

# Appendix A – Traffic Signal and Roadway Illumination Specifications

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## **N-6001 Traffic Signal Construction**

In addition to the conditions stipulated in the Niagara Region Traffic Signal Standards (NRTSS) Manual and the Niagara Peninsula Standard Contract Document, the following shall also apply:

### **6001.01 SCOPE**

This supplementary special provision covers the additional requirements for traffic signal construction. This supplementary special provision has been developed for use on this Contract.

### **6201.02 CONSTRUCTION**

As part of this contract, the Region will utilize internal staff to complete the portion of the traffic signal construction not included in the schedule of quantities. The contractor is therefore required to give adequate notice (minimum 5 working days) to the Region, and co-ordinate the scheduling of this work following the completion of all preparatory work within the intersection.

The contractor shall ensure (at no cost) adequate separation when Region staff are working on-site to satisfy the Ministry of Labour requirements and will not claim for mobilization or any lost time costs as a result. Regional forces shall have 10 working days per intersection to perform their portion of the work. During this phase of the project, traffic control at the intersection shall be managed by the Region, but shall be organized in such a manner as to supplement the contractor's traffic management plan.

All construction is to be in accordance with Niagara Region Traffic Signal Standards (NRTSS) manual. This manual can be viewed and downloaded from the Niagara Region website at:

<http://niagararegion.ca/government/works/Traffic-Signals-Manual.aspx>

Traffic control is the responsibility of the contractor including the coordination and cost of a point duty officer when required. The Niagara Peninsula Standard Contract Document, Special Provisions A8; Construction Signs, Traffic Control, and Traffic Management Plan will apply.

Temporary signal works may be required to reduce conflicts between existing traffic signal plant and the proposed road construction. Any modification of the existing signal plant shall be approved and coordinated by the Region. All temporary signal work will be subject to the related specifications in this document.

The contractor shall contact the Region for approval following the traffic signal plant layout. Property and utility locations shall also be identified. The specific locations for all traffic signal plant infrastructure including, but not limited to, conduit, pole bases,

junction boxes, cabinet base, tactile plates, and loops will be verified in the field by the Region prior to installation. Any deviations from the original design shall require Region approval.

The Niagara Peninsula Standard Contract Document provides Special Provisions for construction items not addressed in this document.

## **6201.03 MATERIALS**

### **6201.03.01 Region Supplied Materials**

The Regional Niagara will supply the following materials:

- Interconnect communication cable including:
  - Fiber cable
  - Patch panel
  - Splice Kit
  - #14 TW cable (tracer cable)
- IMSA 19-1C multi-conductor cable (Traffic Signal Cable)

### **6201.03.02 Contractor Supplied Materials**

The Contractor is to supply the following materials:

- 100mm and 50mm rigid PVC Sceptre-type conduit including but not limited to: sweeps, bends, couplings, end bells, and cement.
- Ground rods and/or ground plates
- 6.35mm (1/4") minimum diameter woven polypropylene rope fish in all the conduit work
- Concrete pole foundations and rebar (as per NRS 2002)
- Concrete cabinet foundations (as per NRS 2003-P)
- Vehicle Detection Loops (as per NRS 2520, NRS 2521)
- Junction boxes (as per NRS 2020)
- Anchorage Assemblies (as per NRS 2001)
- Sectional Steel Poles (Direct Buried and/or Base Mounted)
- Spun Aluminum Poles
- Signal Mast Arms and Pole Plates
- Signal Hangers and Brackets
- Traffic and Pedestrian Signals
- Traffic Signal Controller
- Traffic Cabinet c/w anchor bolts
- Vehicle Detection System c/w cable
- Accessible Pedestrian Signal (APS) System
- Emergency Vehicle Pre-Emption (EVP) Equipment
- Power Supply Control Cabinet Assemblies (as per NRS 2130, NRS 2131)
- #14 RWU90 (Loop Cable)
- Roadway Lighting Luminaires and arms c/w hardware

- 16/2 shielded control cable - (push buttons and loops)
- LMR-400 Coax Cable (Antenna Cable)
- #6 RWU cable - (illumination and ground)
- #8 RWU cable - (Traffic Cabinet)
- 12/2 NMWU cable (illumination riser)

All materials provided by the Contractor shall be approved by Regional Niagara before the Contractor is permitted to use on the work site.

