MAINTENANCE MANUAL FOR
STANDARD ELECTRICAL EQUIPMENT

Part 2: Preventive Maintenance Checklists

March 2001
MAINTENANCE MANUAL FOR STANDARD ELECTRICAL EQUIPMENT
PART 2: PREVENTIVE MAINTENANCE CHECKLISTS

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</table>
1 SCOPE OF WORK
   1 This preventive maintenance procedure is used to clean and inspect junction boxes. It is also used to verify the correctness of the installation with existing installation drawings.

2 SCHEDULING
   1 This procedure shall be done once every three years.

3 LOCK-OUT
   1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS
   1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.
   2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES
   1 Make safe all unsafe conditions identified through this checklist.
   2 Report all conditions not remedied or unsafe conditions affecting operations or public safety that are not addressed in this checklist.
   3 Record all corrective maintenance items at the end of the checklist.

6 EXTERIOR
   1 Clear grass, sand and debris from the surface of the junction box.
.2 Check if the junction box is level to grade.
.3 Check if the concrete collar is free of damage.

7 LIDS
.1 Check if the lid fits well and is free of damage.
.2 Lightly lubricate the hold down bolts.
.3 Make sure that hold down bolts are in place and the lid is secure.
.4 Make sure that steel lids are bonded.

8 INTERIOR
.1 Check if the junction box sections are free of damage.
.2 Check if the top, mid and bottom braces, or conductor support bar are correctly installed.
.3 Remove salt, silt and debris from the interior of the box.
.4 Check that unused holes and the spaces between the wall and conduit are plugged.
.5 Check if the junction box has a bottom drain plate or brick base, and has drainage.
.6 Check that empty conduits have pull strings and are capped.
.7 Check that rigid metal conduits are bonded.

9 WIRING AND CABLEING
.1 Check if splices are mechanically secure and insulated. Repair minor problems.
.2 Check if conductors and cables are grouped, bundled and clearly labelled.
STANDARD ELECTRICAL EQUIPMENT
JUNCTION BOXES and CONDUITS
Three Year Preventive Maintenance

.3 Check if the wiring is free of the following conditions:
   .1 Damage, wear, deterioration and corrosion
   .2 Evidence of overheating (overloading)
   .3 Loose and untidy wiring
   .4 Disconnected or redundant items

.4 Make sure that wire is secured to the top brace or conductor support bar.

.5 Note any solid conductors.

10 FINAL CHECKS

   .1 Make sure that all lids are secure before leaving the site.
   .2 Verify the correctness of the installation with the installation drawings.

11 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to:
   .1 Clean and inspect the service panels and kiosks.

2 SCHEDULING

.1 This procedure shall be done once every year.

3 LOCK-OUT

.1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS

.1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Report all conditions not remedied or unsafe conditions affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.

6 EXTERIOR

.1 Clear any build-up of sand, debris, overgrown vegetation, etc. around the cabinet.
.2 Check if the cabinet exterior is free of corrosion, damage, graffiti, etc. Paint rust spots and remove graffiti. Record all other problems for corrective maintenance.

.3 Make sure the following items are securely mounted:
   .1 Service panel.
   .2 Service entrances.
   .3 Service conduits.
   .4 Service ground conduits.

.4 Check if the following items are free of corrosion and damage:
   .1 Service panel.
   .2 Service entrances.
   .3 Service conduits.
   .4 Service ground conduits.

.5 Check if the doors operate properly (open, close, lock) and fit well, lubricate as required.

.6 Check if gaskets are intact and free of damage.

7 INTERIOR

.1 Clean the interior of the cabinet.

.2 Replace the filters (kiosks).

.3 Make sure the service entrance bushing is secure.

.4 Check the seal of conduit entrances and plug with foam or duct seal as required.

.5 Make sure that all covers are secure.

.6 Check if the cabinet interior is free of corrosion. Paint rust spots. Record all other problems for corrective maintenance.
7. Check if the cabinet interior is free of the following conditions:
   1. Condensation.
   2. Water leakage.
   3. Poor drainage.

8. Check if wiring and devices are free of the following conditions:
   1. Damage, wear, deterioration and corrosion.
   2. Evidence of overheating (overloading).
   3. Loose and untidy wiring.
   4. Disconnected or redundant items.
   5. Note any solid conductors.

9. Make sure the enclosure is bonded.

10. Make sure electrical connections are tight.

11. Check if the following items are working:
    1. Cabinet light.
    2. Fan and cooling thermostat. Cycle on and off and leave set at 25°C.
    3. Heater and heating thermostat. Cycle on and off and leave set at 7.2°C (45°F.)

12. Use the test switch to check the operation of the lighting contactor. Clean or replace components if the contactor is noisy, or not operational.

13. Make sure the circuit directory is complete and legible.

14. Check circuit loading and record if over 80% of circuit breaker rating.

8. CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to inspect overhead conductors and support cables.

2 SCHEDULING

.1 This procedure shall be done once every two years.

3 LOCK-OUT

.1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS

.1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or any unsafe conditions affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.

