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List of Tables:

1.0 Overview

1.1 General

This section covers the requirements for Traffic Control Devices and Traffic Management Devices Maintenance. Maintenance Quality Standards and Guidelines are included.

1.2 Items Covered

This section covers maintenance of the following equipment:

- Signal heads
- Audible Pedestrian Signal
- Flashing beacons
- Illuminated signs
- Pedestrian Crossover Fixtures
- Signal hangers and Versa
- Mast arms and brackets
- Traffic Poles
- Span Wires and Back Guys
- Overhead Wiring
- Riser Conduits
- Controller Cabinets and components
- Power Supply Disconnect
- Mechanical Signs
- Detectors loops
- Pedestrian pushbuttons and signs
- Concrete Footings and sidewalk bays
- Handwells
- Grounding and Bonding

1.3 Items Covered Elsewhere

Maintenance Recommendations for specific Traffic Control Devices components are included within Individual Sections of the specifications.

2.0 Maintenance Quality Standards and Maintenance Terms Definitions

2.1 Maintenance Quality Standards

This Maintenance Recommendation is intended to serve as a standard for the maintenance required for Traffic Control Devices.

Maintenance Quality Standards consist of the instructions listed under "Minor Maintenance" and "Major Maintenance" for each major group of equipment. The Standards are considered to be the minimum preventive work required keeping each component in an acceptable state of repair throughout the predicted life of the equipment.

2.2 Maintenance Terms Definition

2.2.1 Routine Maintenance

Preventive or routine maintenance is carried out on equipment at specified intervals and includes specific work to be done. The purpose of routine maintenance is to ensure that problems are solved before failures occur. Minor maintenance problems that cannot be corrected "on the spot" are normally logged and reported for further follow-up.

2.2.2 Minor Maintenance

Minor maintenance are those which need to be readily accomplished in the field which is carried out without large scale testing or the use of heavy equipment or specialized machines. It includes inspection and checking of items, elementary testing, cleaning, lubricating and minor repairs or replacement which can be carried out with hand tools or portable instruments "on hand".

2.2.3 Major Maintenance

Major maintenance is predominantly involved in the overhauling, elaborate testing and replacement of components which require a scheduled power outage, material not normally stocked on a service vehicle, use of auger trucks, other heavy equipment, etc.

2.2.4 Emergency Maintenance

Emergency maintenance is that required for unexpected failure equipment components. It requires immediate action and takes precedence over routine maintenance activities for the duration of the emergency. Emergency Maintenance can include minor and Major Maintenance.

3.0 Quality Standards for Maintenance

3.1 Signal Heads, Audible Signals, Flashing Beacons, Illuminated Signs and PXO Fixtures

3.1.1 Inspect Signal Indications (ISI)

ISI includes:

- Inspect for proper visibility and alignment of each head at each approach. Realign or adjust head as required.
- Inspect for tilt and twist, bouncing or swinging, etc. Adjust head and/or hanger as required or schedule replacement.
- Reset focused lenses where applicable.
- Note and schedule repairs for damaged or missing backboards and visors, damaged or dirty lenses, or burned out lamps or LED's. Lamp and LED burnouts require emergency maintenance.
- Repair damaged or missing backboards and visors, damaged or dirty lenses, or burned out lamps or LEDs. Lamp and LED burnout require emergency maintenance.
- Inspect for low signal head mounting heights. Repair/adjust head/mast arm or brackets as required.
- Inspect for low hanging traffic signal cables. If adjustments required make repairs or make temporary repairs and schedule permanent repairs as soon as possible.
- Inspect for loose or missing pedestrian push buttons. Repair or replace as required.
- Inspect for damaged, missing or loose traffic signs. Repair or replace as required.

3.1.2 Minor Maintenance

- Replace burnt out lamps or LEDs.
- Realign twisted or tilted heads. Retighten compression nut on head hanger.
- Replace faded, peeling, damaged or burnt lenses.
- Replace peeling reflectors.
- Repair/remake wiring connections in head.
- Replace defective lamp sockets.
- Replace worn gaskets.
- Replace damaged or worn doors.
- Repair or replace damaged or missing visors.
- Secure loose bird plugs or replace missing plugs.
- Secure loose backboards.
- Remove obstructing tree branches (up to 10 mm in diameter).

3.1.3 Major Maintenance

- Replace damaged or missing backboards.
- Replace single section or entire signal head.
- Replace illuminated sign or PXO fixture ballast.
- Replacement of Audible Signal circuit boards.

3.1.4 Annual Relamp – Traffic Control Signals, Flashing Beacons and Illuminated Signs

The following activities are to be done while carrying out the Annual Relamping for Traffic Control Signals, Flashing Beacons, and Illuminated Signs.