The contractor must provide an email identifying the project and itemized list of all requested materials at least two working days prior to pick up. If the contractor cannot pick up the material at the scheduled time they must contact the Region and reschedule a pick up date. Materials provided by Regional Niagara are to be obtained by the Contractor from:

Stores Contact:      Transportation Materials Technician Lead  
                                 3547 Thorold Townline Road  
                                 Thorold, ON L2V 4T7

The store hours are 8:00 a.m. to 2:00 p.m., Monday to Friday.

The contractor will be back charged for excess wasted material supplied by the region but not used on project.

## **N-6002      Removal of Traffic Signal Equipment**

In addition to the conditions stipulated in the OPSS.MUNI 610, the following shall also apply:

### **600.01      SCOPE**

This supplementary special provision covers the additional requirements for the removal of traffic signal equipment. This supplementary special provision has been developed for use on this Contract.

### **6002.02      CONSTRUCTION**

All luminaires, traffic signal appurtenances, poles, arms, junction boxes, and cable identified for removal shall be salvage and transported to the Region's Thorold Service Centre. All hardware shall be removed from poles prior to being returned. The contractor must contact the Region and make arrangements for delivery of salvaged materials.

Stores Contact:      Transportation Materials Technician Lead  
                                 3547 Thorold Townline Road  
                                 Thorold, ON L2V 4T7

The store hours are from 8:00 a.m. to 2:00 p.m., Monday to Friday.

All other excess materials, such as, Portland cement, concrete (including pole bases), natural wood, masonry, fabricated metal and plastic products, shall be managed as non-hazardous solid industrial or commercial waste, as specified in OPSS 180.

### **6002.03      MEASUREMENT FOR PAYMENT**

The price of the unit bid item(s) are to be all inclusive of labour, material and equipment to complete the work.

## **N-6201 Traffic Signal Construction Layout**

In addition to the conditions stipulated in OPSS.MUNI 100 GC7.02, the following shall also apply:

### **6201.01 SCOPE**

This supplementary special provision covers the additional requirements for traffic signal construction layout. This supplementary special provision has been developed for use on this Contract.

### **6201.02 CONSTRUCTION**

The contract administrator will provide the contractor a construction drawing in AutoCAD format to layout the proposed signal plant. Where road works or grade changes are included in the project, the roadway construction drawings shall be used to determine the finished grade at traffic signal plant locations.

The contractor shall layout all foundations, junction boxes, conduit, and loops locations prior to construction for review and approval by the Region. The contractor is responsible to have all utilities, watermain, storm and sanitary sewers and property lines located and marked in the field prior to arranging the layout review meeting.

### **6201.03 BASIS OF PAYMENT**

Where there is no separate item for layout in the contract, layout will be included in the contract price for each item.

## **N-6202 Fiber Cable**

### **6202.01 Fibre Cable**

Splice kits are required whenever the fibre cable is interrupted. Fibre cable shall be interrupted as little as possible. A patch panel is required to interface with the signal cabinet.

Fiber cable shall be continuous in between signal plants unless otherwise directed by the Region.

Tracer cable shall be installed in between signal plants and terminated in the junction box closest to the signal plant. Tracer cable cannot enter any signal plant.

16m of extra cable in junction box for every cable involved in a splice.

Junction boxes used as pull points shall have 2-5m extra meters of cable.

### **6202.02 MEASUREMENT FOR PAYMENT**

#### **6202.02.01 Traffic Control**

Traffic control items that are not included in the schedule of quantities shall be considered included as a component of other traffic signal items

### **6202.03 BASIS OF PAYMENT**

Payment shall be as per applicable contract items.