6 CONDUCTORS AND FASTENING HARDWARE

.1 Check if conductors and splices are free of the following conditions:
# STANDARD ELECTRICAL EQUIPMENT

## OVERHEAD CONDUCTOR and SUPPORT CABLE

### Two Year Preventive Maintenance

1. Damage, wear, deterioration and corrosion
2. Evidence of overheating (overloading)
3. Loose and untidy wiring
4. Disconnected or redundant items

### Porcelain-insulated clevises:

1. Make sure that the clevises are secure.
2. Check if the clevises are free of wear and damage.

3. Check if the cable entrance fittings are free of wear, damage and corrosion.

### GUY AND SUPPORT CABLES

1. Check if the support cables are free of wear, damage, and corrosion.

2. Make sure the support cable is tight enough to maintain a minimum 5.0m clearance between signal heads and signs, and the road surface.

3. Guy grips:
   1. Make sure that guy grips are secure.
   2. Check if the guy grips are free of damage and corrosion.

4. Back guys:
   1. Check if back guys are securely anchored and tensioned.
   2. Check if back guys are free of damage.

5. Pole mounting clamps:
   1. Make sure that the clamps are secure.
   2. Check if the clamps are free of wear, damage and corrosion.

### CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
# STANDARD ELECTRICAL EQUIPMENT
## CONTROLLERS
### Semi-annual Preventive Maintenance

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<td><strong>3 SCHEDULING</strong></td>
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<td>.1 This procedure shall be done once every 6 months.</td>
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<td>.2 This procedure shall be done annually in conjunction with the Controller Annual Preventive Maintenance.</td>
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<td><strong>4 LOCK-OUT</strong></td>
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.2 Immediately report all unsafe conditions not remedied or any unsafe conditions not addressed by this checklist.

.3 Record all corrective maintenance items at the end of the checklist.

7 CABINETS

.1 Exterior:
  .1 Note any build-up of sand, debris, overgrown vegetation, etc. around the cabinet.
  .2 Check if the cabinet exterior is free of corrosion, damage, graffiti, etc. Spray paint rust spots. Record all other problems for corrective maintenance.
  .3 Make sure the cabinet is mounted securely.
  .4 Check if the doors operate properly (open, close, lock) and fit well.
  .5 Lightly lubricate the lock, hinges, door screws.
  .6 Check if gaskets are intact and free of damage.

.2 Interior:
  .1 Vacuum and clean the interior of the cabinet.
  .1 Do not use a vacuum cleaner in the immediate vicinity of any printed circuit boards. The high velocity air movement may create a high static electrical charge which can damage the equipment.
  .2 Use a lint-free cloth moistened with a non-flammable solvent to clean electrical components.
  .3 Use a lint-free cloth and a mild detergent and water solution to clean the cabinet interior.
  .2 Replace the air filters.
  .3 Make sure the service entrance bushing is secure.
  .4 Check the seal of conduit entrances and plug with foam or Duxseal as required.
.5 Check if the cabinet interior is free of corrosion. Spray paint rust spots. Record all other problems for corrective maintenance.

.6 Check if the cabinet interior is free of the following conditions:
   .1 Condensation
   .2 Water leakage
   .3 Poor drainage

.7 Check if wiring, terminals and devices are free of the following conditions:
   .1 Damage, wear, deterioration and corrosion
   .2 Evidence of overheating (overloading)
   .3 Disconnected or redundant items

.8 Check if cables and loop conductors are grouped, bundled and clearly labelled.

.9 Make sure the cabinet is bonded to the service ground point. Visually check the wires and ensure that connections are secure.

.10 Check if the following items are working:
   .1 Cabinet light.
   .2 Fan and cooling thermostat. Cycle on and off and leave set at 25°C.
   .3 Heater and heating thermostat. Cycle on and off and leave set at 7.2°C (45°F). A cold spray or preferably an ice pack is required to cycle this in warm weather as the device is not adjustable.

.11 Make sure the surge suppressors and lightning arrestors are intact.

.12 Make sure the ground fault receptacle is operational.

8 UPS

Note: A UPS is used for one of two reasons in a controller cabinet: To condition the power supply, or as a backup power source. When used to condition power, the length of time the battery will operate is not important. UPSs used for backup power shall be checked using a separate checklist specifically designed for the UPS model and battery pack.
STANDARD ELECTRICAL EQUIPMENT
CONTROLLERS

Semi-annual Preventive Maintenance

.1 Check if the UPS is online.
.2 Check if the UPS is free of faults.

9 CONTROLLER UNIT

.1 Check pouch for timing sheet, loop assignment sheet, intersection and cabinet drawings.
.2 Check if the following information on the LMD panel is correct:
   .1 Date.
   .2 Time.
   .3 Battery OK.
   .4 Location.
.3 Check the log for any intermittent or repetitive problems which may not be currently active.

10 CONFLICT MONITOR

.1 Check that the conflict monitor is operating correctly by comparing the conflict monitor LCD display with the controller unit sequences during normal operation.
.2 Check the log for any intermittent or repetitive problems which may not be currently active.