- All vehicle, pedestrian and flashing beacon signal heads are to have the reflectors and lenses (both sides) washed with a detergent mixture, cleaned, dried, polished with antistatic polish and the lamps replaced to correct wattage and type as shown in Table 2.3.A. Lamps shall be positioned such that the filament is always in a "U" shape with the open top upwards.

- Amber traffic signal indications are to be relamped every two years.

- All LED lenses are to be washed with a detergent mixture, cleaned and dried.

- All Illuminated Signs are to have both sides of the sign face washed with a detergent mixture, cleaned and dried.

Lens Size	Light Centre	Rated Initial Lumens	Lamp Wattage	Lamp Voltage	Lamp Type	Lamp Life
300mm	3 inch	1750	135W	125V	clear, traffic	8000 h
200mm	2 7/16 inch	595	60 W	125 V	clear, traffic	8000 h
300mm	2 7/16 inch	1040	90 W	125 V	clear, traffic	8000 h

Table 2.3.A - Lamps for Traffic Signal and Flashing Beacon Heads

- All incandescent lamps provided for relamping must have the current calendar year, (i.e. the last two numbers example "90") placed in the area contain the lamp's rating.

The special lamps for optically programmed signals and fluorescent lamps must be dated with indelible ink. The marking shall be on the back of the lamp and on the left end of the fluorescent lamp. The lamps provided by the Contractor shall meet the following criteria:

200mm PXO Beacon section: 90 watts, 1040 lumens, 8,000 hour, 2 7/16 inch light center (incandescent lamp).

Fluorescent and other replacement lamps shall be replaced with a lamp of similar characteristics and wattage. All fluorescent lamps shall be CW/HO type.

- For optically programmed signals the lamps are as follows:
  - Arrow indications 150 watt
  - Pedestrian heads 75 watt
  - 200mm limited vision green ball 100 watt frosted lamp

- All focused lenses shall be checked for alignment and setup. Note and report any necessary adjustments required.

- All LED lenses shall be checked. Note and report any burnt out LED's or LED strings.

- The Contractor crew must relamp the entire intersection on the same working day. Old lamps shall be disposed of in accordance with the manufacturer recommendations.

The following items should be checked and repaired/replaced while on site. If not feasible then the deficiencies should be noted and scheduled for repair/replacement at a later date.

- Check all gaskets, lenses, visors, latches and door hinges for signs of deterioration.

- The integrity of the mechanical and electrical connections within the signal head shall be checked to ensure that everything is tight and in good condition.

- Inspect for frayed wiring, wire connection corrosion, water ingress, cracking of signal head (particularly at hanger entry), unused holes which are not plugged and any problems with the backboard or signal hanger.

- Ensure that any signal head replacement is in accordance with the proper mounting height and direction and are provided with focused lenses if required.

Upon completion of the relamping, lens washing and reflector washing, the Contractor

shall furnish to Toronto Transportation a completion report.

3.1.5 Relamp and Cleaning – Pedestrian Crossover Fixtures

The following activities are to be done while carrying out the Relamping and Cleaning of Pedestrian Crossover fixtures:

- During relamp and cleaning all PXO fixtures are to have both sides of the sign face dry wiped clean. Low Pressure sodium lamps of the correct wattage shall be installed. All flashing amber beacon signal indications are to have the reflectors and lenses (both sides) washed with a detergent mixture, cleaned, dried, polished with antistatic polish.
- All LED lenses are to be washed with a detergent mixture, cleaned and dried.
- Low Pressure sodium lamps shall be SOX 135 watt, clear with a Rated Initial Lumens of 22,000 and a Rated Average Lamp life of 16,000 hours.
- Flashing amber beacon indications are not required to be relamped during the relamp.
- The Contractor crew must relamp and clean the entire intersection on the same working day. Old lamps shall be disposed of in accordance with the manufacturer recommendations.

The following items should be checked and repaired/replaced while on site. If not feasible then the deficiencies should be noted and scheduled for repair/replacement at a later date.

- All LED lenses shall be checked. Note and report any burnt out LED's or LED strings.
- Check all gaskets, lenses, visors, latches and door hinges for signs of deterioration.
- The integrity of the mechanical and electrical connections within the PXO fixture and beacon head shall be checked to ensure that everything is tight and in good condition.
- Inspect for frayed wiring, wire connection corrosion, water ingress, cracking of signal head and any unused holes which are not plugged.
- All guy suspension and /or mast arms are to be checked to ensure the integrity of the equipment, and that adequate clearance is being maintained.

Upon completion of the relamping and cleaning the Contractor shall furnish to Toronto Transportation a completion report.

