signal Cabinet  
 OFL = Overhead Flashing Beacon  
 PAY = A system which the State pays another Agency to maintain  
 PFL = Flashing Beacon at Pedestrian or School Crossing  
 QND = Coordinated Traffic Signal using Quadra for Communication  
 RLY = Coordinated Traffic Signal using Relay type Communication  
 SFL = Overhead Flashing Beacon with Standby operation  
 TEL = Coordinated Traffic Signal using Telemetry type Communication  
 TOD = Traffic Signal using Time of Day Coordination  
 UNK = A System which is not Owned or Maintained by the State  
 WFL = Flashing Beacon Mounted with a type 'W' Sign  
 XGH = Equipment associated with a Waigh Station

MM = Municipal Maintenance  
 RM = Municipal Reimbursement  
 PH = State Pays Municipality  
 NA = Not Applicable  
 RO = Other Reimbursement

The List has the Following Format:

TH = Trunk Highway ID = System ID Number Type = System Type (See Above) Pr = Maintenance Priority D = District

TH Location ID Type Pr D Ar City County Xformer Address PWR C

Cabinet EVP Hardware LED Maint Luminaire Relamping (REIMBURSE #)  
 SM NA SM MM MM

TH Location ID Type Pr D Ar City County Xformer Address PWR C

36 WASHINGTON AV 20642 TEL A ME M2 Stillwater WASHINGTON 13550 60TH ST. N. NSP  
 Cabinet EVP Hardware LED Maint Luminaire Relamping (REIMBURSE #) REDS ARE LED-STATE MAINTAINS UNTIL 11/13/2003  
 SM SM SM MM MM MM A99469

- THE SIGNAL RESPONSIBILITY LIST HAS THE FOLLOWING HEADINGS:
  - **TH** = Trunk Highway ID number, the highway the signal is located on
  - **Location** = The cross street the signal is located on
  - **System** = System ID number Each signal system is assigned an ID number
  - **Type** = System Type outlined below
  - **Pr** = Maint. Priority Established to set the level in which a signal needs responding, A-B-C-D
  - **D** = District in which the signal is located or is responsible for its maintenance
  - **City** = City the signal is located in or is responsible for its maintenance
  - **County** = County the signal is located
  - **Xformer address** = The address the power company has for the location
    - This is important when reporting a power outage
  - **PWR C** = Power company which supplies power to the signal
  - **Cabinet** --- All equipment within and including cabinet
  - **EVP** --- Emergency vehicle pre-emption All associated equipment both in the cabinet and in the field
  - **Hardware** --- Any equipment in the field including the underground
  - **LED maint.** --- This is in order to encourage other entities to use light emitting diode signal heads, the State agreed to honor the factory warranty and replace any failed units for a specified time
  - Any new installations will not be on the list. In time this heading will disappear
  - **Luminaire** --- The luminaires (street lights) over the traffic signals
  - **Relamping** --- (Reimburse number) Replacing of the lamps in the signal heads
    - The reimbursable number is the number used to bill another entity for the work which was the responsibility of the entity
- Responsibility Types
  - **SM**= State Maintenance
  - **NA**= Not applicable meaning there isn't EVP in this intersection
  - **CM**= County Maintenance
  - **PC**= Pay County State pays County for any maintenance performed
  - **MM**= Municipal maintenance
  - **RM**= Reimbursable maintenance means State is reimbursed for any maintenance
- System Types
  - **ISO** = Free Running Isolated Traffic Signal
    - This would be a signal that operates independently of any other signal or system
  - **DU** = Traffic Signal with Dial Up Capability
    - A signal would be capable of being monitored with a computer and phone line from a remote location
  - **TEL** = Coordinated signal system using Telemetry type communication
    - This would be a signal operating within a system of other signals
    - There would be a series of intersections which would allow the passage of traffic with minimal stoppage
    - The signals have hardwire (interconnect) between them.
  - **AFL** = Advanced Warning Flasher
    - This is the flashers located ahead of the signal which warns motorists to prepare to stop
  - **OFL** = Overhead Flashing Beacon
    - A single or double signal head which flashes either yellow or red and is mounted overhead
  - **UNK** = A System which is not Owned or Maintained by the State
  - There are many other system types, which are indexed under that heading, the above are the most common