11 LOOPS AND DETECTORS

.1 Check if the loop and detector are working (look at the detector and fault indicator LEDs). Test loops and detectors which do not indicate correct operation on LED.
.2 Check if the call indication from detector to the controller unit is working (use test buttons).
**12 PEDESTRIAN BUTTONS**

.1 Check the operation of each pedestrian button. Ensure that the timing and signal displays are operating correctly.

**13 ADVANCE WARNING LIGHTS**

.1 Make sure the advance warning time setting matches the timing sheet.

.2 Verify the advance warning time with stop watch.

**14 FINAL CHECKS**

.1 Make sure that equipment has returned to normal operation and is responding to the traffic conditions. Observe all signal displays for at least two cycles of operation.

.2 Record the maintenance date on the controller maintenance card.

**15 CORRECTIVE MAINTENANCE NOTES**

Record corrective maintenance items here:
1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to:
   .1 Replace the conflict monitors.
   .2 Check controller unit timing and program.
   .3 Check the operation of the flash and pre-emption packages.
   .4 Check power supply and loop wiring.

2 SCHEDULING

.1 This procedure shall be done once every 12 months.

.2 This procedure shall be done in conjunction with one of the Controller Semi-
   annual Preventive Maintenance checks.

.3 This procedure puts the intersection into flash. Checks should be conducted
during off peak periods.

3 LOCK-OUT

.1 The Ministry policy for lock-out is as per Section 6 of the Policy Section of this
   manual, if required.

4 CHECKLIST TERMS

.1 Check: Inspect the equipment, then record problems for corrective
   maintenance at the end of the checklist.

.2 Make sure: Inspect the equipment, then repair or replace it as required to
   meet the standard indicated in the check.
5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.
.2 Immediately report all unsafe conditions not remedied.
.3 Record all corrective maintenance items at the end of the checklist.

6 CONFLICT MONITOR

Note: These procedures only apply to LNM12E conflict monitors.

.1 Put the signals on flash (use the inside flash switch).
.2 Remove the conflict monitor and install the bench tested exchange unit.
.3 Check if the jumper card agrees with the drawing.
.4 Set the minimum flash time and the option DIP switches to the values indicated on the controller drawings.
.5 Put the signals back in operation.
  .1 Check that the controller comes out of flash on the first green display (F.O.P.)
.6 Observe operation of signals.
.7 Clear the message log.
.8 Record the date and serial numbers on the cabinet maintenance card:
  .1 Conflict monitor removed.
  .2 Conflict monitor installed.
.9 Note the date and location on the removed monitor.
7 CONTROLLER UNIT

.1 Compare the currently operating controller unit timing and program to the approved data dump. This shall be done by either of the following methods:
  .1 Compare the controller unit display to the printed output in the cabinet, or,
  .2 Download the controller unit program to a portable computer and compare this to a file copy of the program for this location.

8 WIRING AND POWER

.1 Check the incoming line voltage.

.2 Check the tightness of field terminations (in the cabinet). This includes load switch pack outputs, pre-emption inputs, pedestrian button inputs, loop detector inputs, etc.

9 FLASH

.1 Observe the operation of all signal displays and the advance warning signals during this test.

.2 Check if the flash is working at the following locations:
  .1 Police door.
  .2 Internal flash switch.

.3 Make sure the flash rate is set to 60 FPS (for new controllers) or 120 FPS (for left turn green arrows on older models).

10 PRE-EMPTION PACKAGES

.1 Simulate the operation of the pre-emption packages:
  .1 Open the signal circuit from originating pre-emption device.
  .2 Press the pre-emption button.
.3 Check if the call indication from bus loop detector to pre-emption package is working.

11 LOOPS

.1 Measure inductance and capacitance (L/C check) and record on cabinet loop record card.

.2 Measure (megger) resistance to ground and record on cabinet loop record card.

12 FINAL CHECKS

.1 Make sure that equipment has returned to normal operation and is responding to the traffic conditions. Observe all signal displays for at least two cycles of operation.

13 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
# STANDARD ELECTRICAL EQUIPMENT

## SIGNAL HEADS

### Annual Preventive Maintenance

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<td>Check if the mounting hardware is free of wear, damage and corrosion.</td>
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.2 Make sure that mounting fasteners and locking rings are secure.

.3 Do minor repairs.

.4 Check for wear of the wiring insulation on the spring mounted hardware.

7 ACCESSORIES

.1 Make sure the following components are clean, and free of damage and corrosion:
   .1 Backboard.
   .2 Tunnels and Visors.

.2 Wash the backboard.

8 TRAFFIC SIGNAL HEAD RE-LAMP

.1 Housing:
   .1 Check if the interior and exterior of the signal housing is clean, and free of damage and corrosion.
   .2 Check if gaskets are intact and free of damage.

.2 Replace cracked and discoloured lenses.

.3 Interior wiring and terminals:
   .1 Repair or replace worn and faulty wiring. Note: Especially check the wiring at the entrance to the hanger.
   .2 Repair or replace terminal blocks that are damaged or corroded.
   .3 Check if the signal head is bonded.

.4 Check if gaskets are intact and free of damage. Repair or replace if damaged.
Annual Preventive Maintenance

.5 Re-lamp:
   .1 Lightly lubricate lamp threads.
   .2 Orient lamp such that opening in horseshoe is at twelve o'clock position.