3.2 Traffic Signal Head Hangers, Traffic Signal Plumizers and Versa Brackets

3.2.1 Minor Maintenance

- Check signal head plumbness, swinging, bouncing, etc. Adjust head, hanger, plumizer or versa bracket as required.
- Check hanger/arm and head/hanger attachment. Retighten hardware as required.

3.2.2 Major Maintenance

- Replace damaged or worn hangers as required.

3.3 Mast Arms and Brackets

3.3.1 Minor Maintenance

- Check stainless steel banding and brackets. Tighten or adjust as required.
- Check alignment of mast arms and brackets. Tighten or adjust hardware as required.
- Inspect mounting hardware and brackets for fractures. Repair and/or adjust as required. Note any replacements and report to Toronto Transportation.

3.3.2 Major Maintenance

- Replace damaged or severely worn mast arm and brackets as required.

3.4 Traffic Poles

- For pole maintenance, refer to TTR 805.300.

3.5 Span Wires and Back Guys

3.5.1 Minor Maintenance

- Check tension and clearance height of span wire. Tighten as required.
- Check back guys for tensions and guards. Replace damaged or missing guards. Tighten back guys as required.
- Check span wire for fraying or damage. Schedule repairs/replacements.

3.5.2 Major Maintenance

- Replace frayed or damaged span wire.
- Raise and adjust span wire to obtain adequate clearance.
- Install new back guys as required.

3.6 Overhead Wiring

3.6.1 Minor Maintenance

- Check for loose lashing or missing tie-wraps and repair or replace with lashing (tie wraps no longer permitted).

3.6.2 Major Maintenance

- Check cable clearance height and clearances from other utilities. If adjustments required make repairs or make temporary repairs and schedule permanent repairs as soon as possible.
- Check cable condition for frayed, worn or damaged insulation. Note and report situation to Toronto Transportation.

3.7 Riser Conduits

3.7.1 Minor Maintenance

- Check riser conduits for damage and alignment on pole. Readjust and reband to pole. Schedule replacement of damaged risers.

3.7.2 Major Maintenance

- Replace damaged riser conduits.

3.8 Cabinets and Components

3.8.1 Controller Cabinets

3.8.1.1 Minor Maintenance

- Seal any holes where rodents or insects may enter except those openings intended for drainage or ventilation.

- Inspect for loose or missing nuts, washers. Tighten or replace.
- Check plumbness of cabinet. Replumb cabinet or schedule repairs.
- Inspect, lubricate and check operation of door hinges, handles and locks.
- Inspect door gaskets and apply silicone spray.
- Check for rodents or insects. Apply approved pesticide if required.
- Remove all debris from within cabinet.
- Check "on-line" indicator lamp in Police Door. If burnt out replace lamp or indicator.
- Verify that Manual Control Instructions are provided in Police Door. Replace if missing.
- Inspect and clean graffiti

For cabinets with heating/cooling equipment.

- Test fan operation from the thermostat control. Ensure that fan settings are ON at 18C when temperature is rising.
- Test heater operation from the thermostat control. Ensure that heater settings are ON at 10C when temperature is falling.
- Setting deflective thermostat to "manual" is not satisfactory.
- Summarize in the spring by removing and storing filter and fan baffle plates and installing new filters.
- Winterize in the autumn by installing fan and filter baffle plates.
- Schedule repairs to fans, heaters, and thermostat panels as soon as possible.

3.8.1.2 Major Maintenance

- Inspect for damage caused by vehicles, damage to paint, salt or water corrosion. Make or schedule repairs/replacement.
- If hinge castings are broken on cast cabinets, band cabinet door shut and schedule repairs.
- If heater is defective repair or schedule replacement as soon as practical and no later than November 1.

3.8.2 Cabinets Equipment

3.8.2.1 Minor Maintenance

3.8.2.2 Major Maintenance

- Check 24 VDC Power Supply Output Voltage.

- Check Power Distribution Assembly for any evidence of damage by lightning. Schedule replacement if damaged.
- Check MOVs on incoming line. Replace and apply anti-oxidizing compound if required.
- Check gas tube protector on incoming feeders. Replace if required.
- Check main disconnect (where present) for any evidence of lightning damage. Schedule replacement if damaged.

3.8.3 Controller Units

3.8.3.1 Minor Maintenance

- Verify controller timing reflects timing card information. Report discrepancies to Toronto Transportation immediately.
- Check cabinet documentation and report any missing documents to Toronto Transportation.

3.8.3.2 Major Maintenance

- Check battery voltage level. If level is low, schedule unit replacement.
- Ensure that dip switches controlling communications and address parameters have not been disturbed and are set to the proper baud rate (where applicable).
- Replace defective controller unit or modules.

