

**TS 801
ELECTRICAL WORK - GENERAL**

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1.0 Scope

This specification covers the requirements for electrical work and is applicable to all electrical work in the contract.

The requirements of TS 1.00 and TS 801 shall apply to this work.

2.0 References

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

Toronto Transportation:

TS 1.00 Maintenance of Traffic
TS 815 Removals

City of Toronto Measures and Procedures for Roadwork with Asphalt Containing
Asbestos Fibres

Others:

Ontario Electrical Safety Code – Current Edition.

3.0 Definitions

For the purpose of this specification, the following abbreviations apply:

ASCII - American Standard Code for Information Interchange.
BCD - Bolt Circle Diameter.
CSA - Canadian Standard Association.
EEMAC - Electrical and Electronic Manufacturing Association of Canada.
EIA - Electronic Industries Association.
ESA – Electrical Safety Authority
IEEE - Institute of Electrical and Electrical Engineers.
IES - Illuminating Engineering Society of North America.
IMSA - International Municipal Signal Association.
IPCEA - Insulated Power Cable Engineers Association.
ITE - Institute of Transportation Engineers.
MUTCD – Manual of Uniform Traffic Control Devices
NEMA - National Electrical Manufacturer's Association.
OTM – Ontario Traffic Manual
UL - Underwriters Laboratories.

For the purpose of this specification, the following definitions apply:

Bonding Jumper a conductor connecting two or more metal parts to maintain electrical continuity.

Cable	a solid or stranded, bare or insulated metal conductor or wire or group of conductors or wires enclosed in a common jacket, or twisted or connected to form a group
Cable System	a complete system of cables required for the operation of all or a particular portion of electrical equipment installations
Climbing Space	space for access by a person, consisting of a straight vertical axis and a minimum area of 760mm x 760mm which is clear of all cables, ducts and apparatus and is directly adjacent to manhole steps, climbing steps or ladder rungs where such exist
Code	the Ontario Electrical Safety Code
Contract Administrator	a qualified person of, or retained by Toronto Transportation for administration of the agreement between Toronto Transportation and the Contractor to ensure the timely flow of information and decisions to the Contractor, to enable him to complete the traffic signal installation as required by the documents
Contractor	the firm or individual acting as contractor and commissioned by Toronto Transportation to install the traffic signal system
Direct Buried	directly buried in native or imported material without substantial auxiliary works or protection
Down Time	the time during which an electrical system is de-energized or not under full operation
Drainage Pocket	a cavity excavated and back-filled with crushed stone to permit drainage of water that would otherwise accumulate
Duct	a circular pipe of conduit for the mechanical protection of cables
Electrical Chamber	a chamber for placing and maintaining conductors, cables, ducts or electrical apparatus. General name for electrical maintenance holes, handwells and pedestals.
Handwell	a subsurface chamber not large enough for a person to enter, and affording facilities for placing and maintaining underground conductors, cables and associated apparatus.
Electrical or Communications Pedestal	a surface mounted chamber affording facilities for access to and maintenance of conductors, cables and associated apparatus.
Electrical Work	any work associated with the installation, modification or removal of electrical equipment including work required for all auxiliary

	concrete, mechanical, metallic or non electrical components or equipment
Electrician	a person in possession of a certificate of qualification for the trade of 'Electrician, Construction and Maintenance' issued by the Ministry of Colleges and Universities, Ontario
Electronic Technician	a technician or technologist qualified for certification in the field of electronics by the Ontario Association of Certified Engineering Technicians and Technologists (OACETT).
Energized	electrically alive
Engineer	the Supervisor - Traffic Signals of Toronto Transportation or his designate.
Main Road	the roadway approach or approaches at an intersection, normally carrying the major volumes of vehicular traffic.
Inspector	an employee of Toronto Transportation or any agent who has been assigned to inspect the work, materials and method of installation of the contractor
Night-time	the time during which the ambient natural horizontal illuminant at ground level is less than 15 lx
Pad	a concrete footing with a level surface used to mount electrical equipment
Phase	(traffic signals) a part of the total time cycle allocated to any traffic movements receiving the right-of-way or to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals
Power Supply Equipment	electrical equipment installed to provide a low voltage or extra low voltage source of power for electrical systems; includes transformation, switching and control equipment
PXO	Pedestrian Crossover
Qualified Person	one familiar with the construction and operation of the apparatus and the hazards involved
Riser Wire	the wire or wires between a pole handhole or pole mounted junction box and electrical equipment mounted on the pole
Side Street	the roadway approach or approaches at an intersection normally carrying the minor volume of traffic