.6 Wash the lenses and reflectors with a recommended detergent and antistatic material.

.7 Lightly lubricate the hinges and latches, if required.

.8 Make sure that the lamps are functioning.

.9 Make sure that the signal heads and visors/tunnels are aligned.

.10 Make sure that signals are visible from each approach.

.11 Make sure the heads are level.

9 FINAL CHECKS

.1 Enter the maintenance/re-lamp date on the maintenance card located in the traffic controller.

10 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
STANDARD ELECTRICAL EQUIPMENT
ADVANCE WARNING SIGNS
Annual Preventive Maintenance

1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to:
   .1 Clean, inspect and re-lamp the advance warning signs.
   .2 Visually inspect the pole for signs of rust and or cracks.

2 SCHEDULING

.1 This procedure shall be done once a year.

3 LOCK-OUT

.1 The Ministry policy for lock-out shall be as per Section 6 of the Policy section of this manual, if required.

4 CHECKLIST TERMS

.1 **Check:** Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 **Make sure:** Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or any affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.
### MOUNTING HARDWARE

1. Check that the pole, frangible/breakaway base and sign mounting arm are free of cracks or damage.

2. Make sure that all anchor bolt nuts and frangible and breakaway base nuts are tight.

3. Check if the mounting hardware is free of wear, damage and corrosion.

4. Make sure that mounting fasteners are secure.

5. Do minor repairs.

### ACCESSORIES

1. Check if the visors are clean, and free of damage and corrosion.

### SIGNBOARDS

1. Check that the signboard is mounted level.

2. Wash the front of the signboard.

3. Check if the signboard is free of damage or decay.

4. Check the signboard is visible and legible under both day and nighttime conditions.

### EXTERIOR WIRING

1. Make sure that the exterior wiring is intact and properly secured.

2. Make sure that strain relief connectors are intact.

3. Check if the top finial is in good condition.
10 ADVANCE WARNING SIGNAL HEAD RE-LAMP

.1 Housing:
   .1 Check if the interior and exterior of the signal housing is clean, and free of damage and corrosion.
   .2 Check if gaskets are intact and free of damage. Repair or replace if damaged.

.2 Replace cracked and discoloured lenses and damaged visors.

.3 Interior wiring:
   .1 Repair or replace worn and faulty wiring.
   .2 Make sure that the advance warning signal is bonded.

.4 Check if gaskets are intact and free of damage.

.5 Re-lamp:
   .1 Lightly lubricate lamp threads.
   .2 Orient lamp such that opening in horseshoe is at twelve o'clock position.

.6 Wash the lenses with a recommended detergent and antistatic material.

.7 Lightly lubricate the hinges and latches, if required.

.8 Make sure that the lamps are functioning.

11 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1 SCOPE OF WORK
   .1 This preventive maintenance procedure is used to clean, inspect and re-lamp the island flashers.

2 SCHEDULING
   .1 This procedure shall be done once every year.

3 LOCK-OUT
   .1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS
   .1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.
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5 CHECKLIST PROCEDURES
   .1 Make safe all unsafe conditions identified through this checklist.
   .2 Immediately report all unsafe conditions not remedied or any affecting operations or public safety that are not addressed in this checklist.
   .3 Record all corrective maintenance items at the end of the checklist.

6 MOUNTING HARDWARE
   .1 Check if the mounting hardware is free of wear, damage and corrosion.
.2 Make sure that mounting fasteners are secure.

.3 Do minor repairs.

.4 Make sure the island flasher is at the correct mounting height.

7 EXTERIOR WIRING

.1 Make sure that the SOW cable is intact and properly ty-rapped.

8 ISLAND FLASHER RE-LAMP

.1 Check if the interior and exterior of the flasher housing are clean, and free of damage and corrosion.

.2 Replace cracked and discoloured lenses.

.3 Interior wiring:
   .1 Repair or replace worn and faulty wiring.
   .2 Make sure that the flasher is bonded.

.4 Check if gaskets are intact and free of damage.

.5 Re-lamp:
   .1 Lightly lubricate lamp threads.
   .2 Use a new lamp.

.6 Wash the lenses with a recommended detergent and antistatic material.

.7 Lightly lubricate the lens bolts, if required.

.8 Make sure that the flashers are functioning.

.9 Make sure that the flashers are aligned and visible from each approach.
CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1  SCOPE OF WORK
   .1  This preventive maintenance procedure is used to clean, inspect and re-lamp the street lights.

2  SCHEDULING
   .1  This procedure shall be completed once every three years.

3  LOCK-OUT
   .1  The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4  CHECKLIST TERMS
   .1  Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.
   .2  Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5  CHECKLIST PROCEDURES
   .1  Make safe all unsafe conditions identified through this checklist.
   .2  Immediately report all unsafe conditions not remedied or affecting operations or public safety that are not addressed in this checklist.
   .3  Record all corrective maintenance items at the end of the checklist.

6  LUMINAIRE
   .1  Housing:
      .1  Make sure that the luminaire clamp is secured to the pole tenon.
.2 Check if the housing is free of damage, wear, corrosion, casling cracks and paint deterioration.