3.8.4 Time Clocks

3.8.4.1 Minor Maintenance

- Verify controller timing reflects timing card information. Report discrepancies to Toronto Transportation immediately.
- Check time/date on time clock and adjust if required.

3.8.4.2 Major Maintenance

- Update School flasher times
- Reprogram clock for Statutory Holidays, School times and DST
- Replace defective Time Clocks

3.8.5 Conflict Monitors

3.8.5.1 Minor Maintenance

- Field testing of conflict monitors requires police control of traffic for several minutes as the monitor is cycled through the tests.
- Perform test procedures according to the TTR 809.300.

3.8.5.2 Major Maintenance

- Replace defective Conflict Monitor.

3.8.6 Detector Cards

3.8.6.1 Minor Maintenance

- Test sensor units in conjunction with loops and pushbuttons. All calls should register on LED displays.
- Ensure that the function is timing out properly, not just registering on LEDs.
- Perform tuning as described in TTR 810.300, Section 2.0.

3.8.6.2 Major Maintenance

- Replace defective/damaged Detector Cars

3.8.7 Switchpacks/Relays

3.8.7.1 Minor Maintenance

- Check LED registrations of each phase.
- Clean all terminals and spray with anti-condensate.
- Check for any sign of burning on cases and wiring.
- Check and record On and Off voltages. Switchpack ON voltage should equal line voltage. OFF voltage should be less than 3.0 volts.

3.8.7.2 Major Maintenance

- Replace units if evidence of burning.
- Replace units if On different than line voltage.
- Replace units if Off voltages greater than 3.0 volts.
- Replace any damaged units immediately.

- Return old units for shop tests and possible recycling.

3.8.8 Cable and Conduit Entries

3.8.8.1 Minor Maintenance

- Inspect and check field-wiring terminations on backboard for loose, burnt or corroded connections. Retighten connections or strip back cable and reconnect.
- Check disconnect breaker and service cable terminations for loose or burnt connections. Retighten connections.
- Inspect duct entries and add additional duct seal where required.

3.8.8.2 Major Maintenance

- Replace badly corroded or burnt cables.

3.9 Power Supply Disconnect

3.9.1 Minor Maintenance

- Inspect cabinets for damage by vermin, water, etc.
- Inspect for burning of cables, connections, etc.
- Inspect for damage to surge protection equipment.
- Clean cabinet.
- Note and report any work for scheduled repair.

3.9.2 Major Maintenance

- Replace breakers if necessary.
- Replace surge protection if necessary.
- Remake all cable connections if necessary.

3.10 Mechanical Signs

3.10.1 Minor Maintenance

- Inspect signs for proper operation. Lubricate hinges and mechanisms.
- Inspect cable connections. Retighten connections as required.

3.10.2 Major Maintenance

- Replace gear mechanisms.
- Replace mechanical sign.

3.11 Detector Loops

Refer to TTR 810.300, Section 2.0.

3.12 Pedestrian Push Buttons and Signs

3.12.1 Minor Maintenance

- Test pushbutton operation per TTR 810.300, Section 3.2.3
- Secure loose pushbutton to pole/post.
- Secure loose push button riser conduit to pole/post.
- Replace damaged or missing pushbutton freeze caps.
- Remove, unthaw and replace frozen pushbuttons.
- Secure loose Pedestrian Information signs.
- Straighten bent Pedestrian Information signs.

3.12.2 Major Maintenance

- Replace damaged, missing or in-operative push button switches or the entire assembly.
- Replace missing or severely damaged Pedestrian Information signs.
- Replace damaged push button riser conduits.

3.13 Footings and Sidewalk Bays

3.13.1 Minor Maintenance

- Inspect concrete pads/footing for cracks, vehicle damage, frost heaves, spalling, broken or missing anchor bolts.

3.13.2 Major Maintenance

- Patch minor cracks with hydraulic cement
- Replace footing

- Replace anchorage assembly as per TTR 805.300, Section 2.0

3.14 Handwells

3.14.1 Minor Maintenance

- Inspect handwell lid and replace if broken or missing.
- Inspect handwell lid hold-down bolt. If missing or broken retap hole and replace bolt.
- If handwell needs replacement or repair, place plywood over handwell, weigh it down, place traffic cone and schedule repairs.
- Inspect handwell to ensure bonding conductor is connected. Tighten if required.

3.14.2 Major Maintenance

- Handwell frame replacement.
- Replacement of handwell.
- Adjustment or rebuilding of handwell.

3.15 Grounding Components

For grounding components refer to TTR 813.300.