Signalized Intersection	an intersection or junction of two or more roadways or walkways where the vehicular and pedestrian traffic is controlled by a traffic signal system
Sleeve	a duct installed so as to provide a cavity for the purposes of installing other ducts within
Specialist	a person who is competent, knowledgeable and experienced in the special work to be performed
Splice	a mechanical device connecting two or more conductors, establishing an electrical contact and insulated equal to or better than the cable in which it is installed
Sub-Surface Installation	installation of ducts, conduits or liners under a surface in such a manner that the materials overlying and surrounding the location for the ducts, conduit or liner is not distributed
Supply Pole	a pole where power is obtained
Switchover	the act of closing down an electrical system and bringing a new or modified electrical system into operation
Temporary	work which is completed, to serve a specific temporary function and removed upon completion of the temporary usage required for the contract
Traffic Signal	a system of traffic signal equipment, poles, traffic signal controllers, traffic signal actuation and interconnection equipment and all associated materials required to regulate vehicular and pedestrian traffic at an intersection or intersections
Underground Electrical Provisions	any work which requires underground installation such as ducts, duct banks, conduits, concrete footings and pads, electrical manholes, and handwells and associated equipment installed for the purpose of providing facilities for future electrical work
Underpavement Crossing	a rigid duct installed underground
Voltage, Extra-low	any voltage up to and including 30 V
Voltage, Low	any voltage from 31 to 750 V inclusive
Voltage, High	any voltage above 750 V, up to 44 kV

Other definitions shall be specified in the Code.

4.0 Submissions and Design Requirements

When required, the Contractor shall submit copies of shop drawings to the Contract Administrator for review.

Shop drawings for all items shall include all information required in the applicable Owner's Material Specification and shall be submitted in advance of the commencement of fabrication of the equipment. Shop drawings submitted for review will be stamped with "permission to construct" for the Contract Administrator if found to be acceptable, or will be marked with corrections if found to be unacceptable. Three copies of unacceptable drawings will be returned to the Contractor for correction. The Contractor shall submit seven copies of corrected shop drawings to the Contract Administrator. If the corrected drawings are found to be acceptable by the Contract Administrator, they will be stamped with "permission to construct".

Three copies of drawings stamped with the words "permission to construct" will be returned to the Contractor. The Contractor shall then submit an additional four copies of these drawings to the Contract Administrator.

Once fabrication of the equipment has commenced, materials and dimensions shown on the final shop drawings shall not be changed without approval of the Contract Administrator; resubmission of four copies of revised shop drawings showing any changes from the final shop drawings will be required.

5.0 Materials

Unless otherwise indicated in the contract, all electrical materials shall be new and of uniform pattern throughout the work.

6.0 Construction

6.1 Qualification of Workers

6.1.1 Contractor's Representative

For the electrical work to be performed the Contractor shall appoint a representative who is an electrician and is experienced in the work.

The Contractor's representative shall be in attendance at the work during all operations listed in subsection 6.1.2.

The Contractor's representative shall attend such meetings required by Toronto Transportation to coordinate services affected by the contract.

