

**TS 808
TRAFFIC SIGNAL EQUIPMENT**

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1.0 Scope

This specification covers the requirements for the installation of traffic signal equipment including traffic signal heads, mast arms, brackets, signal hangers, optically directed lens assemblies, aerial mounting equipment and equipment modifications. The requirements of TS 1.00 and TS 801 shall apply to this work.

2.0 References

This specification refers to the following standards, specifications or publications:

Toronto Transportation:

TS 1.00	Maintenance of Traffic
TS 801	Electrical Work
TS 802	Handwells
TS 804	Cables
TS 809	Traffic Signal Controllers
TS 813	Grounding
TS 815	Removals

Others:

ITE Publication No. ST-017B-2001 - Equipment and Material Standards of the Institute of Transportation Engineers

CSA C22.2 No. 45 - M1981 (R1999) - Rigid Metal Conduit

CSA C22.2 No. 65-03 - Wire Connectors

CSA Standard C22.2 No. 84-95 (R2004) - Incandescent Lamps

CSA C22.2 No. 211.2-M1984 (R2003) - Rigid PVC, Unplasticized Conduit

CSA C22.2 No. 197-M1983 (R2003) - PVC Insulating Tape

3.0 Definitions

For the purpose of this specification the following definitions apply:

Auxillary (signal head): means a traffic signal head installed as supplementary to the primary and secondary heads which may be necessary due to local conditions.

Backboard: means a panel surrounding a signal head used for the purpose of increasing the attention value of the signal.

Highway (signal head): means a traffic signal head with a 300mm diameter red lens and 200mm diameter amber and green lenses.

Pedestrian (signal head): means a traffic signal head comprising of a "walk" and "don't walk" symbol mounted at a crosswalk.

Primary (signal head): means a traffic signal head mounted on the far right side of an intersection approach.

Secondary (signal Head): means a traffic signal head mounted on the far-left side or in the median of an intersection approach.

Signal Head: means an assembly containing the signal face.

Special (signal head): means a traffic signal head comprised of a combination of sections with red, amber and green or green arrow indications.

Standard (signal head): means a traffic signal head with 200mm diameter red, amber and green lenses.

4.0 Construction

4.1 Mast Arms

The Contractor shall set the attachment point of the mast arm on the pole to obtain the required clearance from finished grade to the signal head.

When two or more mast arms are mounted on the same pole the clearance height of the primary head shall be set to obtain the required clearance height indicated in the contract and the secondary signal shall be mounted above the primary head height.

For wood pole mounting, holes shall be drilled to accommodate through bolts. Nuts shall be tightened to obtain a minimum wood compression of 3mm under the washers.

Mast arms shall be installed perpendicular to the through lanes of traffic being served.

Mast arms, brackets and signal hangers shall meet the requirements of TTS 808.200.

4.2 Traffic Signal Hangers

The traffic signal hangers shall be slip-fitted onto the tenon of the mast arm, adjusted to vertical and secured in position. The lower compression nut on the signal hanger shall be turned down against the spread cotter pin. The upper compression nut and conduit locknut shall be securely tightened.

Upon completion of signal head adjustments, the slip-fitter set screws shall be tightened to bite into the mast arm tenon.

4.3 Double Arm Brackets

Double arm brackets shall be assembled on signal heads prior to pole mounting. The arms shall be installed in parallel alignment and all locknuts securely tightened.

Pole plates shall be mounted on the side of the pole such that the signal heads meets the required clearance height from finished grade. Pole plates shall be secured with 10mm x 100mm lag bolts or stainless steel strapping which shall not overlap or secure any other equipment on the pole.

When two pedestrian heads are mounted on the same pole, the heads shall be installed so as to allow each head door to swing fully open. This may require that longer brackets be installed on one head.

4.4 Signal Heads

Signal heads shall be installed facing the direction of approaching traffic. Lamps of the size and type indicated in the contract shall be installed, with positive electrical contact in the signal head lampholders. The lampholders shall be turned such that the gap in the lamp filament is facing upwards.

All signal and pedestrian heads shall be covered until all tests have been completed and the signal heads are put into operation. Covers shall remain in place for up to a maximum of 30 days before the signals are put into operation, unless otherwise approved by Toronto Transportation.

Signal heads shall be adjusted for maximum visibility and focusing prior to final tightening or sealing of hardware. Unused openings in signal heads shall be plugged with bird plugs. No gasket required for bottom of the signal head. Rubber gasket to be installed for the top of the signal head.

Signal heads shall meet the requirements of TTS 808.210.

Incandescent lamps shall meet the general requirements of CSA Standard C22.2 No. 84-95 (R2004) and as per Table 2.3.A in TTR 801.305.

4.5 Wiring Apertures

Wiring apertures shall be drilled as required in metal poles. The apertures shall be located clear of the vertical seam and overlapping sections of sectional steel poles. Apertures shall be de-burred and painted with grey zinc rich paint. Rubber grommets shall be installed after paint is dry.