## **N-6203 Concrete Footings and Pads**

In addition to the conditions stipulated in OPSS.MUNI 616 and the Niagara Region's Traffic Signal Standards (NRTSS) the following shall also apply:

### **6203.01 SCOPE**

This supplementary special provision covers the additional requirements for concrete footings and pads. This supplementary special provision has been developed for use on this Contract.

### **6203.02 CONSTRUCTION**

The location and type of pole base shall be confirmed by the Region prior to construction. Bases shall be constructed in sonotubes with the top of concrete 50mm above finished grade on all sides. Poles constructed on slopes will require alteration to the adjacent grades to ensure 50mm clearance. The underground location of the conduit connecting to the pole base will be marked with a 50mm cut cross. Concrete for constructing the footing shall be 30Mpa of 28 days. Any deviations require Region approval.

Concrete pole bases must be constructed and installed as shown in NRS 2002.

Anchorage assembly studs shall be installed to provide maximum adjustment for pole. Studs or bolts shall have the exposed threads, above the ferrule, coated with an anti-seize compound. Anchorage assemblies used for concrete pole bases must be constructed and installed as shown in NRS 2001.

Wet burlap shall be applied to the top (unformed) surface of the footing immediately after completion of the finishing operation, without damaging or marring the surface of the concrete and maintained wet for the minimum curing period. The contractor shall compact all backfill around footings and trenches.

Contractor shall exercise caution when excavating in the proximity of underground utilities. Hand digging and/or use of hydrovac equipment should be undertaken when warranted. Excavation by hydrovac method shall be approved by contract administrator.

Where bedrock is reached before full depth of pole base is attained, the Region may approve the use of "Anchoring into Bedrock" (standard in development). This procedure requires 2" holes to be drilled to a depth of four feet for all vertical rebar specified on the detail drawing. The two-inch (2") drill holes will be filled with "Flow-Rock" Epoxy adhesive to anchor the rebar into the bedrock.

*Existing concrete pole bases may be adjusted 1" to 5" above grade before complete replacement is required.*



## **N-6204     Conduit**

In addition to the conditions stipulated in OPSS.MUNI 603 the following shall also apply:

### **6204.01     SCOPE**

This supplementary special provision covers the additional requirements for conduit. This supplementary special provision has been developed for use on this Contract.

### **6204.02     CONSTRUCTION**

Conduit material to be used under this item is 100mm and 50mm rigid PVC scepter-type or high-density polyethylene (HDPE) conduit or equal and the appropriate fittings. Solvent cement shall be used on all conduit connections.

The conduit shall be installed between 0.75m and 1.0m below finished grade. Conduit in new road base shall be installed in a trench just below the roadway subgrade elevation to prevent damage during granular compaction. Conduit in existing roads shall be placed as close as possible to subgrade elevation. All roadway crossings shall be directionally bored. Open cut crossings only permitted with Niagara Region approval.

Backfill in the road shall be granular A and compacted to 100% standard Proctor density unless otherwise indicated. All asphalt pavements shall be reinstated by matching the existing depth, or a minimum of 180 mm in total, (120 mm of base course and 60 mm top course), in 60 mm lifts of HL8 HS and milled to a minimum 0.6 m beyond the saw cut limit and reinstated with 60 mm of HL3 HS surface course. The vertical edges and milled surfaces must be tack coated with a suitable asphalt emulsion prior to the replacement of the final surface layer of asphalt.

All conduits in junction boxes should extend up 100mm from the bottom of junction box. All conduits shall include end bells on all open ends. All conduit shall be provided with a 6.35mm (1/4") polypropylene rope.

Marking tape shall be used to identify the location of all conduits. The location marking tape shall be placed horizontally along the center of the conduit at a depth half the distance between the conduit and finished grade.

Conduit specified in contract documents as installed by directional bore method will be high-density polyethylene (HDPE).

