

**Construction Specification for  
Traffic Signal Control Equipment****Table of Contents**

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## **TTS 808.100.01      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.

## **TTS 808.100.02      REFERENCES**

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

### **City of Toronto Standard Specifications**

TS 801	Electrical Work - General
TTS 804.100	Construction Specification for Cable Installation
TTS 808.200	Material Specification for Traffic Signal Arms, Hangers, Fittings and Hardware
TTS 808.210	Material Specification for Traffic Signal Head
TS 809	Traffic Signal Controllers
TS 813.100	Construction Specification for Grounding
TS 815.100	Construction Specification for The Removal of Electrical Equipment

### **Canadian Standards Association**

C22.2 No. 45-M1981	Rigid Metal Conduit
C22.2 No. 65-03	Wire Connectors
C22.2 No. 85-M89	Rigid PVC Boxes and Fittings
C22.2 No. 197-M1983	PVC Insulating Tape
C22.2 No. 211.2-M1984	Rigid PVC, Unplasticized Conduit

### **Institute of Transportation Engineers**

ST-017B	Equipment and Material Standards of the Institute of Transportation Engineers
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## **TTS 808.100.03      DEFINITIONS**

For the purpose of this specification the following definitions apply:

**Auxiliary (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.

**Bicycle Signal Head** means a bicycle signal head is a traffic signal head specific for cyclists. The circular lenses with a red, amber and green bicycle outline on a black background differentiate the bicycle signal head from the conventional signal head used by motorized vehicles.

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

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**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.

**Programmable Visibility Head (PVS)** means the traffic signal head that can be programmed to limit the visible area of the indication.

**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 200 mm diameter red, amber and green lenses.

**Transit Signal Head** means a signal head dedicated to providing traffic control related to the movement of public transit vehicles.

#### **TTS 808.100.04 SUBMISSION AND DESIGN REQUIREMENTS**

##### **TTS 808.100.04.01 Working Drawings and Service Manuals**

Working Drawings and service manuals shall be submitted as specified in the Contract Documents.

#### **TTS 808.100.05 MATERIALS**

##### **TTS 808.100.05.01 Mast Arms**

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

##### **TTS 808.100.05.02 Traffic Signal Hangers**

Signal hangers shall be adjustable mid-section hanger or dual-end hanger as specified in the Contract Documents.

The hanger shall be suitable for slip-fitting to a 50 mm IPS mast arm tenon and be locked in place with two stainless steel set screws. An adjustment shall be provided to enable transverse adjustment from plus 7° to minus 4°. The signal head fitting shall be 38 mm IPS threaded tenon with a full-length key slot and a hole near the bottom to hold a cotter pin. Hardware shall include a conduit locknut, a keyed serrated lock washer, a cotter pin and two compression nuts. The entire assembly shall be suitable for connection to the boss of a signal head.

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### **TTS 808.100.05.03 Signal Heads**

Signal heads shall meet the requirements of TTS 808.210.

### **TTS 808.100.05.04 Conduit System**

Rigid PVC conduits and fittings shall meet the requirements of CSA C22.2 No.211.2. Rigid aluminum conduits and fittings shall meet the requirements of CSA C22.2 No. 45.

### **TTS 808.100.05.05 Wiring**

Extra low voltage and traffic signal cables shall meet the requirements of TS 804.100.

### **TTS 808.100.05.06 Wire Connectors**

Wire connectors shall be of the insulated wing nut vibration proof spring type and shall meet the requirements of CSA C22.2 No 65.

### **TTS 808.100.05.07 Junction Boxes and Fittings**

PVC junction boxes and fittings shall be according to CSA C22.2 No. 85.

### **TTS 808.100.05.08 Grommets**

Grommets shall be rubber or neoprene sized to suit the aperture metal thickness and cable diameter.

### **TTS 808.100.05.09 Electrical Tape**

Electrical insulating tape shall meet the requirements of CSA C22.2 No. 197-M, rated 600V and for use in -18°C to 90°C ambient temperature.

## **TTS 808.100.06 EQUIPMENT – Not Used**

## **TTS 808.100.07 CONSTRUCTION**

### **TTS 808.100.07.01 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 bottom of the signal head, or the bottom of the backplate when equipped.