.3 Check if the clasp and hinge on the upper and lower housings are secure and free of damage.

.2 Check if the ballast door latches and hinges are secure and free of damage.

.3 Check if capacitor, starter and ballast are free of the following conditions:
   .1 Damage, deterioration and corrosion.
   .2 Evidence of overheating.

.4 Interior wiring and terminals:
   .1 Repair or replace worn and faulty wiring. Note any solid wiring.
   .2 Repair or replace terminal blocks that are damaged or corroded.
   .3 Check that the luminaire is bonded.

.5 Glass lenses:
   .1 Make sure that the lens is free of cracks.
   .2 Clean the lens.

.6 Plastic lenses:
   .1 Check that the lens is free of discoloration, cloudiness and cracks.
   .2 Clean the lens.

.7 Clean the reflector.

.8 Check if gaskets are intact and free of damage.

.9 Re-lamp:
   .1 Lightly lubricate lamp threads.
   .2 Re-lamp and mark shell with date of installation.
   .3 Make sure that the lamp is functioning.
Where mounted on the service panel pole, check if the photoelectric cell is working and aligned towards north. Replace the photoelectric cell every nine years.

Make sure that the fixture is level and oriented to the road surface.

Make sure that all lamps in the circuit are functioning.

Record corrective maintenance items here:
1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to clean, inspect and re-lamp the sign lighting.

2 SCHEDULING

.1 This procedure shall be done once every three years.

3 LOCK-OUT

.1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS

.1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or any affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.

6 SIGN LIGHTING

.1 Make sure that the exterior wiring is intact and properly secured along with any splice boxes.
Mounting hardware:
.1 Check if the mounting hardware is free of wear, damage and corrosion.
.2 Make sure that mounting fasteners are secure.
.3 Do minor repairs.

Housing:
.1 Check if the housing is free of damage, wear, corrosion, casting cracks and paint deterioration.
.2 Check if the locking mechanism and hinges are secure and free of damage.

.4 Check if the capacitor, starter and ballast are free of the following conditions:
   .1 Damage, deterioration and corrosion.
   .2 Evidence of overheating.

Interior wiring:
.1 Repair or replace worn and faulty wiring.
.2 Make sure that the luminaire is bonded.

Glass lenses:
.1 Make sure that the lens is free of cracks.
.2 Clean the lens.

Plastic lenses:
.1 Make sure the lens if free of discoloration, cloudiness and cracks.
.2 Clean the lens.

.8 Clean the reflector.

.9 Check if gaskets are intact and free of damage.

.10 Check if the mounting seal is watertight.

.11 Re-lamp:
1. Lightly lubricate lamp threads.
2. Re-lamp and mark shell with date of installation.

12. Where mounted on the service panel pole, check if the photoelectric cell is working and aligned towards north. Replace the photoelectric cell every nine years.

13. Make sure that the fixture is positioned correctly.

14. Check if drain holes are clear for luminaires which are directed upwards and, if installed, are clear for luminaires mounted from the top of the sign.

7. FINAL CHECKS

1. Make sure that all lamps in the circuit are functioning.

8. CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to:
    .1 Clean and inspect the winch, cables and luminaire ring.
    .2 Re-lamp the luminaires.

2 SCHEDULING

.1 This procedure shall be done once every three years. Due to the nature of high mast lighting this procedure should be completed during daylight hours.

3 LOCK OUT

.1 If required, the Ministry policy for lock out procedures is as per Section 6 of the Policy Section of this manual.

4 CHECKLIST TERMS

.1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or any affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.
6  EQUIPMENT REQUIREMENTS

Various types of high masts are being used for Ministry lighting. Care needs to be taken to ensure that the correct Operations and Maintenance Manual for the equipment being serviced is being used.

.1 Grease gun.
.2 Oil for the gear box.
.3 External drive motor.

7  PRESTART CHECKS

.1 Ensure that there is adequate clearance to lower the highmast ring.

8  WINCH AND CABLE

.1 Make sure that the winch and cable, and interior of the pole base are clean.

.2 Oil:
   .1 Check the oil level.
   .2 Change the oil if it is excessively thick or dirty. Note: Before draining the oil, run the luminaire ring part way down and up to heat oil.

.3 Make sure that the winch hold-down bolts are secure.

.4 Make sure the power cable is securely attached to the stainless steel cable.

.5 Unplug the power cable (in preparation for lowering the ring).

.6 Check the main gear (applies only to winches that have gear inspection covers):
   .1 Remove the gear cover.
   .2 Operate the winch through one revolution and check if the gear is free of wear and breakage. If you observe any broken teeth or undue wear,
do not proceed with the preventative maintenance procedure. Report for corrective maintenance.

.3 Replace the gear cover.

.7 Continue lowering the luminaire ring and check if the length of the stainless steel cable is free of:
   .1 Frays
   .2 Kinks
   .3 Corrosion

.8 Make sure the stainless steel cable anchorage points are secure:
   .1 On the winch drum.
   .2 On the luminaire ring.