### **6204.03     MEASUREMENT FOR PAYMENT**

Measurement for payment will be by the meter of horizontal length plus one and a half meters (1.5m) for each riser section in the junction boxes and two and a half meters (2.5m) at signal poles and controller cabinet for the sweep riser sections.

## **N-6205 Cable**

In addition to the conditions stipulated in OPSS.MUNI 604 and the Niagara Region Traffic Signal Standards (NRTSS), the following shall also apply:

### **6205.01 SCOPE**

This supplementary special provision covers the additional requirements for cable. This supplementary special provision has been developed for use on this Contract.

### **6205.02 CONSTRUCTION**

The Contractor shall utilize a Certificate of Qualification 309A Electrician to install/ draw cable in conduit as described in the Ontario Regulation 275/11; Scope Of Practice – Trades In The Construction Sector.

Signal cable runs must be continuous between poles. Signal cable splices must only be made at pole hand holes. No signal cable splices are permitted below ground. Sufficient length (1.5m) of free cable must be left in pole hand holes and junction boxes to allow a proper connection to be made with cable coming from signal and/or pedestrian heads.

The contractor must identify all cable in accordance with Appendix D of the Traffic Signal Standards manual.

The contractor shall inspect the cables prior to installation. The contractor will pull the appropriate cables required to construct the traffic signal plant according to the traffic signal drawing. Any changes made to the signal plant at the time of layout approval that require cable location modification to different conduit will be updated by the contractor at no additional cost.

Cable connecting to the traffic cabinet shall be protected by a cabinet base installed by the contractor as part of the cable item.

## **N-6206 Junction Boxes**

In addition to the conditions stipulated in OPSS.MUNI 602 (Junction Box also referred to as a Hand Hole), NRS 2020 and the Niagara Region Traffic Signal Standards (NRTSS), the following shall also apply:

### **6206.01 SCOPE**

This supplementary special provision covers the additional requirements for cable. This supplementary special provision has been developed for use on this Contract.

### **6206.02 CONSTRUCTION**

The installation work also includes junction boxes, standard and shallow (where required), couplings, bends, and wiring as shown in the wiring drawings and construction drawings. Junction boxes must be placed on bricks at each corner with 150mm of clear stone as shown in NRS 2020. Alterations or cuts into the sides of the junction box shall not be permitted.

*Existing junction boxes shall be adjusted by the contractor to match new sidewalk and curb elevations where required.*

Junction box locations shall be confirmed by the Region prior to installation.

## **N-6207 Sectional Steel Poles**

In addition to the conditions stipulated in OPSS.MUNI 615, the following shall also apply:

### **6207.01 SCOPE**

This supplementary special provision outlines the specifications that must be satisfied when installing traffic signal poles at a Regional traffic signal installation. This supplementary special provision has been developed for use on this Contract.

### **6207.02 CONSTRUCTION**

The height and location of each traffic signal pole must be as outlined in the contract drawings unless otherwise directed by the Region. Where traffic signal poles are perforated for cables or cut for any reason, they must be treated with a zinc black rich compound and fitted with rubber grommets.

Traffic signal poles shall be installed as per the manufacturer's specifications. Pole sections must be fastened to each section using 3 zinc coated  $\frac{1}{4}$ " x  $1\frac{1}{4}$ " self-tapping screws. Traffic signal poles shall be installed in such a manner that the hand holes are facing away from the direction of traffic unless otherwise noted or directed in the field.

Pole plates (mast arm brackets) should be installed at the location where pole sections overlap unless otherwise directed in the field.

## **N-6208      Signal Mast Arms**

In addition to the conditions stipulated in OPSS.MUNI 620, the following shall also apply:

### **6208.01      SCOPE**

This supplementary special provision covers the additional requirements for the installation of traffic signal (signal mast) arms. This supplementary special provision has been developed for use on this Contract.