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 Drawings 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 3 mm under the washers.

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

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#### **TTS 808.100.07.02 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.

#### **TTS 808.100.07.03 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 meet the required clearance height from finished grade. Pole plates shall be secured with 10 mm x 100 mm 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. The Contractor shall supply longer brackets to be installed on one head when required.

#### **TTS 808.100.07.04 Signal Heads**

All 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 lamp holders.

All signal and pedestrian heads shall be covered with opaque material 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 Calendar Days before the signals are put into operation.

All 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 for the top of the signal head shall be installed.

#### **TTS 808.100.07.05 Wiring Apertures**

Wiring apertures shall be drilled in metal poles as required. 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.

#### **TTS 808.100.07.06 Pole Mounted Conduit Systems**

Where traffic signal equipment is to be installed on concrete or wood poles, the Contractor shall install conduit systems on the pole surface including junction boxes and all necessary fittings and hardware.

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Conduit shall be installed in straight lengths to follow to taper of the pole using stainless steel strapping on steel or concrete poles or galvanized pipe straps with lag screws at 1.5 m maximum spacing on wood poles.

Offset bends shall be used where required to avoid existing pole attachments. Conduits shall be kept free of kinks or scorch marks. Fittings, accessories and hardware shall meet the general configuration requirements indicated in the Contract.

#### **TTS 808.100.07.07    Wiring**

The Contractor shall install traffic signal cable 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 300 mm of riser cable shall be left in pole handholes.

Drip loops shall be left on all external cable. Cable shall be protected with rigid PVC conduit where slack lengths of more than 450 mm are externally exposed. Aerial cable from the junction box to the signal head shall be installed in accordance with the requirements of TS 804.100.

Riser cables shall be connected with insulated wingnut vibration proof spring connectors to the lamp holder leads in the amber section of the signal head housing. 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 insulating tape. 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 insulating tape.

#### **TTS 808.100.07.08    PVS Signal Heads**

PVS 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.

#### **TTS 808.100.07.09    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 weather elements such as wind, rain, ice or snow.

#### **TTS 808.100.07.10    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.

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#### **TTS 808.100.07.11    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 Contract Administrator.

#### **TTS 808.100.08        QUALITY ASSURANCE**

Equipment and Materials, as supplied by the Contractor, are subject to inspection by the Contract Administrator prior to installation.

Equipment requiring the submission of Working Drawings and service manuals as specified in the Contract Documents may be inspected by the Contract Administrator prior to shipping from the manufacturer's factory or at the supplier's place of business. The Contractors shall inform the Contract Administrator when the equipment fabrication is complete and shall make suitable arrangements for any required inspection.

All electrical installation work is subject to random inspection by the Contract Administrator. The Contract Administrator may witness any testing performed by the Contractor during installation.

#### **TTS 808.100.09        MEASUREMENT OF PAYMENT**

##### **TTS 808.100.09.01    Actual Measurement**

##### **TTS 808.100.09.01.01 Single Member Arm**

For measurement purposes, a count shall be made of the number of single member arms installed.

##### **TTS 808.100.09.01.02 Signal Hangers**

For measurement purposes, a count shall be made of the number of signal hangers installed.

##### **TTS 808.100.09.01.03 Double Arm Brackets**

For measurement purposes, a count shall be made of the number of double arm brackets installed.

##### **TTS 808.100.09.02    Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

#### **TTS 808.100.10        BASIS OF PAYMENT**

##### **TTS 808.100.10.01    Single Member Arms – Item Signal Hangers – Item**



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### **Double Arm Brackets – Item**

Payment at the Contract Price for the above tender items shall be full compensation for all labour, Equipment and Material required to do the Work.

### **TTS 808.100.10.02 Highway Type Signal Head – Item**

#### **Special Type Signal Head – Item**

#### **Bicycle Signal Head – Item**

#### **Transit Type Signal Head – Item**

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material 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.

### **TTS 808.100.10.03 PVS Signal Heads – Item**

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the Work including the installation or modification of all signal heads, mast arms, brackets, lens assemblies, lamps, 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.