6.1.2 Work Requiring Qualified Workers

Electricians shall be employed to do the following work:

- Extra-low and low voltage cable installation
- Extra-low and low voltage splices and connections
- Panel board, fuse and circuit breaker installation
- Traffic signal control device installation
- Traffic signal equipment installation
- Traffic signal control cabinet installation
- Traffic signal control equipment installation
- Electronic equipment installations
- Electronic equipment testing

6.2 Coordination with Hydro Authorities

6.2.1 Work to be Done in Coordination With the Hydro Power Supply Authority

The Contractor shall coordinate the following work with the hydro power supply authority unless otherwise specified:

- (a) Mounting of any equipment on a pole owned by or under the jurisdiction of the hydro power supply authority.
- (b) Work near high voltage conductors requiring temporary insulation of the cables by the hydro power supply authority.
- (c) patrol of high voltage aerial cable systems prior to energization by the hydro power supply authority.
- (d) Installation of transformers and low voltage bus at supply poles by the hydro power supply authority.
- (e) Service cable connections at supply pole by the hydro power authority.
- (f) Initiating and coordinating processing of any service contracts required between the Owner and the hydro power supply authority.
- (g) Informing the hydro power supply authority of the status of Electrical Safety Authority requirements and ensuring that the hydro power supply authority receives a copy of the inspection certificate.

The Contractor shall allow sufficient time for proper scheduling of any work to be done by the hydro power supply authority.

6.2.2 Work to be Coordinated with Others

The Contractor shall where required coordinate the following work with the Contract Administrator:

- (a) Mounting of any equipment on a pole of any structure owned by or under the jurisdiction of a communications company, commission or hydro power supply authority.
- (b) Mounting of any equipment in close proximity to, or requiring modification of, any plant owned by a utility company or by a private person or company.

6.2.3 Permits, Fees, Certificates

Unless otherwise directed, the Contractor shall obtain permits for all work requiring Electrical Safety Authority Inspection and shall file applications for inspection with Electrical Safety Authority Inspection Department as necessitated by the Progress of the work. The Contractor shall pay all fees related to permits, applications and inspections.

The Contractor shall correct all defects in his workmanship and electrical equipment that is not approved by the Electrical Safety Authority. This work shall be done within such time and in such a manner as indicated by notices of deficiency from the Electrical Safety Authority. Upon completion of all work, the Contractor shall obtain a final certificate of approval from the Electrical Safety Authority and shall furnish the original copy of the certificate to the City of Toronto.

6.3 Traffic Signal Systems

6.3.1 Existing Traffic Signal Systems

Except where the contract requires modifications to existing traffic signal systems, the Contractor shall perform his operations so as to leave existing traffic signal systems undisturbed and fully operational. Where traffic signal systems are to be installed and the existing traffic signal is to be removed or modified, the new traffic signal system shall be installed independently of the existing system such that short duration switchover from one system to the other is effected without appreciable down time. Hybrid systems consisting of combinations of existing, temporary or permanent signal systems will not be allowed unless otherwise indicated in the contract.

6.3.2 New Traffic Signal Systems

A new traffic signal system, at an intersection not previously signalized, shall be initially switched on for operation to conform the following requirements:

- (a) For the testing of circuitry and components operation of the system shall take place with signal head covers in place. 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.
- (b) The Contractor shall give the Contract Administrator a minimum of two (2) days notice of when the system will be ready for operation and shall reconfirm that the work will be done as scheduled 24 hours prior to doing the work.

- (c) Activation will not be permitted on Mondays, Saturdays, Sundays or Statutory Holidays unless otherwise advised by the Contract Administrator.
- (d) The Contractor shall complete all preliminary system testing as indicated in the contract and shall complete all repairs or replacement of defective components prior to activation. Traffic at the intersection shall be under police supervision during this operation.
- (e) Switchover of systems shall be done during periods of light traffic volume as determined by the Contract Administrator.

