TS 804
CABLES

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 Scope

This specification covers the requirements for the installation of high voltage, low voltage and extra low voltage cables including splicing and terminations.

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

2.0 References

Toronto Transportation:

TS 1.00	Maintenance of Traffic
TS 803	Ducts
TS 813	Grounding
TS 815	Removals

Canadian Standards Association:

CSA C22.2 No. 129-1976 (R2004) - Neutral Supported Cable.
CSA C22.2 No. 38-05 - Thermoset Insulated Wires and Cables.
CSA C22.2 No. 65-03 - Wire Connectors
CSA C22.2 No. 197-M1983 (R2003) - PVC Insulating Tape
CAN/CSA C22.3 No. 1-01 - Overhead Systems.
CAN/CSA C61089-03 - Round Wire Concentric Lay Overhead Electrical Stranded Conductors
CSA C57-98 (R2002) - Electric Power Connectors for Use in Overhead Line Conductors.
CSA C83-96 (R2000) - Communication and Power Line Hardware.
CAN/CSA G12-92 (R2003) - Zinc Coated Steel Wire Strand.

Others:

International Municipal Signal Association Specification No. 19-1C 2001 - Polyethylene-Insulated Polyvinylchloride-Jacketed Signal Cable.

International Municipal Signal Association Specification No. 19-2 1999 - paired Polyethylene-Insulated Polyvinylchloride-Jacketed Communication Cable with Electrical Shielding.

Insulating Power Cable Engineer's Association Publication S 65-524 Cross-Linked Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electric Energy.

Ontario Electrical Safety Code, Current Edition.

3.0 Construction and Materials

3.1 General

3.1.1 Fish Line

Fish Line shall be installed in all ducts along with traffic signal cables in accordance to TS 803. A 1.5 m length of fish line shall be left coiled, tied and accessible in each pole handwell, handwell and controller.

3.1.2 Coils and Slack Cable

When specified in the contract, coils of cable shall be left for future extension by others.

A coil length of low voltage, traffic signal and extra-low voltage cables where applicable shall be left at all handwells such that a minimum of 1.0m total length of cable may be pulled out above finished grade. Coils shall be neatly tie wrapped and left in a readily accessible location.

3.1.3 Low Voltage Cable

Low voltage cables shall be type RWU 90-cross link conforming to CSA C22.2 No. 38-05.

Low voltage multiconductor traffic signal cable shall conform to IMSA Spec No. 19-1C 2001.

3.1.4 Extra-low Voltage Cable

Extra-low voltage cables for use with traffic signal Interconnection systems shall conform to IMSA Spec No. 19-2.

Extra-low voltage cables for use with traffic signal actuation devices shall conform to TS 810.100 except as specified elsewhere in the contract.

3.1.5 Traffic Signal Cables

Traffic Signal Cables shall conform to IMSA Spec No. 19-1C 2001.

3.2 Cables in Ducts

Cable shall be pulled through ducts using any necessary cable lubricant, mechanical aids and pulling cables or ropes as required. The pulling tension shall not exceed the safe tension recommended by the cable manufacturer.

Expansion joints shall be accurately formed and mechanically supported as specified in the contract.

3.3 Cables, Aerial

Messenger cables shall be stranded galvanized hard drawn steel 3/8 inch, 7 strand grade 180 conforming to CAN/CSA G12-92 (R2003).

Hardware and fittings for aerial cable installations shall conform to CSA C83-96 (R2000).

Cables shall be tensioned to obtain the sag and safety clearance from other utilities or above ground facilities at any ambient temperature.

Where lashing of cable to a messenger strand is required, single wound 1.0mm diameter stainless steel lashing wires shall be installed. In lieu of lashing wires, black outdoor nylon cable ties may be used where specified in the contract.

Nylon or stainless steel mesh cable grips shall be installed to support vertical cable runs where the unsupported cable mass exceeds 25kg.

Drip loops and expansion loops shall be formed at each pole or conduit entry and shall be held free of the pole or other cables and connections to prevent abrasion.

Cables shall be re-tensioned one month after initial installation to maintain the required cable clearances.

All work shall conform to CAN/CSA C22.3 No. 1-01, the Ontario Electrical Safety Code and the Electrical Utilities Safety Association of Ontario Rule Book.

3.4 Splices and Terminations

3.4.1 Stranded Wires

Low voltage and traffic signal cables splices for single stranded conductors installed underground shall be made with compression or twist type connectors insulated with electrical vinyl tape and protected with waterproof splices installed in conformance with the manufacturer's recommendations.

Extra low voltage wire are to be soldered prior to using compression or twist type connectors insulated with electrical vinyl tape and protected with waterproof splices.