.9 Check if the final length of stainless steel cable (that could not be observed through the hand hole) is free of:
   .1 Frays
   .2 Kinks
   .3 Corrosion

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9 TOP SHEAVES

.1 Check if the top sheaves are in good condition and are greased once every 5 years. This procedure requires specialized equipment capable of reaching the top of the high mast equipment.

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10 LUMINAIRE RING

.1 Check if the guide pads on the luminaire are in good condition and securely mounted.

.2 Luminaire ring bolts:
   .1 Make sure the ring bolts are secure.
   .2 Check if the bolts are free of corrosion.
.3 Check if the welds on the ring are free of cracks.

.4 Check if the exterior of the junction boxes are free of damage and corrosion.

.5 Check if the interconnecting electrical cables are free of:
   .1 Damage, wear, deterioration and corrosion.
   .2 Evidence of overheating (overloading).

.6 Power cable (and spare, if installed):
   .1 Make sure the anchorage is secure.
   .2 Check if the cable is free of damage, wear, deterioration, corrosion and evidence of overheating (overloading).

11 LUMINAIRES

.1 Make sure that the luminaire fixture is securely mounted to the ring.

.2 Housings:
   .1 Check if the housings are free of damage, wear, corrosion, casting cracks and paint deterioration.
   .2 Check if the locking mechanism and hinges are secure and free of damage.

.3 Turn on the highmast lighting and make sure that the luminaires are functioning.

.4 Check if the capacitors, starters and ballasts are free of the following conditions:
   .1 Damage, deterioration and corrosion.
   .2 Evidence of overheating.

.5 Interior wiring and terminals:
   .1 Repair or replace worn and faulty wiring.
   .2 Repair or replace terminal blocks that are damaged or corroded.
   .3 Make sure that the luminaire is bonded.
.4 Check if wiring is grouped, bundled and clearly labelled.

.6 Glass lenses:
   .1 Make sure that the lens is free of cracks.
   .2 Clean the lenses.

.7 Plastic lenses:
   .1 Make sure that the lens is free of discoloration, cloudiness and cracks.
   .2 Clean the lenses.

.8 Clean the reflectors.

.9 Check if gaskets are intact and free of damage.

.10 Re-lamp:
   .1 Lightly lubricate lamp threads.
   .2 Re-lamp and mark shell with date of installation.
   .3 Make sure that the lamp is functioning.

.11 Make sure that the luminaire fixtures and optics are oriented as specified on the site drawings.

.12 Raise the ring and make sure that:
   .1 The luminaire ring is properly seated against supports, and
   .2 The cables are taut (hand tighten with the winch).

.13 Make sure that the luminaires are functioning.

12 ELECTRICAL CHECKS

The electrical checks in this section apply to the following equipment:

**Utility circuit:**
- Three circuit breakers
- 15 A utility receptacle
- 20 A drive motor receptacle

**Lighting circuit:**
- Local fused disconnect
- Receptacle
STANDARD ELECTRICAL EQUIPMENT
HIGH MAST LIGHTING
Three Year Preventive Maintenance

.1 Check if the equipment is free of the following conditions:
   .1 Damage, wear, deterioration and corrosion
   .2 Evidence of overheating (overloading)
   .3 Loose and untidy wiring
   .4 Disconnected or redundant items

.2 Make sure that the equipment is:
   .1 Bonded.
   .2 Clean.
   .3 Breakers operating correctly.

.3 Power electrical circuits:
   .1 Infrared-scan electrical connections and components.
   .2 Tighten electrical connections as indicated by the infrared-scan.

13 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1 **SCOPE OF WORK**

.1 This preventive maintenance procedure is used to clean, inspect and re-lamp the various styles of wall mount or underpass luminaires, excluding incandescent.

2 **SCHEDULING**

.1 This procedure shall be done once every three years.

3 **LOCK-OUT**

.1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 **CHECKLIST TERMS**

.1 **Check:** Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 **Make sure:** Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 **CHECKLIST PROCEDURES**

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or any affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.

6 **LUMINAIRE**

.1 Mounting hardware:
STANDARD ELECTRICAL EQUIPMENT
WALL MOUNT/UNDERPASS LUMINAIRES
Three Year Preventive Maintenance

.1 Check if the mounting hardware is free of wear, damage and corrosion.
.2 Make sure that mounting fasteners are secure.
.3 Do minor repairs.

.2 Housing:
.1 Check if the housing and guard are free of damage, wear, corrosion, casting cracks and paint deterioration.
.2 Check if the locking mechanism and hinges are secure and free of damage.

.3 Check if the capacitor, starter and ballast are free of the following conditions:
.1 Damage, deterioration and corrosion.
.2 Evidence of overheating.

.4 Interior wiring:
.1 Repair or replace worn and faulty wiring.
.2 Check that the luminaire is bonded.

.5 Glass lenses:
.1 Make sure the lens is free of cracks.
.2 Clean the lens.

.6 Plastic lenses:
.1 Make sure the lens is free of discoloration, cloudiness and cracks.
.2 Clean the lens.

.7 Clean the reflector.

.8 Check if gaskets are intact and free of damage.

.9 Re-lamp:
.1 Lightly lubricate lamp threads.
.2 Re-lamp and mark shell with date of installation.
.3 Make sure that the lamp is functioning.
.10 Where mounted on the service panel pole, check if the photoelectric cell is working and aligned towards north. Replace the photoelectric cell every nine years.