### **6208.02      CONSTRUCTION**

The Region shall confirm the length of each traffic signal arm to ensure the placement of the signals are in accordance with the construction drawing. Traffic signal arms shall be installed as per the manufacturer's specifications.

Pole plate brackets shall be fastened to traffic signal poles using two zinc coated ¼" x 1¼" self-tapping screws.

## **N-6209      Vehicle Detection Loops**

In addition to the conditions stipulated in OPSS.MUNI 620, NRS 2520 and the Niagara Region Traffic Signal Standards (NRTSS), the following shall also apply:

### **6209.01      SCOPE**

This supplementary special provision covers the additional requirements for vehicle detection loops. This supplementary special provision has been developed for use on this Contract.

### **6209.02      CONSTRUCTION**

Loops shall be located 0.6 meters from the edge of the lane being serviced and will be a maximum of 2.4 meters wide. The Region must confirm Loop layout in field.

Inductive loop feeds crossing barrier curb shall be installed in flexible 19mm conduit below the curb as shown in NRS 2520. Where inductive loops are used, loop feeders shall be tagged at the controller cabinet. Loop leads must include 2.0 meters of slack coil at the base of the controller cabinet and at the junction box feeding the pavement loop cable.

Loops will be duplex or simplex as specified in the contract documents and shall be constructed in the upper most lift of base asphalt prior to the placement of the top surface.

### **6209.03      MEASUREMENT FOR PAYMENT**

This item shall be inclusive of all labour, material (wire, sealing compound and flexible duct for under curb) and equipment required to construct the vehicle detection loops.

## **N-6210     Lighting Luminaries**

In addition to the conditions stipulated in OPSS.MUNI 617, NRS 2130 and the Niagara Region Traffic Signal Standards (NRTSS), the following shall also apply:

### **6210.01     SCOPE**

This supplementary special provision covers the additional requirements for lighting luminaries. This supplementary special provision has been developed for use on this Contract.

### **6210.02     CONSTRUCTION**

Illumination will be part of the traffic signal system and connected at the traffic signals power pole. Luminaires will be placed as per the contract drawings and confirmed by the Region. This item will include the installation of the luminaire, bracket and arm.

## **N-6211      Ground Wire and Ground Rods**

In addition to the conditions stipulated in OPSS.MUNI 609, the following shall also apply:

### **6211.01      SCOPE**

This supplementary special provision covers the additional requirements for ground wire and ground rods. This supplementary special provision has been developed for use on this Contract.

### **6211.02      CONSTRUCTION**

The Contractor shall inspect the grounding cables, bonding jumpers, ground electrodes and connection components prior to and during installation to ensure that they meet the requirements of the contract.

All poles shall be connected to a ground rod in the closest available junction box with connection hardware approved by the Region.

Two (2) ground rods shall be installed at the power supply pole a minimum of 3m apart.



## **N-6212 Interconnect Duct**

In addition to the conditions stipulated in OPSS 603, the Niagara Region Standards (NRS) and the Niagara Region Traffic Signal Standards (NRTSS) the following shall also apply:

### **6212.01 SCOPE**

This supplementary special provision covers the additional requirements for interconnect duct. This supplementary special provision has been developed for use on this Contract.

### **6212.02 CONSTRUCTION**

Interconnect duct to be 50mm PVC Sceptre-type conduit constructed 0.75m to 1.0m below finished grade. Junction boxes shall be spaced no more than 300m apart and whenever a road crossing is present or as directed by the Region. Dedicated conduit for interconnect shall be connected from one signal plant to another signal plant to allow for the placement of future interconnect cable.

All conduit shall be provided with interconnect cable (supplied by Region) as specified in the Schedule of Quantities and be provided with 6.35mm (1/4") polypropylene rope.

Marking tape shall be installed along the centerline of the trench half the distance between the conduit and finished grade for duct protection.

Reinstatement of open cut tranches or daylight pits for trenchless installations shall be to existing condition or as noted on the Contract Drawings.