3.4.2 Solid Wires

Low voltage and extra-low voltage splices shall be made only in accessible locations such as handwells and pole handholes. Traffic signal cable splices shall be made only in pole handholes, above ground junction boxes or controller cabinet. Underground splices additional to those specified in the contract shall be only allowed where staging of the work requires partial completion and therefore future extension of the cables as part of the contract.

Low voltage cable splices for solid conductor installed underground shall be made by twisting the conductors together with twist type connector, insulating with electrical

vinyl tape and protecting with waterproof splices installed in conformance with the manufacturer's recommendations.

Low voltage cable splices for cable installed aerially or above ground shall be made with twist type or compression connectors protected with insulating covers installed in a splice box.

Extra-low voltage cable splices shall be made by twisting the conductors together with twist type connector or by installation of connector sets as specified in the contract.

Connections to terminal boards shall be made with insulated fork tongue or ring type compression connector for stranded conductors; for solid conductors, they shall be terminated under the terminal. All conductors, insulation and jackets shall be carefully cleaned prior to installing connections, splices or terminations. All ground shields, braids or tapes shall be connected securely to a ground wire in conformance to TS 813. All wires are to be tapped together and placed up within the hand hole.

Electrical insulating tape shall be rated for 600V and -18°C to 90°C working temperature and conform to CSA C22.2 No. 197-M1983 (R2003). Cable connectors shall conform to CSA C22.2 No. 65-03 and CSA C57-98 (R2002).

3.5 Removals and Restoration

Removals and restoration work required for the installation of work described herein shall conform to TS 815.

3.6 Quality Control

3.6.1 General

The Contract Administrator shall be given 24 hours notice of when tests are to be performed. The Contract Administrator shall witness all tests and all installations of splices, as required.

Continuity of all cables and connections shall be checked by means of an ohmmeter test prior to energizing the system. This test shall be done with temporary jumpers installed to by-pass any active system elements or any passive DC blocking devices.

Cables shall be tested for leakage to ground by means of a "megger" test. Resistance to ground shall be 10MΩ or greater.

4.0 Measurement for Payment

4.1 Individual Item Method

4.1.1 Actual Measurement

Where the Contract includes tender items using the Individual Item Method, measurement for cable will be made horizontally in metres, along the longitudinal axis of the duct, trench or aerial cables and shall be from centre to centre of poles, pole

footings, handwells, sign footings and traffic signal controller cabinet pads, and to the face of bridge structures, retaining walls and substation pads.

4.1.2 Plan Quantity Measurement

Measurement will be by Plan Quantity as may be revised by Adjusted Plan Quantity, when designated in the Contract. Such measurement will be based on the units indicated in the clauses under 4.1.1 Actual Measurement.

5.0 Basis of Payment

5.1 All inclusive Price Method

5.1.1 Cable Systems - Item

Payment at the contract price for the above tender items includes low voltage cable systems, traffic signal and extra-low voltage cable systems, and shall be full compensation for all labour, equipment and materials required to install the appropriate cable systems, regardless of type and size, in ducts or aerially, and shall include all earth excavation, backfill, bedding, compaction and cable protection bricks required for all pole line hardware, fittings and accessories required for aerial cable systems, installation of all mechanical support, connections, tests, splices, terminations, coils of cable, slack cable and waste cable required. Such payment shall include compensation for removal of pavement, sidewalk and curb and gutter as required and restoration work where such work is not included in other tender items.

5.2 Individual Item Method

5.2.1 General

Payment at the Contract price for the following tender items shall include compensation for all labour, equipment and materials required for vertical runs of cable, coils of cable, slack cable, waste cable and for all testing and accessories required.

5.2.2 Low Voltage Cables, In Ducts - Item
Extra-low Voltage Cables In Ducts - Item
Traffic Signal Cables, In Ducts -Item

Payment at the contact price for the above tender item(s) shall be full compensation for all labour, equipment and materials required to do the work regardless of size and number of conductors in the cable and regardless of size and type of duct and including low voltage and extra-low voltage splices where applicable, connections installation of all mechanical support, systems and baffles required.

5.2.3 Low Voltage Cables, Aerial on Messenger Cable - Item
Traffic Signal Cables, Aerial on Messenger Cable - Item
Extra-low Voltage Cables, Aerial on Messenger Cable - Item
Steel Messenger Cables, Aerial-Item

Payment at the contract price for the above tender item(s) shall be full compensation for all labour, equipment and materials required to do the work regardless of size and number of conductors in the cable and including low voltage and extra-low voltage splices where applicable, all splices of uninsulated cables, all pole line hardware fittings and accessories, connections and re-tensioning of cables as necessary.