.11 Make sure that the fixture is level and positioned correctly.

7 FINAL CHECKS

.1 Make sure that all lamps in the circuit are functioning.

8 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
1  SCOPE OF WORK
   .1  This preventive maintenance procedure is used to clean, inspect and re-lamp the post top luminaires.

2  SCHEDULING
   .1  This procedure shall be done once every three years.

3  LOCK-OUT
   .1  The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4  CHECKLIST TERMS
   .1  Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.
   .2  Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5  CHECKLIST PROCEDURES
   .1  Make safe all unsafe conditions identified through this checklist.
   .2  Immediately report all unsafe conditions not remedied or any affecting operations or public safety that are not addressed in this checklist.
   .3  Record all corrective maintenance items at the end of the checklist.

6  LUMINAIRE
   .1  Mounting hardware:
STANDARD ELECTRICAL EQUIPMENT
POST TOP LUMINAIRES
Three Year Preventive Maintenance

.1 Check if the tenon mount bolts (locking and levelling) are free of wear, damage and corrosion.
.2 Make sure that the mounting fasteners are secure.
.3 Do minor repairs.

.2 Housing:
.1 Check if the components of the post top are securely assembled.
.2 Check if the base and hood assembly are free of damage, wear, corrosion, casting cracks and paint deterioration.
.3 Remove the hand hole cover and lightly lubricate the bolt.

.4 Check if the capacitor, starter and ballast are free of the following conditions:
.1 Damage, deterioration and corrosion.
.2 Evidence of overheating.

.5 Interior wiring:
.1 Repair or replace worn and faulty wiring.
.2 Check that the luminaire is bonded.

.6 Lens:
.1 Make sure the lens is free of discoloration, cloudiness and cracks.
.2 Clean the lens.

.7 Check if gaskets are intact and free of damage.

.8 Re-lamp:
.1 Lightly lubricate lamp threads.
.2 Re-lamp and mark shell with date of installation.
.3 Make sure that the lamp is functioning.

.9 Where mounted on the service panel pole, check if the photoelectric cell is working and aligned towards north. Replace the photoelectric cell every nine years.
10 Make sure that the fixture is level.

7 FINAL CHECKS

1 Make sure that all lamps in the circuit are functioning.

8 CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here:
STANDARD ELECTRICAL EQUIPMENT
TRAFFIC SIGNAL/SIGN POLES
Annual Preventive Maintenance

CHECKLIST 500-1

1 SCOPE OF WORK
   .1 This preventive maintenance procedure is used to inspect the poles for the following equipment:
     .1 Signals.
     .2 Advance warning and signs.

2 SCHEDULING
   .1 This procedure shall be done once every year.

3 LOCK-OUT
   .1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS
   .1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.
   .2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES
   .1 Make safe all unsafe conditions identified through this checklist.
   .2 Immediately report all unsafe conditions not remedied or unsafe conditions affecting operations or public safety that are not addressed in this checklist.
   .3 Record all corrective maintenance items at the end of the checklist.
6 BASE

.1 Make sure that any build-up of sand, debris, overgrown vegetation, etc. around the pole is removed.

.2 Check if the concrete base is free of damage and level.

.3 Check if the surrounding area is stable.

.4 Make sure that the frangible, breakaway or safety base is free of damage. Ensure that all frangible and breakaway base nuts are tight.

.5 Make sure that the anchor bolt nuts are tight, are double nutted if required and have nuts covers where required.

.6 Check for the location of any levelling shims used with a frangible base. Ensure they are located between the frangible and the concrete base. Shims are not to be installed between the top of the frangible base and the pole base plate.

7 POLE AND ARMS

.1 Check if the pole is free of damage.

.2 Check the pole for surface rust and spray paint minor rust spots. Note for replacement if more than 20% of the surface is rusted.

.3 Check if the joints at the flange connections and at the base plate are free of rust and cracks. Note for replacement if there are any cracks or rust.

.4 Check if the mast arm is horizontal or has proper rise.

.5 Check if the pole is plumb.

.6 Check that flange connection bolts are double nutted where required.
8  HAND HOLE
   .1  Remove the hand hole cover and lightly lubricate the bolt.
   .2  Check if the splices are mechanically secure and insulated. Repair minor problems.
   .3  Check if conductors and cables are grouped, bundled and clearly identifiable.
   .4  Repair or replace worn and faulty wiring.
   .5  Check if the pole is bonded.
   .6  Check that the wiring between the handhole and the junction box is clear.

9  SIGNS
   .1  Check if signs are free of damage.
   .2  Check if signs are positioned correctly.
   .3  Check if the mounting hardware is free of wear, damage and corrosion.

10 CORRECTIVE MAINTENANCE NOTES

   Record corrective maintenance items here:
1 SCOPE OF WORK

.1 This preventive maintenance procedure is used to inspect the poles for the following equipment:

   .1 Street lights.
   .2 Post top luminaires.
   .3 High mast lighting.
   .4 Service panels.

2 SCHEDULING

.1 This procedure shall be done once every three years.