4.6 Pole Mounted Conduit Systems

Where traffic signal equipment is to be installed on concrete or wood poles, the Contractor shall install pole mounted conduit systems including junction boxes and all necessary fittings and hardware. Conduit shall be installed in straight lengths to follow to taper of the pole using stainless steel strapping or galvanized pipe straps with lag screws at 1.5m maximum spacing. Offset bends shall be used where required to avoid pole attachments and conduits shall be kept free of kinks or scorch marks. Fittings, accessories and hardware shall meet the general configuration requirements indicated in the contract.

Rigid PVC conduits and fittings shall meet the requirements of CSA C22.2 No. 45 - M1981 (R1999). Rigid aluminum conduits and fittings shall meet the requirements of CSA C22.2 No. 45 - M1981 (R1999).

4.7 Wiring

Traffic signal cable shall be installed between the signal head and either the pole handhole or the pole mounted junction box. Wiring shall be run through the mast arms, signal hangers and the lower arm of double arm brackets. A minimum length of 300mm of riser cable shall be left in pole handholes. Extra low voltage and traffic signal cables shall meet the requirements of TS 804.100.

Drip loops shall be left on all external cable. Cable shall be protected with rigid PVC conduit where slack lengths of more than 450mm are externally exposed. Aerial cable from the junction box to the signal head shall be installed in accordance with the requirements of TS 804.

Riser cables shall be connected to the lampholder leads in the amber section of the signal head housing with insulated wingnut vibration proof spring connectors. Termination of spare conductors in handhole or junction box connections shall be made with insulated spring connectors. All insulated spring connectors shall be held in place with three half wraps of electrical vinyl tape. Wire connectors shall be insulated wingnut vibration proof spring type and shall meet the requirements of CSA C22.2 No. 65-03. Upon completion of connections a JB clamp shall be installed around the riser cable and all conductors shall be neatly bundled together and secured with four wraps of electrical vinyl tape. Electrical insulating tape shall meet the requirements of CSA C22.2 No. 197-M1983 (R2003), rated for -18°C to 90°C use, 600V.

4.8 Optically Directed Signal Heads

Optically directed signal heads shall be installed in accordance with the manufacturer's instructions. Signal heads shall be adjusted to focus along the designated roadways or traffic lanes.

4.9 Aerial Mounted Equipment

The Contractor shall install all equipment and fittings, hardware, junction boxes, and accessories necessary for the mounting of equipment on aerial messenger cable systems. All compression nuts, locknuts and fitting hardware shall be securely tightened to prevent shifting of equipment by wind.

4.10 Equipment Modifications

Removal of existing equipment shall be done in accordance with requirements of TS 801 and TS 815. Installation of new, refurbished or modified equipment shall be done in accordance with the requirements for installation of the particular items of equipment as described herein.

4.11 Quality Control

The Contractor shall test all signal heads for lamp operation and proper traffic phase connection in accordance with the requirements of TS 809.

The Contractor shall make all minor adjustments required by the Engineer under Section 5.0.

5.0 Quality Assurance

The Engineer will provide direction for the aiming of signal heads and optically directed lens assemblies. Upon substantial completion of the installation the Engineer will test-drive the controlled traffic lanes and will notify the Contractor of any adjustments required to the foregoing equipment.

6.0 Measurement for Payment

Where the contract includes tender items using the Individual Item Method, measurement will be made of each aluminum single member arm and signal hanger, each sign hanger, each double arm bracket, each signal head, each single signal head section and each optically directed signal head.

7.0 Basis of Payment

7.1 All Inclusive Price Method

Payment at the contract price for the tender item: "Traffic Signal Equipment" shall be full compensation for all labour, equipment and materials required to do all work specified herein including the installation of all signal heads, signal head sections, mast arms, brackets, lens assemblies, lamps, riser cables, wiring connections, associated pole mounted and fittings, junction boxes, fittings, hardware and accessories and including all testing and all modifications to existing equipment required in the contract.

7.2 Individual Item Method

Payment at the contract price for the tender item(s): "Single Member Arms and Signal Hangers", "Double Arm Brackets" shall be full compensation for all labour, equipment and materials required to do the work including all hardware, accessories and adjustment required.

Payment at the contract price for the tender item(s): "Highway Type Signal Heads", "Special Type Signal Heads", "Standard Type Signal Heads", "Pedestrian Type Signal Heads", "Single Signal Head Sections" shall be full compensation for all labour, equipment and materials required to do the work including the installation of backboards, lamps, riser cables, wiring connections, associated pole mounted conduit and fittings, junction boxes equipment fittings, hardware, accessories, adjustments and testing required.

Payment at the contract price for the tender item: "Optically Directed Signal Heads" shall be full compensation for all labour, equipment and materials required to do the work including the installation or modification of all signal heads, mast arms, brackets, lens assemblies, lamps, riser cables, wiring connections, associated pole mounted conduit and fittings, junction boxes, equipment fittings, hardware, adjustments, accessories and testing required. Such payment shall include compensation for the removal, refurbishing, modification and re-installation of existing equipment where indicated in the contract.