6.3.3 Traffic Signal Systems Switchover

A new traffic system installed at an intersection to replace an existing traffic signal system, shall be initially activated to conform to the following requirements:

- (a) The Contractor shall give the Contract Administrator a minimum of two (2) days notice of when the system switchover will be done and shall reconfirm that the work will be done as scheduled 24 hours prior to doing the work.
- (b) The Contractor shall complete all preliminary system testing as indicated in the contract and shall complete all adjustments or replacement of defective equipment in the new system prior to system switchover.
- (c) For the testing of circuitry and components, operation of the new signal system shall take place with the signal head covers in place and the existing signal system operational. 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.
- (d) Signal heads of the existing traffic signal system shall be covered and covers shall be removed from the new signal heads with both systems not activated. Traffic at the intersection shall be under police supervision during this operation.
- (e) Switchover of systems shall be done during periods of light traffic volume as determined by the Contract Administrator.

6.3.4 Traffic Signal Controller Operation

Unless otherwise specified, Toronto Transportation will set up the traffic signal controller, perform all programming, time settings and switch settings, and switch the controller to the normal operational mode. The Contractor shall not adjust any programming controls, mode switches, keyboard or timing switches or devices unless otherwise indicated in the contract.

6.3.5 Maintenance of Traffic Signal Systems

Toronto Transportation will perform all routine and emergency maintenance work upon operation of the traffic signal system for public use of the intersection.

6.4 Temporary Electrical Work

All temporary electrical work indicated in the contract shall be installed and made ready for operation prior to opening the associated traffic lanes or sidewalks which the work is intended to serve. Removal of temporary work shall conform to MT 815.

6.5 Layout of Equipment

The electrical layout drawings are a schematic representation of the requirements. All equipment shall be installed in locations detailed in the contract.

6.6 Adjustment of Equipment

The Contractor shall adjust all traffic signal heads, optical lens assemblies, and other devices which may be adjusted to give optimum performance.

6.7 Asphalt Saw Cutting - Asbestos

The use of asbestos in the surface layer of roadways during the 1960s, 1970s and early 1980s was common in many City of Toronto roadways. This potential hazard can be encountered when saw cutting the asphalt. The City of Toronto has developed Measures and Procedures for Roadwork with Asphalt containing Asbestos Fibres. These measures include training, notification, separation, special signing, use of respirators, protective clothing, dust control and decontamination procedures. The Contractor is to follow all procedures as outlined in the City of Toronto policy.

6.8 Open Excavations

Any excavations within the roadway and/or boulevard shall not be left open.

6.9 Disposal

Excess materials or materials unsuitable for the contract requirements shall be managed as specified elsewhere in the contract, as the City of Toronto policy.

6.10 Removal and Restoration

Removal and restoration of pavement, sidewalk, curb and gutter shall be carried out as per the Contract Administrator.

6.11 Quality Control

6.11.1 General Requirements

Tests on electrical wiring shall conform to the Electrical Code or Toronto Transportation Specifications.

Tests on electrical equipment shall conform to the appropriate specifications covering the work. The Contractor shall supply all labour, equipment and material required to carry out all test specified in the contract.

7.0 Quality Assurance

All equipment requiring the submission of shop drawings, as detailed in Section 4.0, is subject to inspection by Toronto Transportation or its designate, prior to shipping of the equipment. The inspection shall take place at the manufacturer's factory or at the supplier's place of business. The Contractor shall inform the Contract Administrator of when the equipment fabrication is approximately 80% and 100% complete and shall make suitable arrangements for any required inspection.

All underground work (ducts, handwells, pole bases, controller bases, etc.) must be inspected by Toronto Transportation before the above ground installation can proceed. The contractor will notify Toronto Transportation in advance of underground work and in advance of re-instatement.

8.0 Basis of Payment

8.1 Maintenance Costs

Where Toronto Transportation performs maintenance work on systems installed by the Contractor prior to acceptance of the work by Toronto Transportation, the actual costs of maintenance work which are a result of inadequate workmanship or defective materials supplied by the Contractor will be charged to the Contractor.