3 LOCK-OUT

.1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.

4 CHECKLIST TERMS

.1 **Check:** Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 **Make sure:** Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or any conditions affecting operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.
6 BASE

.1 Make sure any build-up of sand, debris, overgrown vegetation, etc. around the pole is removed.

.2 Check if the concrete base is free of damage and level.

.3 Check if the surrounding area is stable.

.4 Check if the frangible, breakaway or safety base is free of damage.

.5 Check for tightness of the anchor bolt nuts, are double nutted if required and have nuts covers where required.

7 POLE AND ARMS

.1 Check if the pole is free of damage.

.2 Check the pole for surface rust and spray paint minor rust spots. Note for replacement if more than 20% of the surface is rusted.

.3 Check if the joints at the flange connections and at the base plate are free of rust and cracks. Note for replacement if there are any cracks or rust.

.4 Check if the mast arm is horizontal or has proper rise.

.5 Check is the pole is plumb.

.6 Check that flange connection bolts are double nutted where required.

8 HAND HOLE

.1 Remove the hand hole cover and lightly lubricate the bolt.

.2 Check if the splices are mechanically secure and insulated. Repair minor problems.

.3 Check if conductors and cables are grouped, bundled and clearly identifiable.
.4 Repair or replace worn and faulty wiring.
.5 Check if the pole is bonded.
.6 Check is wiring from the handhole to the junction box is clear.

**9 SIGNS**

.1 Check if signs are free of damage.
.2 Check if signs are positioned correctly.
.3 Check if the mounting hardware is free of wear, damage and corrosion.

**10 CORRECTIVE MAINTENANCE NOTES**

Record corrective maintenance items here:
1 SCOPE OF WORK

.1 The Electrical Patrol is a regular "walk-by" of systems and equipment. The purpose of the patrol is to check if the systems and equipment are free of visible damage, and if they are operating normally at the time of the patrol. The timing of the patrol is subject to the varying weather conditions experienced within the province.

.2 This checklist contains the Electrical Patrol for the following equipment:
   .1 Junction boxes.
   .2 Service panels and kiosks.
   .3 Street, sign, high mast and pedestrian lighting.
   .4 Island flashers and advance warning signs.
   .5 Poles.
   .6 Sign boards.
   .7 Loops.
   .8 Pedestrian push buttons.
   .9 Traffic signal displays.
   .10 Controller cabinets.

2 SCHEDULING

.1 This procedure shall be done once every month in urban areas with a high density of traffic signals and/or lighting. In regions where the electrical inventory is separated by large travel times the interval may be extended to six months. In the case of the extended intervals the Area Manager should be advised of the basic operation of traffic signals and requested to report malfunctions or complaints to the Regional Senior Electrical Trade Supervisor.

3 LOCK-OUT

.1 The Ministry policy for lock-out procedures is as per Section 6 of the Policy Section of this manual, if required.
4 CHECKLIST TERMS

.1 Check: Inspect the equipment, then record problems for corrective maintenance at the end of the checklist.

.2 Make sure: Inspect the equipment, then repair or replace it as required to meet the standard indicated in the check.

5 CHECKLIST PROCEDURES

.1 Make safe all unsafe conditions identified through this checklist.

.2 Immediately report all unsafe conditions not remedied or that affect operations or public safety that are not addressed in this checklist.

.3 Record all corrective maintenance items at the end of the checklist.

6 PRESTART CHECKS

.1 Turn on the street lights.

7 ELECTRICAL PATROL

.1 Power distribution:
   .1 Check if the junction box covers fit well and are free of damage.
   .2 Check if the service panels, kiosks, exposed conduit and related hardware are free of damage.
   .3 Check if service panel and kiosk doors are secure and locked.
   .4 Check if overhead conductors and support cables are free of damage.

.2 Street, sign, high mast and pedestrian lighting:
   .1 Check if fixtures are illuminated and free of damage.

.3 Island flashers:
   .1 Check if island flashers are working and are free of damage.
.4 Advance warning signs:
   .1 Check if signs are operating in sync with the intersection.
   .2 Check if boards are free of damage.

.5 Poles:
   .1 Check if poles are free of major damage.

.6 Signboards:
   .1 Check if signboards are illuminated.
   .2 Check if signboards are damaged.

.7 Loops:
   .1 Check if the loop wiring is adequately covered.
   .2 Check if loops are working correctly.
   .3 Check all detectors for proper operation.

.8 Pedestrian push buttons:
   .1 Make sure that pedestrian traffic signals and audible signals respond to push button operation.

.9 Traffic signal displays:
   .1 Check signal heads, visors, tunnels and backboards are free of damage.
   .2 Check signal heads are aligned.
   .3 Observe the intersection and make sure that the signal heads are operational. Re-lamp any signal outages.

.10 Traffic signal controller cabinet:
   .1 Check if the cabinet is free of damage.
   .2 Check if the door lock is working.
   .3 Check if the traffic signal controllers are operating correctly.
   .4 Check if the indicators are working.
FINAL CHECKS

1. Turn off the street lighting.

CORRECTIVE MAINTENANCE NOTES

Record corrective maintenance items here: