Electrical Specifications

Electrical Specifications – General

Abbreviations

When the following abbreviations are used in the Electrical Specifications, they shall have the following meanings:

A Ampere

AC Alternating Current

AHr Ampere-Hour

ANSI American National Standard Institute

ASA American Standards Association (formerly [American National Standards Institute](https://en.wikipedia.org/wiki/American_National_Standards_Institute) from 1928 to 1966)

ASTM ASTM International (formerly American Society for Testing and Materials)

AWG American Wire Gauge

BCD Bolt Circle Diameter

c/w complete with

C Celsius

CCTV Close Circuit Television

CCU Central Control Unit

CD-ROM Compact Disc Read-Only Memory

CGSB Canadian General Standards Board

CSA CSA Group (formerly Canadian Standards Association)

CTCS Centralized Traffic Control System

CWI Constant Wattage Isolated Winding

DSM Designated Sources Manual

ELV Extra Low Voltage

ERP Effective Radiated Power

ESA Electrical Standards Association

GPS Global Positioning System

HPS High Pressure Sodium

HW Handwell

IES Illumination Engineering Society

ITE Institute of Transportation Engineering

ITS Intelligent Transportation Systems

LB Trade Description for an Access Fitting

LED Light Emitting Diode

MDS Microwave Date Systems

MTO Ministry of Transportation, Ontario

N Newton

NASTT North American Society for Trenchless Technology

NEMA National Electrical Manufacturers Association

NSF “CSA Type Designation” for Neutral Supported Cable, Flame-Tested Polyvinyl Chloride (Ontario Electrical Safety Code, 27th Edition/2018)

NSSP Non-Standard Special Provisions

OPSD Ontario Provincial Standard Drawing

OPSS Ontario Provincial Standard Specification

P.S.I Pound per Square Inch

OTM Ontario Traffic Manual

PVC Polyvinyl Chloride

RSS Radio Standards Specification (Industry Canada, RSS-210, Issue 7, June 2007)

RWU “CSA Type Designation” for Thermoset Insulated Wires & Cables (Ontario Electrical Safety Code, 25th Edition/2012)

SDLC Synchronous Data Link Control

TWU “CSA Type Designation” for Thermoplastic Cable, Moisture-Resistant, Flame-Tested Thermoplastic (Ontario Electrical Safety Code, 25th Edition/2012)

USB Universal Serial Bus

V Volt

VDC Volts Direct Current

VAC Volts Alternating Current

W Watt

Qualifications

The Contractor and/or its representatives shall be licensed by the Electrical Contractor Registration Agency/Electrical Safety Authority, have a minimum of three (3) years of previous experience in the construction and maintenance of traffic control signal and street lighting systems and be acceptable to the Owner.

The Contractor's field representative shall be a qualified journeyperson electrician certified under the *Ontario College of Trades and Apprenticeship Act, 2009*, SO 2009, c 22, or a workman who is similarly qualified by training and experience and is otherwise acceptable to the Owner.

Codes, Rules and Regulations

All electrical work shall be performed in accordance with the twenty-seventh edition of the "Ontario Electrical Safety Code" consisting of CSA Standard C22.1-18, "Canadian Electrical Code Part 1" with specific amendments for Ontario and all appending bulletins issued by the Electrical Safety Authority of Ontario which are applicable to the work.

All electrical work shall be governed by all applicable federal, provincial and local laws and by-laws pertaining to the work, as well as the latest issue of CSA Standards pertinent to the work.

In the event of conflicting regulations, the strictest regulation shall apply.

If it becomes necessary to perform work within close limits of approach to energized hydro lines as defined by Section 188 of O. Reg 213/91 (Construction Projects) under the Ontario *Occupational Health and Safety Act*, the Contractor shall make the necessary arrangements with the appropriate hydro authority to obtain authorization to proceed with the work and ensure that qualified staff authorized by the hydro authority perform the work. Any costs associated with making such arrangements and having qualified staff authorized by the hydro authority perform the work shall be the responsibility of the Contractor.

Fees, Certificates and Inspections

The Contractor shall obtain permits for all electrical work and shall file applications for inspection with Alectra Utilities (the “**Local Hydro Authority**”) and the Electrical Safety Authority, as required. The Contractor shall pay all fees related to permits, applications and inspections required for the completion of the Work as outlined in the Contract.

Testing and Acceptance of Work

Factory finished equipment shall be protected so that the surface will not be damaged during construction. All damaged work shall be removed and replaced at no additional cost to the Owner. Minor damage to paint finishes may be retouched to the satisfaction of the Owner.

When all electrical work under the Contract has been completely tested and proven satisfactory, the protective covering of factory finished materials shall be removed and the equipment shall be thoroughly cleaned and kept clean so that the work is in good and proper working condition when acceptance is made. Luminaires and lamps shall be cleaned thoroughly prior to final inspection.

Discrepancies and Conflicts

Discrepancies and conflicts in the Contract Documents shall be brought to the attention of the Owner prior to commencing work on that portion of the Work. No additional payment will be made for the correction of errors made in this regard.

Coordination

The electrical work shall be coordinated with the other work required by different trades so as to minimize any disturbance, alteration or damage to adjacent and/or adjoining facilities.

Except as otherwise provided for in the Specifications, or as may be approved by the Owner, adjacent and/or adjoining facilities shall not be disturbed, altered or damaged in any way to permit the construction of the Work.

Where the Owner approves the disturbance, alteration or removal and subsequent replacement of an adjacent or adjoining structure or other facility not provided for in the Contract, all work and costs resulting from the disturbance, alteration and/or removal and subsequent replacement shall be at the Contractor's expense and no separate payment will be made for this work.

If it becomes necessary to perform work within 3 metres of primary hydro lines, the Contractor shall arrange for the appropriate hydro authority to be present while the work is being performed, to assist/advise on how to perform the work.

Adjustment of Equipment

All equipment shall be installed in a neat and orderly manner to the satisfaction of the Owner.

Minor adjustments to equipment, which in the opinion of the Owner are required to improve the appearance of the Site, shall be carried out at the Contractor's expense.

The Contractor shall also make minor adjustments, if so required, to any equipment that can be adjusted to provide optimum performance. All such adjustments shall be carried out to the satisfaction of the Owner at the Contractor's expense.

Materials

1. New Materials

Unless otherwise provided for in the Contract, all materials shall be new and of a uniform pattern throughout the Work. All materials, and components of custom equipment, shall be CSA approved, where applicable, and shall comply with the requirements of the Electrical Safety Authority with respect to their application.

Unless specified otherwise in the Contract Documents, materials for items covered by MTO specifications shall meet the requirements of the applicable MTO material specifications.

Materials not specified but which are indicated elsewhere in the Contract Documents as being required (including minor accessories such as connectors, fasteners, tape, etc. which are considered incidental to the Work) shall be standard construction grade materials supplied in accordance with CSA Standards to suit the application as required by recognized trade practice or supplied in accordance with the applicable MTO material specification.

2. Storage of Materials

The Contractor shall not store equipment (e.g. poles, etc.) at the Site if the installation of said equipment will not be completed within 10 Working Days from the date that the equipment is brought to the Site.

All materials shall be stored in accordance with the manufacturers' instructions in order to prevent any damage, soiling or finish spoilage.

New poles shall be stacked to prevent any bending or warping and shall be protected against any condition which may cause chipping or pitting of the finish.

Acceptance of Electrical Work

The electrical work is subject to the inspection and acceptance of the Local Hydro Authority and/or the Electrical Safety Authority.

Prior to declaring Total Performance of the Contract, the Owner shall inspect the electrical work. Once the work has been inspected and found to be completed in accordance with the requirements of the Contract Documents, the Owner will give notice in writing to the Contractor of Total Performance of the Contract.

Any defects in the electrical work arising from faulty installation, materials supplied by the Contractor, or workmanship discovered or occurring within twenty-four (24) months of Total Performance of the Contract, shall be repaired by the Owner and all costs will be billed to the Contractor or deducted from any monies owing to the Contractor.

Final Acceptance of the Work

The Contractor shall guarantee its work for twenty-four (24) months following the date of Total Performance of the Contract except when defects are discovered after Total Performance of the Contract, in which case it shall, in respect of those defects, guarantee the work for the balance of the warranty period or twelve months after the date upon which such defects are repaired, whichever is longer.

The Contractor shall notify the Owner in writing, requesting final acceptance of the Work, and the Owner shall confirm whether the Work has been completed in accordance with the Contract Documents. The Owner will subsequently give notice in writing to the Contractor of Total Performance of the Contract.

Testing

Tests on electrical wiring and material shall, unless specified otherwise in the Contract Documents, conform to the requirements of the Canadian Electrical Code Part 1 and shall include insulation value readings and resistance to ground readings.

Testing shall be performed by qualified personnel only and in the presence of the Owner or the Electrical Safety Authority inspectors.

The Contractor shall provide all necessary instruments, equipment and personnel required to satisfactorily carry out the prescribed tests at its own expense.

The following tests shall be performed if requested by the Owner:

1. All conduits and duct systems shall be proven to be free of stones, dirt, water and other debris by pulling a test mandrel, 1/4 inch (6.4 mm) smaller in diameter than the nominal conduit or duct size and 12 inches (300 mm) in length, through each individual conduit or duct.
2. All circuits shall be proven to be continuous and free of short circuits and ground faults.
3. All circuits shall be proven to be free of unspecified grounds and the resistance to ground of all circuits shall be no less than fifty (50) megohms.
4. All circuits shall be proven to be operable. Each control and switching device shall be operated no less than ten times and each circuit for no less than eight (8) hours.
5. The resistance to ground for all grounded equipment shall be proven to not exceed twenty-five (25) ohms.

In addition to the above tests, the Contractor shall, when requested by the Owner, perform any tests called for where the performance of the electrical system indicates a deficiency.

The Owner shall provide for tests on materials other than electrical materials as described elsewhere in the Contract Documents.

Where any tests indicate faulty workmanship or unacceptable electrical measurements/ readings, the Contractor shall repair or replace the faulty equipment at its own expense, and to the satisfaction of the Owner.

Coordination of Traffic Control Signal Installations

The Contractor shall notify the Owner a minimum of two (2) Working Days prior to commencing any operations on the Site.

If existing vehicle loop detectors are to be abandoned as noted on the Drawings, the Contractor shall contact the Owner a minimum of one (1) week in advance of commencing any work that will render the existing vehicle loop detectors inoperative.

The Contractor shall also contact the Owner to arrange for a final inspection prior to energizing the traffic control signals and illumination installations. **All construction deficiencies shall be completed prior to scheduling the activation of the traffic control signal turn on.**

The Contractor shall assist the Owner with the final inspection of the electrical and traffic components of the Work.

The installation of temporary and permanent traffic control signals and all removals shall be coordinated with the road reconstruction work.

The Contractor shall ensure that the traffic signal controller and accessory equipment is properly and adequately tested prior to installation so that the traffic signals can be put into proper operation with a minimum of field testing.

The Contractor shall adjust and/or relocate, as applicable, temporary traffic signal heads, pedestrian signal heads and detection zones to accommodate all construction stages, and all work required to do so shall be deemed to be included under Item G1 – Maintenance of Traffic.

The intersections shall continue to operate fully with existing, temporary or permanent traffic control signals.

Should any testing in the field become necessary where a display on the exposed signal heads is required, a member of the Owner’s Public Works Department, Capital Delivery – Transportation Branch, Electrical and Traffic Section and a paid duty police officer must be present while the testing occurs.

The Contractor shall minimize the amount of downtime for the switchover of the signal systems. The Contractor shall arrange for a paid duty police officer and a member of the Owner’s Public Works Department, Capital Delivery – Transportation Branch, Electrical and Traffic Section to be present at the Site during all switchovers. [Delete the following sentence if the contract contains a cash allowance for paid duty police] All payments for the paid duty police officer shall be the responsibility of the Contractor.

Electrical Specifications – Items

Item E101 Supply and Install Rigid PVC Conduit by Open Cut (All Sizes)

*This Specification shall be read in conjunction with OPSS.MUNI 1010 (Nov 2013).*

*The following Standard Drawing is applicable to this item: E-3.25.*

The Contractor shall supply and install rigid PVC conduit by open cut in the location(s) shown on the Drawings and directed by the Owner. The rigid PVC conduit shall conform to the requirements of CSA C22.2, No. 211.2. The 25 mm and 38 mm conduit shall be installed in accordance with Standard Drawing E-3.25.

The wall thickness of the conduit shall be as follows:

* 3.4 mm (0.133 inches) for 25 mm conduit
* 3.7 mm (0.145 inches) for 38 mm conduit
* 3.9 mm (0.154 inches) for 50 mm conduit
* 5.5 mm (0.216 inches) for 75 mm conduit
* 6.0 mm (0.237 inches) for 100 mm conduit

The Contractor shall excavate the trench, supply and install rigid PVC conduit in the trench, backfill the trench and compact the backfill in the trench.

The conduit shall be installed 600 mm below the final grade. The Contractor shall adjust the depth of the conduit where the proposed conduit conflicts with the sub drain. The excavation and conduit shall be kept free of water at all times.

Material removed as a result of tunnelling under the existing concrete sidewalks, asphalt spillways and curb and gutter shall be replaced by tamping intermittently to ensure proper compaction to 100% maximum dry density with no cavities.

Backfill shall conform to the requirements of OPSS.MUNI 1010 for Granular ‘A’ and Granular ‘B’ Type 1 and shall be compacted to 100% maximum dry density. Granular ‘B’ Type 1 backfill shall be used up to the elevation where Granular ‘A’ is shown on typical sections on the Drawings. Earth backfill shall be compacted to 95% maximum dry density.

Unshrinkable fill shall be used as backfill in place of granular material. When a trencher equipped with a rock wheel is used, the crossing must be backfilled with unshrinkable fill. The unshrinkable fill shall be 0.70 MPa (K-crete) to at least 1.0 metre beyond the existing edge of pavement and/or curb.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL-3 asphalt. Cold patch asphalt may be used for minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

Couplings, as manufactured by the manufacturer of the conduit supplied, shall be used to join the sections of rigid conduit and shall be installed to provide a tight fit in accordance with the manufacturer’s recommended practice for joining conduit. The Contractor shall ensure that couplings are not split or damaged in any way which would allow the seepage of water and/or foreign material into the conduit.

All connections between pole bases and adjacent concrete handwells shall be made with 75 mm diameter rigid PVC conduit unless otherwise noted on the Drawings.

Conduit entering a handwell shall be connected to an equivalent sized conduit sleeve in the handwell. Under no circumstances shall the Contractor install a smaller diameter conduit through the inside of a larger diameter conduit sleeve.

If the Contractor is required to break into a handwell, the Contractor shall grout around the conduit sleeve on the inside and outside of the handwell to the satisfaction of the Owner. The Contractor shall be responsible for any damage done to the handwell.

The Contractor shall install a 400 N test nylon fish line in all conduit, both when it is left empty for future use or has wiring installed in it, and shall leave 1.5 m of line coiled in the bottom of the handwell at the end of each conduit run.

The Contractor shall install a 150 mm wide, red plastic “CAUTION” tape, buried 300 mm above the conduit, for the full length of the conduit.

The extension of any existing under pavement crossings as indicated on the Drawings shall be done at the applicable unit price for the size of conduit used.

Upon completion of the conduit crossing, the Contractor shall obtain approval of satisfactory completion from the Owner. In the presence of the Owner, the conduit shall be proven to be free of stones, dirt, water and other debris by pulling a test mandrel, which is 300 mm in length by 6.4 mm smaller in diameter than the nominal conduit size, through the conduit crossing.

Measurement for Payment

Measurement for payment shall be per metre (m) along the centerline of conduit supplied and installed, measured from centre to centre of handwells and/or pole bases.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E102 Supply and Install 100 mm Diameter Coilable High Density Polyethylene Conduit by Directional Bore

*This Specification shall be read in conjunction with OPSS.MUNI 450 (Nov 2021) and OPSS.MUNI 1010 (Nov 2013).*

All directional drilling within Regional right of ways shall conform to the requirements of OPSS.MUNI 450 and NASTT Horizontal Directional Drilling Good Practices Guidelines 2017 (4th Edition).

The Contractor shall supply and install 100 mm diameter coilable high density polyethylene conduit by directional bore in the location(s) shown on the Drawings and directed by the Owner. The coilable high density polyethylene conduit shall be RED with a configuration of smooth/smooth and a wall thickness of 8.46 mm (0.333 inches). The composition shall be Grade P34, Type III, Class B or C, Category 5, ASTM 1248(89)2513.

Road crossings shall be carried out using a directional bore machine that removes material to make room for the conduit. The Owner will not allow the use of a machine that displaces material rather than remove it.

The Contractor shall perform its own Site investigation and make the results available to the Owner upon request, and complete drill log sheets and provide copies to the Owner upon request.

Conduit shall be installed 1000 mm below the final grade.

Polyethylene conduit shall be continuous with no joints.

Bore pits shall be backfilled in accordance with the requirements of OPSS.MUNI 1010 for Granular ‘A’ and Granular ‘B’ Type 1 and shall be compacted to 100% maximum dry density. Granular ‘B’ Type 1 backfill shall be used up to the elevation where Granular ‘A’ is shown on typical sections on the Drawings. Granular ‘A’ shall be used as trench backfill beyond the elevation where Granular ‘A’ is shown on typical sections on the Drawings. Earth backfill shall be compacted to 95% maximum dry density.

If the diameter of the bore is greater than the diameter of the duct, the resulting void shall be grouted. All false bore tunnels shall be grouted.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall install a 400 N test nylon fish line in all conduit, both when it is left empty for future use or has wiring installed in it, and shall leave 1.5 m of line coiled in the bottom of the handwell at the end of each conduit run.

Measurement for Payment

Measurement for payment shall be per metre (m) along the centreline of conduit placed, measured from centre to centre of handwells and/or pole bases.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E103 Extend Existing Concrete Encased Duct Bank by Open Cut

*This Specification shall be read in conjunction with OPSS.MUNI 1010 (Nov 2013).*

*The following Standard Drawings are applicable to this item: OPSD 2100.060 (Nov 2015) and OPSD 2101.020 (Nov 2013).*

The Contractor shall extend the existing concrete encased duct bank as shown on the Drawings.

The extension shall be [enter number of layers] layer(s) of concrete encased [enter description of ducts] ducts installed in accordance with OPSD 2100.060 and OPSD 2101.020.

The Contractor shall excavate the trench and construct a concrete encased duct bank in the trench, backfill the trench and compact the backfill in the trench.

The conduit shall be installed 600 mm below the final grade. The Contractor shall adjust the depth of the conduit where the proposed conduit conflicts with the sub drain. The excavation and conduit shall be kept free of water at all times.

Material removed as a result of tunnelling under the existing concrete sidewalks, asphalt spillways and curb and gutter shall be replaced by tamping intermittently to ensure proper compaction to 100% maximum dry density with no cavities.

Backfill shall conform to the requirements of OPSS.MUNI 1010 for Granular ‘A’ and Granular ‘B’ Type 1 and shall be compacted to 100% maximum dry density. Granular ‘B’ Type 1 backfill shall be used up to the elevation where Granular ‘A’ is shown on typical sections on the Drawings. Earth backfill shall be compacted to 95% maximum dry density.

Unshrinkable fill shall be used as backfill in place of granular material. When a trencher equipped with a rock wheel is used, the crossing must be backfilled with unshrinkable fill. The unshrinkable fill shall be 0.70 MPa (K-crete) to at least 1.0 metre beyond the existing edge of pavement and/or curb.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

Measurement for Payment

Measurement for payment shall be per metre (m) measured along the centreline of the extended concrete encased duct bank.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E104 Supply and Install Rigid PVC Conduit for Mounting on Wood/Concrete Pole

*The following Standard Drawings are applicable to this item: E-3.03, E-3.04 (for aerial installation), E-3.05 (for buried installation) and E-3.10.*

The Contractor shall supply and install 19 mm, 25 mm, 38 mm and 50 mm diameter, rigid PVC conduit in the location(s) shown on the Drawings. The rigid PVC conduit shall conform to the requirements of CSA C-22.2, No. 211.2.

The wall thickness of the conduit shall be as follows:

* 3.2 mm (0.126 inches) for 19 mm conduit
* 3.4 mm (0.133 inches) for 25 mm conduit
* 3.7 mm (0.145 inches) for 38 mm conduit
* 3.9 mm (0.154 inches) for 50 mm conduit

The Contractor shall also supply and install couplings, PVC coated pipe straps, junction boxes, weatherheads, LB fittings and "O" ring expansion couplings and hardware.

The conduit and accessory equipment shall be installed in accordance with Standard Drawing E-3.03, E-3.04 (for aerial installations), E-3.05 (for buried installations) and E-3.10 to service the traffic signal head, pedestrian signal head, pushbutton and pole mounted controller as required.

Couplings, as manufactured by the manufacturer of the conduit supplied, shall be used to join the sections of rigid conduit and shall be installed to provide a tight fit in accordance with the manufacturer's recommended practice for joining conduit. The Contractor shall ensure that couplings are not split or damaged in any way which would allow the seepage of water and/or foreign material into the conduit.

PVC coated pipe straps shall be used to secure the conduit onto wood poles. The pipe straps shall be placed at intervals as specified by ESA Rule 12-1114, based on the conduit size.

Stainless steel banding shall be used to secure the conduit onto concrete poles. The banding shall be placed at intervals as specified by ESA Rule 12-1114, based on conduit size.

Measurement for Payment

Measurement for payment shall be a count of each pole upon which rigid PVC conduit is installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E105 Supply and Install Concrete Handwell (All Sizes)

*The following Standard Drawings are applicable to this item: E-1.01 (300 mm diameter handwells), E-1.02 (300 mm diameter handwells), E-1.03 (450 mm diameter handwells) and E-2.20.*

The Contractor shall supply and install a concrete handwell in the location(s) shown on the Drawings or directed by the Owner on Site.

300 mm concrete handwells shall be constructed in accordance with Standard Drawings E-1.01 and E-1.02.

450 mm concrete handwells shall be constructed in accordance with Standard Drawing E-1.03.

Handwells shall not be installed until after the proposed curb and gutter has been placed.

The Contractor shall supply and install expansion joint on the outside of an isolated concrete handwell in a concrete surface in accordance with Standard Drawing E-2.20.

The Contractor shall remove all sono-tube and debris from the inside of the handwell prior to final inspection by the Owner.

Handwell covers shall:

* be a cast iron frame and cover conforming to the requirements of ANSI/ASTM Standard A48-1990, Grey Iron Casting Class Number 30C;
* have a keyway slot designed to assist in removing the cover;
* be uniform throughout the Contract and indicate the year of installation; and
* be securely bolted down when work at the handwell is complete and the Contractor is leaving the Site.

An anti-seize compound shall be applied to all bolts used to fasten the handwell cover to the handwell frame.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL-3 asphalt. Cold patch may be used for temporary minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

Measurement for Payment

Measurement for payment shall be a count of each concrete handwell constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E106 Supply and Install 675 mm Diameter Precast Concrete Handwell

*The following Standard Drawings are applicable to this item: OPSD 401.010 (Nov 2018), E-1.04 and E-2.20.*

The Contractor shall supply and install a 675 mm diameter precast concrete handwell in the location(s) shown on the Drawings.

Handwells shall be constructed in accordance with Standard Drawing E-1.04.

Handwells shall not be installed until after the proposed curb and gutter has been placed.

The Contractor shall supply and install expansion joint on the outside of an isolated concrete handwell in a concrete surface in accordance with Standard Drawing E-2.20.

Handwell covers shall:

* be in accordance with OPSD 401.010;
* have a minimum of two (2) square lifting holes to assist in removing the cover;
* be uniform throughout the Contract and indicate the year of installation; and
* be securely installed when work at the handwell is complete and the Contractor is leaving the Site.

An anti-seize compound shall be applied to all bolts used to fasten the handwell cover to the handwell frame.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL3 asphalt. Cold patch asphalt may be used for temporary minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

Measurement for Payment

Measurement for payment shall be a count of each handwell supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E107 Adjust Existing 450 mm Diameter Concrete Handwell

*The following Standard Drawings are applicable to this item: E-1.03 and E-2.20.*

The Contractor shall break down the existing handwell and remove the frame and cover in the location(s) shown on the Drawings.

Handwells shall be adjusted in accordance with Standard Drawing E-1.03 and E-2.20.

Four (4) holes, equally spaced, shall be drilled 75 mm deep into the concrete and No. 6 rebar, 150 mm long, shall be placed in each of the holes. The handwell shall be adjusted with 28-day compressive strength concrete of minimum 32 MPa and the frame and cover reinstalled to the adjacent finished grade.

The Contractor shall supply and install expansion joint on the outside of an isolated concrete handwell in a concrete surface in accordance with Standard Drawing E-2.20.

The Contractor shall remove all sono tube and debris from the inside of the handwell prior to final inspection by the Owner.

The handwell cover shall:

* be a cast iron frame and cover conforming to the requirements of ANSI/ASTM Standard A48-1990, Grey Iron Casting Class Number 30C;
* have a keyway slot designed to assist in removing the cover;
* be uniform throughout the Contract and indicate the year of installation; and
* be securely bolted down when work at the handwell is complete and the Contractor is leaving the Site.

An anti-seize compound shall be applied to all bolts used to fasten the handwell cover to the handwell frame.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL3 asphalt. Cold patch asphalt may be used for temporary minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

Measurement for Payment

Measurement for payment shall be a count of each concrete handwell adjusted.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E108 Break into Existing Conduit and Supply and Install 450 mm Diameter Concrete Handwell

*The following Standard Drawings are applicable to this item: E-1.03 and E-2.20.*

The Contractor shall:

* break into the existing conduit;
* supply and install a 450 mm diameter concrete handwell;
* pull back and reinstall any existing wiring in the conduit; and
* reinstall luminaire wiring and ground wire within the same Working Day to ensure there is no down time for the existing illumination

in the location(s) shown on the Drawings or directed by the Owner on Site. The method of breaking into the existing conduit shall be saw cut.

The handwell shall be constructed in accordance with Standard Drawing E-1.03. Water shall be pumped out and crushed stone shall be placed prior to the installation of a sono-tube.

The handwell shall be constructed in conjunction with the construction of the median island or following the construction of the curb and gutter.

The Contractor shall supply and install expansion joint on the outside of an isolated concrete handwell in a concrete surface in accordance with Standard Drawing E-2.20.

Handwell covers shall:

* be securely bolted down when work at the handwell has been completed and the Contractor is leaving the Site;
* have a keyway slot designed to assist in the removing the cover; and
* be uniform throughout the Contract and indicate the year of installation.

The Contractor shall remove all sono-tube and debris from the inside of the handwell prior to final inspection by the Owner.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL3 asphalt. Cold patch asphalt may be used for temporary minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

An anti-seize compound shall be applied to all bolts used to fasten the handwell cover to the handwell frame.

Measurement for Payment

Measurement for payment shall be a count of each concrete handwell constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E109 Relocate Electrical Maintenance Hole

*The following Standard Drawings are applicable to this item: OPSD 2117.010 (Apr 2019) and E-2.20.*

The Contractor shall relocate the existing electrical maintenance hole in the location(s) shown on the Drawings.

The void left from the removal of the existing electrical maintenance hole shall be filled with U-fill material.

The installation of the electrical maintenance hole in its new location shall be in accordance with OPSD 2117.010.

The Contractor shall supply and install expansion joint on the outside of an isolated concrete electrical maintenance hole in a concrete surface in accordance with Standard Drawing E-2.20.

Measurement for Payment

Measurement for payment shall be a count of each electrical maintenance hole relocated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E110 Adjust Existing Electrical Maintenance Hole

*This Specification shall be read in conjunction with OPSS.MUNI 408 (Nov 2021).*

*The following Standard Drawing is applicable to this item: E-2.20.*

The Contractor shall adjust the existing electrical maintenance hole in accordance with OPSS.MUNI 408.05.07 in the location(s) shown on the Drawings.

Only interlocking precast concrete adjustment units shall be used to adjust the maintenance hole.

**408.07.06** **Excavating, Backfilling, and Compacting** is amended by the addition of the following:

Compaction of granular backfill material shall be 100% of the maximum dry density.

**408.07.08** **Adjusting** is amended by:

* deleting the reference to “brickwork” in the first sentence; and
* adding the following:

The Contractor shall restore the adjacent area as soon as practical after the electrical maintenance hole is adjusted. This restoration includes removing and replacing existing asphalt as required.

The Contractor shall supply and install expansion joint around the outside of an isolated electrical maintenance hole in a concrete surface in accordance with Standard Drawing E-2.20.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL3 asphalt. Cold patch asphalt may be used for temporary minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

Measurement for Payment

Measurement for payment shall be a count of each electrical maintenance hole adjusted.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E111 Breakdown and Abandon Existing MTO Maintenance Hole

The Contractor shall breakdown and abandon the existing MTO maintenance hole in the location(s) shown on the Drawings.

For maintenance holes in median islands/roadway, the Contractor shall breakdown/grind to 300 mm below sub-base and backfill with unshrinkable fill.

For maintenance holes outside of the roadway, the Contractor shall breakdown/grind to 600 mm below grade and backfill with Owner-approved materials.

The Contractor shall seal all open duct entry points prior to backfilling.

All materials removed under this item shall be disposed of at a disposal site approved by the Owner, outside the limits of the Contract.

Measurement for Payment

Measurement for payment shall be a count of each MTO maintenance hole broken down and abandoned.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E201 Construct Concrete Pole Base with Anchorage Assembly (All Sizes)

*The following Standard Drawings are applicable to this item: E-2.13 (300 mm diameter pole bases), E-2.17 (600 mm and 762 mm diameter pole bases), E-2.18 (600 mm and 762 mm diameter pole bases), E-2.20 and E-3.36 (300 mm diameter pole bases).*

The Contractor shall construct a concrete pole base with anchorage assembly in the location(s) shown on the Drawings.

300 mm concrete pole bases with anchorage assemblies shall be constructed in accordance with Standard Drawings E-2.13 and E-3.36.

600 mm and 762 mm concrete pole bases with anchorage assemblies shall be constructed in accordance with Standard Drawings E-2.17 and E-2.18.

The Contractor shall supply and install expansion joint on the outside of an isolated concrete pole base in a concrete surface in accordance with Standard Drawing E-2.20.

Pole bases shall not be constructed until after the proposed curb and gutter has been placed.

Pole bases shall augered, hydro-vaced or hand dug as may be required by the location of underground utilities and as determined by utility stakeouts.

All concrete footings shall be vibrated during the concrete pour and cured using methods appropriate for the weather conditions.

Where a proposed pole base is constructed in an existing cut-out, the Contractor shall remove the cut-out form and restore the unfinished area with cold mix asphalt, properly compacted.

The Contractor shall verify the bolt spacing with the pole manufacturer prior to constructing the base.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

The Contractor shall restore all asphalt boulevards and median islands using 50 mm of HL3 asphalt. Cold patch asphalt may be used for temporary minor restorations with the prior approval of the Owner. All hard surfaces shall be restored to their original, pre-construction condition or better.

Measurement for Payment

Measurement for payment shall be a count of each concrete pole base with anchorage assembly constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E202 Supply and Install Frangible Base

*The following Standard Drawing is applicable to this item: E-2.16.*

The Contractor shall supply and install a grooved coupler type frangible base in the location(s) shown on the Drawings. The frangible pole base shall be installed directly on top of the concrete pole base and levelled with galvanized steel shims in accordance with Standard Drawing E-2.16. Double nutting will not be allowed.

The Contractor shall verify the bolt circle requirements with the pole manufacturer prior to installing the frangible base.

Measurement for Payment

Measurement for payment shall be a count of each frangible base supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E203 Construct Cut-Out for Future Traffic Signal Pole in Median Island

*The following Standard Drawing is applicable to this item: E-6.02 (for asphalt infill islands), E-6.04 (for concrete slab medians) and E-6.06 (for concrete slab medians wider than 1.5 m).*

The Contractor shall construct a cut-out for a future traffic signal pole in the median island in the location(s) shown on the Drawings and in accordance with Standard Drawing E-6.02 (for asphalt infill islands), E-6.04 (for concrete slab medians) or E-6.06 (for concrete slab medians wider than 1.5 m).

Measurement for Payment

Measurement for payment shall be a count of each cut-out constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E204 Supply and Install 1.5 Metre Pedestrian Pushbutton Pole

*This Specification shall be read in conjunction with OPSS.MUNI 2423 (April 2022).*

*The following Standard Drawings are applicable to this item: E-2.13, E-3.06 and E-3.36.*

The Contractor shall supply and install a 1.5 metre pedestrian pushbutton pole in the location(s) shown on the Drawings and in accordance with Standard Drawings E-2.13, E-3.06 and E-3.36.

The pole shall be an octagonal, hot dipped galvanized steel, standard duty pole and shall be supplied complete with a pole cap and base plate.

Octagonal steel poles shall meet the requirements of OPSS.MUNI 2423.

The Contractor shall verify the bolt circle requirements with the pole manufacturer prior to constructing the concrete pole base.

The Contractor shall install the pole directly on top of the concrete pole base and level it with galvanized steel shims. Double nutting of a pole will not be allowed.

The Contractor shall position the pole so that the pole handhole is facing away from the intersection.

Measurement for Payment

Measurement for payment shall be a count of each pole supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E205 Supply and Install Octagonal Steel Pole

*This Specification shall be read in conjunction with OPSS.MUNI 2423 (April 2022).*

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18 and E-3.06.*

The Contractor shall supply and install an octagonal steel pole in the location(s) shown on the Drawings and in accordance with Standard Drawings E-2.17, E-2.18 and E-3.06.

The pole shall be octagonal, hot dipped galvanized steel, and shall be supplied complete with a pole cap and base plate.

Octagonal steel poles shall meet the requirements of OPSS.MUNI 2423.

All octagonal steel poles shall be standard duty poles except for the following:

* 6.1 m octagonal steel poles with a mast arm length greater than 3.0m shall be heavy duty poles; and
* 7.3 m octagonal steel poles shall be heavy duty poles.

The Contractor shall verify the bolt circle requirements with the pole manufacturer prior to constructing the concrete pole base.

The Contractor shall install the pole directly on top of the concrete pole base and level it with galvanized steel shims. Double nutting of a pole will not be allowed.

The Contractor shall position the pole so that the pole handhole is facing away from the intersection.

Measurement for Payment

Measurement for payment shall be a count of each pole supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E206 Supply and Install Sectional Steel Pole

*This Specification shall be read in conjunction with OPSS.MUNI 2422 (Nov 2022).*

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18 and E-3.06.*

The Contractor shall supply and install a sectional steel pole in the location(s) shown on the Drawings and in accordance with Standard Drawings E-2.17, E-2.18 and E-3.06.

The pole shall be sectional hot dipped galvanized steel and shall be supplied complete with a pole cap and base plate.

Sectional steel poles shall meet the requirements of OPSS.MUNI 2422.

The Contractor shall verify the bolt circle requirements with the pole manufacturer prior to constructing the concrete pole base.

The Contractor shall install three (3) self-tapping screws or impact inserted pins, equally spaced, in the overlap of all sections of the pole.

The Contractor shall install the pole directly on top of the concrete pole base and level it with galvanized steel shims. Double nutting of a pole will not be allowed.

The Contractor shall position the pole so that the pole handhole is facing away from the intersection.

Measurement for Payment

Measurement for payment shall be a count of each pole supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E207 Supply and Install Wood Traffic Signal Pole

*The following Standard Drawings are applicable to this item: E-2.20 and E-3.01.*

The Contractor shall supply and install a wood traffic signal pole in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.01.

Pole length(s) are shown on the Drawings.

Poles shall be set in the soil to a depth in accordance with the Ontario Electrical Safety Code, Table 104.

Poles shall be Western Red Cedar, Class 3, with preservative butt treatment conforming to CSA 015.2-1969 and CSA 080-1974 or equivalent pressure treated pine. A used pole, in good condition, is acceptable subject to the prior approval of the Owner.

The Contractor shall supply and place cold patch on the outside of an isolated wood pole in a concrete surface in accordance with Standard Drawing E-2.20. The depth of the cold patch shall be the same depth as the adjacent concrete surface.

Measurement for Payment

Measurement for payment shall be a count of each pole supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E208 Install Wood Traffic Signal Pole

*The following Standard Drawings are applicable to this item: E-2.20 and E-3.01.*

The Contractor shall install a wood traffic signal pole in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.01.

Pole length(s) are shown on the Drawings.

Poles shall be set in the soil to a depth in accordance with the Ontario Electrical Safety Code, Table 104.

The Contractor shall supply and place cold patch on the outside of an isolated wood pole in a concrete surface in accordance with Standard Drawing E-2.20. The depth of the cold patch shall be the same depth as the adjacent concrete surface.

Measurement for Payment

Measurement for payment shall be a count of each pole installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E209 Supply and Install Temporary Traffic Signal Stand

*The following Standard Drawing is applicable to this item: E-3.32.*

The Contractor shall supply and install a temporary traffic signal stand in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.32.

Measurement for Payment

Measurement for payment shall be a count of each temporary traffic signal stand supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E210 Relocate Existing Steel Pole Complete with All Existing Equipment

*The following Standard Drawing is applicable to this item: E-3.06.*

The Contractor shall relocate the existing steel pole, complete with all existing equipment, onto a concrete pole base in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.06.

Measurement for Payment

Measurement for payment shall be a count of each pole relocated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E301 Supply and Install Aluminum Traffic Signal Mast Arm

*This Specification shall be read in conjunction with OPSS.MUNI 2460 (Nov 2018).*

*The following Standard Drawings are applicable to this item: E-3.04 (Wood Pole Aerial Installation), E-3.04A (Concrete Pole Aerial Installation), E-3.05 (Wood Pole Buried Installation), E-3.05A (Concrete Pole Buried Installation), E-3.06 (Steel Poles) and E-3.12.*

The Contractor shall supply and install a tapered aluminum single member arm in accordance with OPSS.MUNI 2460, complete with all attachments and fittings for mounting on a pole.

Mast arms shall be mounted on pole(s) in the location(s) shown on the Drawings and in accordance with the following Standard Drawings:

* E-3.04 (Wood Pole Aerial Installation)
* E-3.04A (Concrete Pole Aerial Installation)
* E-3.05 (Wood Pole Buried Installation)
* E-3.05A (Concrete Pole Buried Installation)
* E-3.06 (Steel Poles)
* E-3.12 (All Poles/Installations)

Mast arm length(s) are shown on the Drawings.

Measurement for Payment

Measurement for payment shall be a count of each mast arm supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified

Item E302 Supply and Install Vertical Brackets

*The following Standard Drawings are applicable to this item: E-3.06, E-3.13 and E-3.14.*

The Contractor shall supply and install aluminum one-way vertical brackets with
500 mm aluminum extensions in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.06, E-3.13 and E-3.14.

The extensions shall be 38 mm diameter, rigid, Schedule 40 aluminum conduit.

The brackets shall be used to mount a traffic signal head and/or a pedestrian head in the location(s) shown on the Drawings.

Measurement for Payment

Measurement for payment shall be a count of each set of vertical brackets supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified

Item E303 Supply and Install Yellow/Grey Backed LED Traffic Signal Head Reflectorized (All Types)

*The following Standard Drawings are applicable to this item: E-3.06, E-3.13, E-3.14 and E-3.15.*

The Contractor shall supply and install a yellow/grey backed, polycarbonate, LED traffic signal head with a reflectorized backboard and cowl visors in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.06, E-3.13, E-3.14 and E-3.15. The Contractor shall also supply and install riser wire, as required.

LED signal displays shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent. All modules shall be ITE compliant and labelled as such. The top entry hub shall be plugged with the device made for this purpose complete with a gasket. The bottom entry hub shall be plugged with the device made for this purpose but omitting the gasket.

The diameter of the LED lenses shall be as follows:

|  |  |
| --- | --- |
| **Traffic Signal Head Type** | **Lens Diameter (in mm)** |
| **Red** | **Amber** | **Green** | **Left Turn Signal Arrow** |
| Highway | 300 | 200 | 200 | n/a |
| Highway (all 300 mm lenses) | 300 | 300 | 300 | n/a |
| Special No. 2 | 300 | 300 | n/a | 300 |
| Special No. 9 | 300 | 200 | 200 | 300 green/amber |
| Special No. 9A (all 300 mm lenses) | 300 | 300 | 300 | 300 green/amber |
| Special No. 10 | 300 | 200 | 200 | 300 green |
| Special No. 10A | 300 | 300 | 300 | 300 green |

Traffic signal heads shall be Federal Standard 595a, colour chip 13538 yellow and ASA-70 grey.

Reflectorized backboards shall be yellow/grey backed, polycarbonate vehicle signal head backboards.

Federal Standard 595a, colour chip 13538 yellow and ASA-70 grey backboards shall be flexible poly and shall be provided with a knock-out to allow for installation with a plumbizer.

75 mm reflective sheeting shall be applied to the backboard along the perimeter of the front of the backboard in accordance with the manufacturer’s recommendations. The 75 mm reflective sheeting shall be 3M, Diamond Grade, DG3 Reflective Sheeting, Series 4000, Product Code 4081 (fluorescent yellow), or Equivalent.

Traffic signal heads with single point mounting (i.e. cushion hanger or plumbizer) must have stainless steel reinforcement plates. The Contractor shall contact the Owner and arrange for an inspection of the plates prior to installing the head.

Cushion hanger mounting reinforcement shall be on the inside and outside of the red section.

Plumbizer mounting reinforcement shall be in accordance with the manufacturer’s specifications (i.e. inside and outside of the amber section or outside of the red and amber sections). A spacer shall be provided to hide the plumbizer and prevent background lighting. The Contractor shall use the appropriate backboard when the traffic signal head is mounted using a plumbizer.

Temporary traffic signal heads shall be mounted using traffic signal head suspension clamps.

A non-operational traffic signal head mounted with a plumbizer shall be rotated so that the head is parallel to the pavement with the front of the signal head facing down.

A non-operational traffic signal head mounted on a median pole with vertical brackets shall be securely covered and turned to the left of approaching traffic.

A non-operational pedestrian head mounted with vertical brackets shall be securely covered and turned to face the pole on which it is mounted.

All heads that are not operational shall be covered with “Traffic Jackets” as distributed by Sentinel Pole & Traffic Equipment Ltd., or Equivalent.

Measurement for Payment

Measurement for payment shall be a count of each traffic signal head supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price(s) for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E304 Supply and Install Black Standard Type LED Traffic Signal Head

*The following Standard Drawings are applicable to this item: E-3.06, E-3.13, E-3.14 and E-3.15.*

The Contractor shall supply and install a black, polycarbonate, standard type, LED traffic signal head, with tunnel visors and 200 mm diameter red, amber and green LED signal lamps but without the backboard in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.06, E-3.13, E-3.14 and E-3.15. The Contractor shall also supply and install riser wire, as required.

LED signal displays shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent. All modules shall be ITE compliant and labelled as such. The top entry hub shall be plugged with the device made for this purpose complete with a gasket. The bottom entry hub shall be plugged with the device made for this purpose but omitting the gasket.

The traffic signal head and housing shall be black.

Traffic signal heads with single point mounting (i.e. cushion hanger or plumbizer) must have stainless steel reinforcement plates. The Contractor shall contact the Owner and arrange for an inspection of the plates prior to installing the head.

Cushion hanger mounting reinforcement shall be on the inside and outside of the red section.

Plumbizer mounting reinforcement shall be in accordance with the manufacturer’s specifications (i.e. inside and outside of the amber section or outside of the red and amber sections). A spacer shall be provided to hide the plumbizer, and prevent background lighting.

Temporary traffic signal heads shall be mounted using traffic signal head suspension clamps.

A non-operational traffic signal head mounted with a plumbizer shall be rotated so that the head is parallel to the pavement with the front of the signal head facing down.

A non-operational traffic signal head mounted on a median pole with vertical brackets shall be securely covered and turned to the left of approaching traffic.

A non-operational pedestrian head mounted with vertical brackets shall be securely covered and turned to face the pole on which it is mounted.

All heads that are not operational shall be covered with “Traffic Jackets” as distributed by Sentinel Pole & Traffic Equipment Ltd., or Equivalent.

Measurement for Payment

Measurement for payment shall be a count of each traffic signal head supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified

Item E305 Supply and Install Traffic Signal Head Suspension Clamps (Top and Bottom)

*The following Standard Drawings are applicable to this item: E-3.01 and E-3.14.*

The Contractor shall supply and install suspension clamps for mounting a traffic signal head to aerial suspension and stabilizing cables in the location(s) shown on the Drawings.

Suspension clamps shall be installed in accordance with Standard Drawings E-3.01 and E-3.14.

Measurement for Payment

Measurement for payment shall be a count of each set of suspension clamps supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified

Item E306 Supply and Install Two-Way Plumbizer Mast Arm Bracket

*The following Standard Drawing is applicable to this item: E-3.39.*

The Contractor shall supply and install a two-way plumbizer mast arm bracket in the location(s) shown on the Drawings.

Two-way mast arm brackets shall be Sentinel Pole and Traffic Equipment Ltd., Catalogue No. STE 4022, or Equivalent.

Two-way plumbizer mast arm brackets shall be installed in accordance with Standard Drawing E-3.39.

Measurement for Payment

Measurement for payment shall be a count of each two-way plumbizer mast arm bracket supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E307 Supply and Install Universal Bracket

*The following Standard Drawing is applicable to this item: E-3.33.*

The Contractor shall supply and install a universal bracket, including the appropriate clamp mount kit, to mount a traffic signal head on a mast arm in the location(s) shown on the Drawings.

Brackets and clamp mount kits shall be Sentinel Traffic VSB-C-xx, or Equivalent.

Pipe length is dependent on size of signal head.

Universal brackets shall be installed in accordance with the manufacturer’s specifications and Standard Drawing E-3.33.

Measurement for Payment

Measurement for payment shall be a count of each universal bracket supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E308 Supply and Install Adjustable Plumbizer

*The following Standard Drawings are applicable to this item: E-3.14 and E-3.15.*

The Contractor shall supply and install an adjustable plumbizer to mount a traffic signal head in the location(s) shown on the Drawings.

Adjustable plumbizers shall be Sentinel Pole and Traffic Equipment Inc., Catalogue No. AP42830, or Equivalent.

Adjustable plumbizers shall be installed in accordance with Standard Drawings E-3.14 and E-3.15.

Measurement for Payment

Measurement for payment shall be a count of each adjustable plumbizer supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E309 Supply and Install LED Countdown Display Pedestrian Signal Head

*The following Standard Drawings are applicable to this item: E-3.04, E-3.05, E-3.06 and E-3.14.*

The Contractor shall supply and install a yellow, two-section, polycarbonate, Siemens LED countdown pedestrian signal head with a 300 mm square lens, complete with cutaway visors and a minimum 260 mm high numeric display, or Equivalent, in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.04, E-3.05, E-3.06 and E-3.14. The Contractor shall also supply and install riser wire, as required.

The top lens shall be a General Electric square, bimodal LED pedestrian signal, Model Number PS6-CFC4-01A-H3 or Equivalent.

The bottom lens shall be a General Electric square, LED countdown signal, Model Number PS6-PFD1-26A-H3 or Equivalent.

LED countdown signal displays shall be set up to operate during the pedestrian clearance interval.

A LED countdown pedestrian signal head shall be securely covered and turned to face the pole on which it is mounted until such time as the signal installation is complete and working.

All heads that are not operational shall be covered with “Traffic Jackets” as distributed by Sentinel Pole & Traffic Equipment Ltd., or Equivalent.

Measurement for Payment

Measurement for payment shall be a count of each LED countdown pedestrian signal head supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E401 Construct Concrete Pad for Base Mounted Controller

*The following Standard Drawings are applicable to this item: E-3.09 and E-3.09A.*

A concrete pad, upon which a traffic signal controller is to be mounted, shall be constructed in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.09 and E-3.09A.

All concrete footings shall be vibrated during the concrete pour and cured using methods appropriate for the weather conditions.

Joints between the controller pad and the base extension, and the base extension and the controller cabinet, shall be sealed with a good quality weatherproof caulking compound.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

Measurement for Payment

Measurement for payment shall be a count of each concrete pad constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E402 Construct Temporary Wood Traffic Signal Controller Pad

*The following Standard Drawing is applicable to this item: E-3.08.*

A temporary wooden pad, upon which a traffic signal controller is to be mounted, shall be constructed in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.08.

Openings in the wood base shall be filled with limestone screening in order to deter animals from burrowing into the controller cavity from beneath.

Joints between the controller pad and the base extension, and the base extension and the controller cabinet, shall be sealed with a good quality weatherproof caulking compound.

All grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

Measurement for Payment

Measurement for payment shall be a count of each temporary wooden pad constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E403 Construct Earth Platform for Traffic Signal Controller Pad

*This Specification shall be read in conjunction with OPSS.MUNI 1010 (Nov 2013).*

*The following Standard Drawing is applicable to this item: E-3.07.*

The Contractor shall construct an earth platform for the proposed concrete controller pad in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.07.

The height of the platform shall be [insert platform height].

Granular material shall be Granular ‘B’ Type 1 meeting the requirements of
OPSS.MUNI 1010.

Granular material shall be placed in 150 mm layers and compacted to 100% maximum dry density.

Measurement for Payment

Measurement for payment shall be a count of each earth platform constructed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E404 Supply and Install Temporary Mast Extension

*The following Standard Drawing is applicable to this item: E-3.16.*

The Contractor shall supply and install a temporary mast extension in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.16.

Temporary mast extensions shall be removed under Item E423.

Measurement for Payment

Measurement for payment shall be a count of each temporary mast extension supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E405 Supply and Install Four-Way Span Cable Bracket

The Contractor shall supply and install a four-way span cable bracket for mounting a four-way flashing LED beacon to suspension cable in the location(s) shown on the Drawings.

Four-way span cable brackets shall be Fortran Traffic Systems Ltd., Catalogue No. HAN504, or Equivalent.

Four-way span cable brackets shall be installed in accordance with the manufacturer’s specifications.

Measurement for Payment

Measurement for payment shall be a count of each four-way span cable bracket supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E406 Supply and Install Pedestrian Pushbutton

*The following Standard Drawings are applicable to this item: E-3.04, E-3.05 and E-3.06.*

The Contractor shall:

* supply and install a pedestrian pushbutton with backplate and riser wire; and
* install pedestrian instruction signs supplied by the Owner

in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.04, E-3.05, and E-3.06.

The pedestrian pushbuttons shall be a:

* Polara Bulldog, Type BDLM2 pedestrian pushbutton distributed by Tacel Ltd.;
* Campbell Company 4 EVR 120 pedestrian pushbutton distributed by Innovative Traffic Solutions Inc. (ITS); or
* Equivalent.

Pedestrian pushbuttons shall be traffic yellow in colour and actuator buttons shall be stainless steel.

Silicone grease shall be applied to field wire terminals.

Manufacturer’s back plates shall be installed to suit the pole mounting requirements.

An anti-seize compound shall be applied to all screws used to mount the face of the pushbutton to the pushbutton housing.

The wiring aperture in the pole shall be filled with duct seal.

Measurement for Payment

Measurement for payment shall be a count of each pushbutton supplied and installed with the corresponding pedestrian instruction sign.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E407 Supply and Install Accessible Pedestrian Signal Station

*The following Standard Drawing is applicable to this item: E-3.30.*

The Contractor shall supply and install an accessible pedestrian signal station, complete with mounting hardware and riser wire, in the location(s) shown on the Drawings.

Accessible pedestrian signal stations shall be Polara Engineering Incorporated, Model EN25BNO-PY, or Equivalent.

Accessible pedestrian signal stations shall be installed in accordance with the manufacturer’s specifications and Standard Drawing E-3.30.

Any modifications to the traffic signal controller cabinet, including wiring, required to implement proper operation of the accessible pedestrian signal station shall be completed under this item.

The two-wire central control unit shall be supplied and installed under Item E409.

The Contractor shall also purchase a configurator for the programming of the station. This unit shall become the property of the Owner.

The Contractor shall set-up and test the accessible pedestrian signal station in the presence of the Owner.

The audible sounds shall be as follows:

 1) “Canadian Melody” East-West

 2) “Cuckoo” North-South

Final sound orientation of these units shall be carried out by the Contractor in the presence of the Owner.

Measurement for Payment

Measurement for payment shall be a count of each accessible pedestrian signal station supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E408 Supply and Install Two-Way Accessible Pedestrian Signal Station

*The following Standard Drawing is applicable to this item: E-3.30.*

The Contractor shall supply and install a two-way accessible pedestrian signal station, complete with mounting hardware and riser wire, in the location(s) shown on the Drawings.

Two-way accessible pedestrian signal stations shall be Polara Engineering Incorporated, Model iN25AN0-Y-BD, or Equivalent.

Two-way accessible pedestrian signal stations shall be installed in accordance with the manufacturer’s specifications and Standard Drawing E-3.30.

The two-wire central control unit shall be supplied and installed under Item E409.

The Contractor shall also purchase a configurator for the programming of the station. This unit shall become the property of the Owner.

The audible sounds shall be as follows:

 1) “Canadian Melody” East-West

 2) “Cuckoo” North-South

Final sound orientation of the unit shall be carried out by the Contractor in the presence of the Owner.

Measurement for Payment

Measurement for payment shall be a count of each two-way accessible pedestrian signal station supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E409 Supply and Install Two-Wire Central Control Unit for Accessible Pedestrian Signal Station

The Contractor shall supply and install a two-wire central control unit for use with the accessible pedestrian signal stations. The central control unit shall be installed in the traffic signal controller cabinet in the location(s) shown on the Drawings.

Two-wire central control units shall be Polara Engineering Inc., CCU2 EN, or Equivalent.

The central control unit shall interface between the traffic signal controller and the accessible pedestrian signal stations.

Measurement for Payment

Measurement for payment shall be a count of each two-wire central control unit supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E410 Install Traffic Signal Controller Cabinet Complete with Accessory Equipment (8-Phase Base Mount)

*The following Standard Drawings are applicable to this item: E-3.09 and E-3.09A.*

The Contractor shall install an eight-phase solid state microprocessor-based controller cabinet with a 12 position back panel in the location(s) shown on the Drawings.

The Owner has pre-purchased the traffic signal controller complete with accessory equipment. The Contractor shall pick up the controller and accessory equipment at the Owner’s Operations Centre located at 90 Bales Drive East, East Gwillimbury. The controller and accessory equipment will be set up and tested by the Owner.

The Contractor shall set up the controller to operate on phases [insert phases] and in a [insert fully actuated or semi actuated] mode. Phases [insert phases] will not be used for the initial installation.

The controller shall provide for pedestrian timing on four (4) phases and vehicle timing on eight (8) phases (see the attached diagram for phasing).

The controller shall be programmable to start up in Phases 2 and 6 amber and Phases 4 and 8 red intervals.

The controller shall be mounted on a concrete pad in accordance with Standard Drawing E-3.09 and E-3.09A.

The Contractor shall provide a warranty for the controller and its equipment from the time of pick up until the time the controller is activated and inspected by the Owner.

The new traffic signal controller installation and accessory equipment shall be guaranteed by the Contractor against defects in materials and workmanship for a period of twenty-four (24) months from the date of Total Performance of the Contract.

The Contractor shall NOT be required to provide on-call emergency repair support. ALL maintenance during the warranty period shall be performed by the Owner's electrical maintenance contractor. The Owner will determine whether any maintenance work required during the warranty period can be attributed to the Contractor's original work, and if such responsibility is assigned, the Owner will bill the Contractor for the appropriate charges.

Measurement for Payment

Measurement for payment shall be a count of each traffic signal controller cabinet installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified



Item E411 Supply and Install Traffic Signal Controller Cabinet Complete with Accessory Equipment (8-Phase Base Mount)

*The following Standard Drawings are applicable to this item: E-3.09 and E-3.09A.*

The Contractor shall purchase an Econolite NEMA TS2 Type-1, Base Mount, 8-Phase, 12 Position, Type-B Cabinet Assembly, which meets the Owner’s requirements, from Econolite Canada. The Contractor shall contact Jeffrey Mendez, Account Manager, Econolite Canada at 905-294-9920 ext. 1129 to make arrangements for purchase and delivery.

The Contractor shall deliver the cabinets to the Owner for programming and testing, at 90 Bales Drive East, East Gwillimbury, during normal business hours (i.e. 8:00 a.m. to 4:00 p.m., Monday to Friday), a minimum of 28 Days prior to the scheduled activation of the traffic control signals. The Contractor shall contact the Owner’s Centralized Traffic Control System Centre at 1-877-464-9675 ext. 75218, a minimum of 24 hours in advance to make arrangements for the delivery.

The Contractor shall pick up the controller cabinets from the Owner after the hydro service at the intersection has been energized and a minimum of two (2) Working Days prior to the proposed activation date of the traffic control signals.

The Contractor shall install the 8-phase, solid state microprocessor-based controller with a 12-position back panel in the location(s) shown on the Drawings.

The controller shall be set up to operate on phases 2, 4, 6, and 8 and in a semi-actuated mode. Phases 1, 3, 5, 7 will not be used for the initial installation.

The controller shall provide for pedestrian timing on four (4) phases and vehicle timing on eight (8) phases (see the diagram below for phasing).

The controller shall be programmable to start up in Phases 2 and 6 amber and Phases 4 and 8 red intervals.

The controller shall be mounted on a concrete pad in accordance with Standard Drawings E-3.09 and E-3.09A.

The Contractor shall provide a warranty for the controller and its equipment from the time of pick up until the time that the controller is activated and inspected by the Owner.

The new traffic signal controller installation and accessory equipment shall be guaranteed by the Contractor against defects in materials and workmanship for a period of twenty-four (24) months from the date of Total Performance of the Contract.

The Contractor shall NOT be required to provide on-call emergency repair support. ALL maintenance during the warranty period shall be performed by the Owner’s electrical maintenance contractor. The Owner will determine whether any maintenance work required during the warranty period can be attributed to the Contractor’s original work, and if such responsibility is assigned, the Owner will bill the Contractor for the appropriate charges.

Measurement for Payment

Measurement for payment shall be a count of each traffic signal controller cabinet supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.



Item E412 Install Traffic Signal Controller Cabinet Complete with Accessory Equipment (8-Phase Pole Mount)

*The following Standard Drawing is applicable to this item: E-3.10.*

The Contractor shall install an eight-phase solid state microprocessor-based controller with a 12-position back panel in the location(s) shown on the Drawings.

The Owner has pre-purchased the traffic signal controller complete with accessory equipment. The Contractor shall pick up the controller and accessory equipment at the Owner’s Operations Centre located at 90 Bales Drive East, East Gwillimbury. The controller and accessory equipment will be set up and tested by the Owner.

The Contractor shall set up the controller to operate on phases [insert phases] and in a [insert fully actuated or semi actuated] mode. Phases [insert phases] will not be used for the initial installation.

The controller shall provide for pedestrian timing on four (4) phases and vehicle timing on eight (8) phases (see the attached diagram for phasing).

The controller shall be programmable to start up in Phases 2 and 6 amber and Phases 4 and 8 red intervals.

The controller shall be mounted on a pole in accordance with Standard Drawing E-3.10.

The Contractor shall provide a warranty for the controller and its equipment from the time of pick up until the time the controller is activated and inspected by the Owner.

The new traffic signal controller installation and accessory equipment shall be guaranteed by the Contractor against defects in materials and workmanship for a period of twenty-four (24) months from the date of Total Performance of the Contract.

The Contractor shall NOT be required to provide on-call emergency repair support. ALL maintenance during the warranty period shall be performed by the Owner's electrical maintenance contractor. The Owner will determine whether any maintenance work required during the warranty period can be attributed to the Contractor's original work, and if such responsibility is assigned, the Owner will bill the Contractor for the appropriate charges.

Measurement for Payment

Measurement for payment shall be a count of each traffic signal controller cabinet installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified



Item E413 Relocate Existing Traffic Signal Controller Cabinet Complete with Accessory Equipment (8-Phase Base Mount)

*The following Standard Drawings are applicable to this item: E-3.09 and 3.09A.*

The Contractor shall relocate the existing eight-phase solid state microprocessor-based controller in the location(s) shown on the Drawings.

The controller shall be set up to operate on phases [insert phases] and in [insert fully actuated or semi actuated] mode. Phases [insert phases] shall not be used for the initial installation.

The controller shall provide for pedestrian timing on four (4) phases and vehicle timing on eight (8) phases (see attached diagram for phasing).

The controller shall be programmable to start up in Phases 2 and 6 amber and Phases 4 and 8 red intervals.

The controller shall be mounted on the new concrete pad in accordance with Standard Drawings E-3.09 and E-3.09A.

The Contractor shall be responsible for all costs associated with any damage that occurs to the controller during the relocation.

Measurement for Payment

Measurement for payment shall be a count of each traffic signal controller relocated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.



Item E414 Supply and Install Ground Rod

*The following Standard Drawings are applicable to this item: E-3.01, E-5.01, E-5.02, E-5.03, E-5.05, E-5.08, E-5.09, E-5.10, E-5.11, E-5.12 and E-5.13. [List only applicable drawing numbers]*

The Contractor shall supply and install a 20 mm x 3.0 m copper clad ground rod in the location(s) shown on the Drawings.

Ground rods shall be driven into the bottom of concrete handwells.

Ground rods for the service enclosure shall be driven into the ground and shall start at typical 3.0 m to the service pole.

A ground rod driven into the ground shall be buried so that the top of the ground rod is 300 mm below the finished grade, and it shall be left uncovered until it has been inspected by the Owner.

Ground rods for the service enclosure shall be installed in accordance with Standard Drawings E-5.01, E-5.02, E-5.03, E-5.05, E-5.08, E-5.09, E-5.10, E-5.11, E-5.12 and E-5.13. [List only applicable drawing numbers]

For temporary traffic signal installations, the Contractor shall supply and install a
#6 AWG, RWU90 green, stranded copper ground wire in accordance with Standard Drawing E-3.01.

Connections to ground rods shall be made with thermit weld connectors.

Measurement for Payment

Measurement for payment shall be a count of each ground rod supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E415 Replace Existing Load Centre

*This Specification shall be read in conjunction with OPSS.MUNI 604 (Nov 2017).*

The Contractor shall remove and dispose the existing load centre from hydro pole P XX and replace it with a new load centre.

The new load centre shall be Square D Model CQ018M100RB or Equivalent, complete with top entry hub.

The Contractor shall also supply and install power supply cable from the new service to the existing traffic signal controller.

The power supply cable shall be single conductor, stranded copper, low voltage cable, rated 600 volts and RWU90. The low voltage cable shall meet the requirements of OPSS.MUNI 604.

The cable shall be sized so as to satisfy the voltage drop requirements of the electrical/electronic equipment and shall not exceed 5%.

The Contractor shall supply circuit breakers in the new load centre as follows:

 1 - 2 pole - common trip circuit breaker

 Square D Catalogue No. Q0M 100 VHL (100 amp), or Equivalent

 This shall be used as the main circuit breaker

 1 - 30 amp circuit breaker for illumination

 1 - 40 amp circuit breaker for the traffic signals

Measurement for Payment

Measurement for payment shall be a count of each load centre replaced.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E416 Supply and Install Equipment for Power Supply

*The following Standard Drawings are applicable to this item: E-5.01, E-5.02 E-5.03, E-5.05 E-5.08, E-5.09 E-5.10, E-5.11 E-5.12 and E-5.13. [List only applicable drawing numbers]*

The Contractor shall supply and install equipment for the power supply on the service pole in the location(s) shown on the Drawings and in accordance with Standard Drawings E-5.01, E-5.02, E-5.03, E-5.05, E-5.08, E-5.09, E-510, E-5.11, E-5.12 and E-5.13. [List only applicable drawing numbers]

**Prior to the service installation, the Owner will contact the Local Hydro Authority to schedule a Site meeting and obtain a Service Layout showing the proposed service pole and/or the proposed supply pole.**

The load centre shall be a Square D, Model CQO18M100RB or Equivalent, complete with top entry hub.

The Contractor shall supply circuit breakers at the supply location(s) as follows:

 1 - 2 pole - common trip circuit breaker

 Square D Catalogue No. QOM 100 VHL (100 amp), or Equivalent

 This shall be used as the main circuit breaker

 [indicate number of circuits] - 40-amp breaker(s) for illumination

 1 - 40 amp breaker for the [future] traffic signals

The Contractor shall leave sufficient wire coiled (as specified by the Local Hydro Authority) for the connection to the secondary supply/transformer. The wire from the hydro source of supply to the service shall be RWU90, rated 600 volts. The cable shall be sized so as to satisfy voltage drop requirements of the electrical/electronic equipment and shall not exceed 3% in accordance with Ontario Electrical Safety Code, Rule 8-102.

The ground wire and ground rods for the power supply shall be supplied and installed under Items E611 and E414, respectively.

The Contractor shall obtain an Inspection Clearance from the Electrical Safety Authority. The Inspection Clearance must be obtained well in advance of the power turn on to ensure that the Local Hydro Authority receives it prior to turn on.

The installation of the power supply equipment and the power connection must be completed very early in the Contract to ensure that there is no delay to the traffic signal and illumination turn on. The Contractor shall communicate with the Local Hydro Authority early enough in the Contract to ensure that their requirements (i.e. permits and inspections) are satisfied and shall arrange for the earliest possible power connection.

Measurement for Payment

Measurement for payment shall be a count of each power supply supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E417 Cash Allowance for Connection to Power by Local Hydro Authority

The Contractor shall contact the Local Hydro Authority and arrange for the connection to power.

The Contractor shall be responsible for all costs associated with the connection to power by the Local Hydro Authority.

Basis of Payment

Payment from the cash allowance will be made based on paid invoices from the Local Hydro Authorities for connection to power, without any markup or additional fees. Under no circumstances shall the Contractor be entitled to payment in excess of payments actually made to the Local Hydro Authorities, as substantiated by paid invoices.

Item E418 Supply, Install and Activate a Phase Selector

The Contractor shall supply, install and activate a:

* two-channel phase selector when there is one (1) detector unit for any two (2) directions (i.e. one (1) detector for north-south and/or one (1) detector for east-west); and/or
* four-channel multimode phase selector when there are two (2) detector units for any two (2) directions (i.e. two (2) detectors for north-south and/or two (2) detectors for east-west)

in the location(s) shown on the Drawings.

Two-channel phase selectors shall be Global Traffic Technologies, Opticom Model 762, or Equivalent.

Four-channel, multimode phase selectors shall be Global Traffic Technologies, Opticom Model 764, or Equivalent.

Phase selectors shall be installed in the traffic signal controller cabinet.

Detector units shall be supplied and installed under Item E419.

The Owner will test the optical pre-emption equipment for the desired range using a pre-emption emitter and the Contractor shall make any adjustments necessary, as specified by the Owner. The testing and adjustments to the desired range shall be completed on the Day of the traffic control signal turn on.

Measurement for Payment

Measurement for payment shall be a count of each phase selector supplied, installed and activated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E419 Supply, Install and Activate an Optical Pre-Emption Detector

*The following Standard Drawings are applicable to this item: E-3.17 (Permanent Installations) and E-3.35 (Temporary Installations).*

The Contractor shall supply, install and activate an optical pre-emption detector, complete with all required mounting hardware, in the location(s) shown on the Drawings.

The optical pre-emption detector shall be Global Traffic Technologies, Model 722, or Equivalent.

Optical pre-emption detectors shall be installed in accordance with Standard Drawings E-3.17 (for permanent installations) or E-3.35 (for temporary installations).

The Owner will test the optical pre-emption equipment for the desired range using a pre-emption emitter and the Contractor shall make any adjustments necessary, as specified by the Owner. The testing and adjustments to the desired range shall be completed on the Day of the traffic control signal turn on.

Measurement for Payment

Measurement for payment shall be a count of each optical pre-emption detector supplied, installed and activated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E420 Supply, Install and Activate an Auxiliary Interface Panel Complete with an Auxiliary Interface Panel Cable

The Contractor shall supply, install and activate an auxiliary interface panel, complete with an auxiliary interface panel cable, for use with an auxiliary optical pre-emption detector.

The auxiliary interface panel and auxiliary interface panel cable shall be installed in the traffic signal controller cabinet in the location(s) shown on the Drawings.

The auxiliary interface panel shall be a Global Traffic Technologies, Opticom Priority Control System, Model 768, or Equivalent.

The auxiliary interface panel cable shall provide connection between the phase selector and the auxiliary interface panel.

The auxiliary optical pre-emption detector and phase selector shall be supplied and installed under Items E419 and E418, respectively.

The Owner will test the auxiliary optical pre-emption equipment for the desired range, using a pre-emption emitter and the Contractor shall make any adjustments necessary, as specified by the Owner. The testing and adjustments to the desired range shall be completed on the Day of the traffic signal activation.

Measurement for Payment

Measurement for payment shall be a count of each auxiliary interface panel supplied, installed and activated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E421 Supply, Install and Activate Overhead Detector System

*The following Standard Drawing is applicable to this item: E-3.40.*

The Contractor shall supply, install and activate an overhead detector system for vehicle detection in the location(s) shown on the Drawings.

The overhead detector system shall be a Wavetronix Smart Sensor Matrix overhead detector system, an Iteris VantageRadius overhead detector system, or Equivalent.

A Wavetronix Smart Sensor Matrix overhead detector system shall include the following at a minimum:

* Wavetronix Matrix Smart Sensors (quantity as shown on the Drawings) 24.000GHz, or Equivalent
* Wavetronix Click 650 Cabinet Interface Device, or Equivalent
* Heavy duty sensor mount 6” – two-axis bracket for sensor(s)
* Terminal strip junction box (for 8- or 10-pin connector cable)
* Smart sensor power and communication cable with connector for each sensor
* Two-channel contact closure rack card(s) (when not connecting Click 650 to controller via SDLC)
* Operating software and documentation on CD-ROM and USB stick
* 1pr 18 AWG + 2pr 22 AWG, F-Shield CSA FT-4, Smart Sensor Matrix/Advance home run cable (supplied in 500ft and 1000ft rolls), or Equivalent
* Setup equipment as required
* All mounting apparatus and other necessary equipment

An Iteris VantageRadius overhead detector system shall include the following at a minimum:

* Iteris VantageRadius Sensor (quantity as shown on the Drawings) 24.000GHz – P/N: RAD-SENSOR-BH-PAK, or Equivalent
* Iteris VantageRadius Shelf Mount CCU in Cabinet Interface, TS2 – P/N: RAD-CCU-SM-TS2-PAK, or Equivalent
* Side of Pole Aluminum Mounting Brackets 1’- P/N: CAMBRKT4, or Equivalent
* Iteris VantageRadius Surge Protection – P/N: RAD-SURGE, or Equivalent
* CAT5E Outdoor Rated, Shielded Cable for each sensor – M/N: 5AE350STP/POLYM1B, or Equivalent
* Setup equipment as required
* All mounting apparatus and other necessary equipment

The Contractor shall arrange for the manufacturer to provide on-Site training for the Owner’s staff.

The overhead detector system shall be installed in accordance with the manufacturer’s recommendations and Standard Drawing E-3.40.

The Contractor shall test the overhead detector system for the desired range in the presence of the Owner and shall make any adjustments necessary, as specified by the Owner. The testing and adjustments to the desired range shall be completed on the Day that the detector system is activated.

For temporary signals, periodic maintenance and modifications to existing detection zones shall be covered under Item G1 – Maintenance of Traffic.

Measurement for Payment

Measurement for payment shall be a count of each intersection in which an overhead detector system is supplied and installed, regardless of the number of sensors.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E422 Remove and Salvage Traffic Control Signal and Illumination Equipment

The Contractor shall carefully remove and salvage the traffic control signal and illumination equipment in the location(s) shown on the Drawings. The Contractor shall refer to the Removals Chart on the Drawings to determine the location(s) and types/quantities of equipment to be removed and salvaged.

Existing traffic control signal and illumination equipment shall be removed immediately upon completion and switch over to the temporary traffic control signal and illumination equipment. Under no circumstances shall existing traffic control signal and illumination equipment be removed before the temporary traffic control signal and illumination equipment is put into operation.

Temporary traffic control signal and illumination equipment shall be removed immediately upon completion and switch over to the new traffic control signal and illumination equipment. Under no circumstances shall temporary traffic control signal and illumination equipment be removed before the new traffic control signal and illumination equipment is put into operation.

A paid duty police officer and a member of the Owner’s Roads and Traffic Operations Branch are required at the Site during the switch overs to temporary and/or new traffic control signal installations.

Holes left from the removal of a wood pole shall be filled with native material. Granular material shall be compacted to 100% maximum dry density and earth to 95% maximum dry density.

Grassed areas shall be reinstated with a minimum of 100 mm of good quality imported topsoil and sodded or seeded as required by the Owner.

Equipment Being Salvaged and Transferred/Returned to the Owner

Equipment to be salvaged and transferred/returned to the Owner may include:

* Overhead detector systems and associated equipment
	+ Wavetronix Smart Sensor Matrix overhead detector systems, including but not limited to:
		- Wavetronix Matrix Smart Sensors (quantity as shown on the Drawings) 24.000GHz
		- Wavetronix Click 650 Cabinet Interface Device
		- Heavy duty sensor mount 6” – two-axis bracket for sensor(s)
		- Terminal strip junction box (for 8- or 10-pin connector cable)
		- Smart sensor power and communication cable with connector for each sensor
		- Two-channel contact closure rack card(s)
	+ Iteris VantageRadius overhead detector systems, including but not limited to:
		- Iteris VantageRadius Sensor (quantity as shown on the Drawings) 24.000GHz – P/N: RAD-SENSOR-BH-PAK
		- Iteris VantageRadius Shelf Mount CCU in Cabinet Interface, TS2 – P/N: RAD-CCU-SM-TS2-PAK
		- Side of pole aluminum mounting brackets 1’- P/N: CAMBRKT4
		- Iteris VantageRadius Surge Protection – P/N: RAD-SURGE
		- CAT5E Outdoor Rated, Shielded Cable for each sensor – M/N: 5AE350STP/POLYM1B
* Controller cabinet and timer from the traffic signal section
* Transit signal priority and emergency vehicle pre-emption equipment including the intersection GPS radio and/or infrared detectors, auxiliary interface panel and phase selector cards and racks

All salvaged equipment being transferred/returned to the Owner shall be free of damage. The Contractor shall report any damaged equipment, prior to its removal, to the Owner. The Contractor will be charged replacement costs for any materials and equipment damaged during their removal and/or delivery to the Owner.

Salvaged equipment being transferred/returned to the Owner shall be delivered to the Owner’s Operations Centre located at 90 Bales Drive East, East Gwillimbury. The Contractor shall contact the Owner a minimum of two (2) Working Days prior to delivering the equipment to the Owner to make arrangements for the delivery.

The Contractor shall make a detailed list of all salvaged equipment and have it confirmed and signed by the Owner.

Equipment Being Salvaged and Transferred to the Contractor

The Contractor shall calculate a credit for the equipment being transferred to it and shall reflect this credit in its bid.

All conduit to be abandoned under the existing road shall be plugged with conduit plugs to provide a watertight seal.

Measurement for Payment

Measurement for payment shall be a count of each intersection in which equipment is removed and salvaged.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E423 Remove and Dispose of Traffic Control Signal and Illumination Equipment

The Contractor shall completely remove and dispose of traffic control signal and illumination equipment in the location(s) shown on the Drawings. The Contractor shall refer to the Removals Chart on the Drawings to determine the location(s) and types/quantities of equipment to be removed and disposed of.

Existing traffic control signal and illumination equipment shall be removed immediately upon completion and switch over to the temporary traffic control signal and illumination equipment. Under no circumstances shall existing traffic control signal and illumination equipment be removed before the temporary traffic control signal and illumination equipment is put into operation.

Temporary traffic control signal and illumination equipment shall be removed immediately upon completion and switch over to the new traffic control signal and illumination equipment. Under no circumstances shall temporary traffic control signal and illumination equipment be removed before the new traffic control signal and illumination equipment is put into operation.

A paid duty police officer and a member of the Owner’s Roads and Traffic Operations Branch are required at the Site during the switch overs to temporary and/or new traffic control signal installations.

Holes left from the removal of a pole base and/or a handwell shall be backfilled with Granular ‘A’ compacted to 100% maximum dry density.

All equipment and materials removed under this item shall be disposed of at a disposal site approved by the Owner, outside the limits of the Contract. All conduit to be abandoned under the existing road shall be plugged with conduit plugs to provide a watertight seal.

Measurement for Payment

Measurement for payment shall be a count of each intersection in which equipment is removed and disposed of.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E424 Relocate and Activate Optical Pre-Emption Detector

*The following Standard Drawings are applicable to this item: E-3.17 (Permanent Installations) and E-3.35 (Temporary Installations).*

The Contractor shall remove, relocate and activate an existing optical pre-emption detector, complete with all required mounting hardware, in the location(s) shown on the Drawings.

Optical pre-emption detectors shall be installed in accordance with Standard Drawings E-3.17 (for permanent installations) or E-3.35 (for temporary installations).

The Owner will test the optical pre-emption equipment for the desired range using a pre-emption emitter and the Contractor shall make any adjustments necessary, as specified by the Owner. The testing and adjustments to the desired range shall be completed on the Day of the traffic control signal turn on.

Measurement for Payment

Measurement for payment shall be a count of each optical pre-emption detector relocated and activated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E425 Relocate Existing Integrated Dome Close Circuit Television (CCTV) Camera

*The following Standard Drawing is applicable to this item: E-3.26*

The Contractor shall remove an existing dome CCTV camera and reinstall it on a new pole in the location(s) shown on the Drawings. The camera shall be installed in accordance with Standard Drawing E-3.26 and the manufacturer’s specifications.

The Contractor shall notify the Owner’s Centralized Traffic Control System Centre at 1-877-464-9675 ext. 75218:

* prior to disconnecting the existing camera; and
* once the camera has been reinstalled in its new location and wired to the processor.

The relocated camera shall be free of damage. The Contractor will be charged replacement costs for any material or equipment damaged during the camera’s removal and reinstallation.

Once the camera has been relocated the Contractor shall test the camera and associated camera to ensure proper orientation and propagation.

Measurement for Payment

Measurement for payment shall be a count of each dome CCTV camera relocated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E426 Relocate and Activate GPS Detector Complete with Cable

The Contractor shall remove, relocate and activate an existing GPS detector, complete with all required mounting hardware and cable in the location(s) shown on the Drawings.

The relocated GPS detector shall be free of damage. The Contractor will be charged replacement costs for any material or equipment damaged during the GPS detector’s removal and re-installation.

Measurement for Payment

Measurement for payment shall be a count of each GPS detector relocated and activated.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E501 Supply and Install Side Mount Luminaire Bracket

*The following Standard Drawing is applicable to this item: E-3.34.*

The Contractor shall supply and install an offset bracket/side mount plate for the installation of a tapered elliptical luminaire mast arm in the location(s) shown on the Drawings.

Offset brackets/side mount plates shall be Kabar-Almat, Catalogue No. K93-2, Drawing No. K93-2 or Equivalent.

The bracket shall be mounted on the pole in accordance with Standard Drawing E-3.34.

Luminaire mast arms shall be supplied and installed under Item E502.

Measurement for Payment

Measurement for payment shall be a count of each side mount luminaire bracket supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E502 Supply and Install Aluminum Luminaire Mast Arm

*The following Standard Drawings are applicable to this item: E-3.04 (aerial installation on wood pole), E-3.04A (aerial installation on concrete pole), E-3.05 (buried installation on wood pole), E-3.05A (buried installation on concrete pole) and E-3.06 (buried installation on steel pole).*

The Contractor shall supply and install a:

* 2.4 metre long elliptical aluminum luminaire arm on a steel pole in the location(s) shown on the Drawings;
* 3.7 metre long elliptical aluminum luminaire arm on a steel pole in the location(s) shown on the Drawings;
* 2.4 metre long elliptical aluminum luminaire arm on a concrete pole in the location(s) shown on the Drawings;
* 2.4 metre long elliptical aluminum luminaire arm on a wood pole in the location(s) shown on the Drawings;
* 3.7 metre long elliptical aluminum luminaire arm on a concrete pole in the location(s) shown on the Drawings; and/or
* 3.7 metre long elliptical aluminum luminaire arm on a wood pole in the location(s) shown on the Drawings.

2.4 metre long elliptical aluminium luminaire arms to be mounted on steel poles shall be SENTINEL Pole & Traffic Equipment Limited, RE-8-4188 or Equivalent, with a minimum wall thickness of 0.188 inches.

3.7 metre long elliptical aluminium luminaire arms to be mounted on steel poles shall be SENTINEL Pole & Traffic Equipment Limited, RE-12-4188 or Equivalent, with a minimum wall thickness of 0.188 inches.

2.4 metre long elliptical aluminum luminaire arms to be mounted on concrete or wood poles shall be SENTINEL Pole & Traffic Equipment Limited, WE8MA, or Equivalent.

3.7 metre long elliptical aluminum luminaire arms to be mounted on concrete or wood poles shall be SENTINEL Pole & Traffic Equipment Limited, WE12M, or Equivalent.

Luminaire arms shall be installed on steel poles in accordance with Standard Drawing E-3.06.

Luminaire arms shall be installed on wood poles in accordance with Standard Drawings E-3.04 (aerial installation) and E-3.05 (buried installation).

Luminaire arms shall be installed on concrete poles in accordance with Standard Drawings E-3.04A (aerial installation) and E-3.05A (buried installation).

**The Contractor shall install a pole identification tag, supplied by the Owner, on each pole upon which a Regional luminaire is installed. The Contractor shall contact the Owner to obtain the necessary number of tags. The tags shall be installed on the pole with the number facing the road, at a height of 2.7 m from grade, using self-tapping screws in each corner of the tag. The tags must be attached prior to the final acceptance of the Work by the Owner.**

Measurement for Payment

Measurement for payment shall be a count of each aluminum luminaire mast arm supplied and installed with a pole identification tag.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E503 Supply and Install High Pressure Sodium Luminaire

The Contractor shall supply and install a:

* 200 watt, integral ballast, high pressure sodium luminaire complete with lamp, individual photocontrol and receptacle;
* 250 watt, integral ballast, high pressure sodium luminaire complete with lamp, individual photocontrol and receptacle; and/or
* 400 watt, integral ballast, high pressure sodium luminaire complete with lamp, individual photocontrol and receptacle.

in the location(s) shown on the Drawings with a clearance of [select one] 9.6 m, 10.0 m, 10.4 m, 10.7 m, 11.6 m, 12.2 m, 12.6 m, 13.1 m or 13.7 m to the finished pavement. The Contractor shall also supply and install riser wire, as required.

200 watt luminaires shall be:

* General Electric Co., M-400A Series, Catalogue No. MDRL20S1P22RMC31 (IES Distribution No. GE-1010.IES);
* American Electric Lighting, 12520SCTMT1R3DGCSECHK; or
* Equivalent.

250 watt luminaires shall be:

* General Electric Co., M-400A Series, Catalogue No. MDRL25S1P22RMC31 (IES Distribution No. GE-1010.IES);
* American Electric Lighting, 12525SCTMT1R3DGCSECHK; or
* Equivalent.

400 watt luminaires shall be:

* General Electric Co., M-400A Series, Catalogue No. MDRL40S1P22RMC31 (IES Distribution No. GE-1010.IES);
* American Electric Lighting, 12540SCTMT1R3DGCSECHK; or
* Equivalent.

Luminaires shall be wired for 120 volt operation.

Measurement for Payment

Measurement for payment shall be a count of each luminaire supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price(s) for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E504 Supply and Install 400 Watt High Pressure Sodium Flat Glass Luminaire Fixture Complete with High Pressure Sodium Lamp

The Contractor shall supply and install a 400 watt, high pressure sodium “Cobra Head” style luminaire fixture, complete with a 200 or 250 watt high pressure sodium lamp, internally shielded with flat tempered glass lens, 120 volt CWI ballast and individual photocontrol in the location(s) shown on the Drawings. The Contractor shall also supply and install riser wire, as required.

The photocontrol shall be TE Connectivity Model #SST-IES or Equivalent.

For fixtures with a 200 watt high pressure sodium lamp, luminaires shall be:

* General Electric Co., M-400A Series, Catalogue No. MDCL20S1P22FMC31 (Photometric Curve No. GE–1002.IES);
* American Electric Lighting, 125 Series (Photometric Curve No. AE 57431.IES); or
* Equivalent.

For fixtures with a 250 watt high pressure sodium lamp, luminaires shall be:

* General Electric Co., M-400A Series, Catalogue No. MDCL25S1P22FMC31 (Photometric Curve No. GE–1002.IES);
* American Electric Lighting, 125 Series (Photometric Curve No. AE 57431.IES); or
* Equivalent.

Luminaire shall be wired for 120 volt operation.

Luminaires shall be installed with a clearance of [select one] 9.6 m, 10.0 m, 10.4 m, 10.7 m, 11.6 m, 12.2 m, 12.6 m, 13.1 m or 13.7 m to the finished pavement.

Measurement for Payment

Measurement for payment shall be a count of each luminaire fixture supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price(s) for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E505 Relocate Existing Luminaire Mast Arm and 200 Watt High Pressure Sodium Luminaire

The Contractor shall remove the existing luminaire mast arm and luminaire from an existing steel pole and reinstall them on a temporary wood pole in the location(s) shown on the Drawings. The Contractor shall also supply and install riser wire, as required.

The luminaire mast arm shall be mounted to provide a mounting height of 10.7 metres from the luminaire to the road elevation.

Measurement for Payment

Measurement for payment shall be a count of each luminaire mast arm and luminaire relocated.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price(s) for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E506 Supply and Install LED Luminaire

The Contractor shall supply and install a:

* XXX watt, LED luminaire complete with lamp, individual photocontrol and receptacle;
* XXX watt, LED luminaire complete with lamp, individual photocontrol and receptacle;

in the location(s) shown on the Drawings with a clearance of [select one] 9.6 m, 10.0 m, 10.4 m, 10.7 m, 11.6 m, 12.2 m, 12.6 m, 13.1 m or 13.7 m to the finished pavement. The Contractor shall also supply and install riser wire, as required.

XXX watt luminaires shall be:

* [Luminaire brand and model number]
* or Equivalent.

XXX watt luminaires shall be:

* [Luminaire brand and model number]
* or Equivalent.

Luminaires shall be wired for 120 volt operation.

Measurement for Payment

Measurement for payment shall be a count of each luminaire supplied and installed.

Riser wire will not be measured for payment purposes; all costs associated with the riser wire shall be included in the unit price(s) for this item.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E601 Supply and Install Accessible Pedestrian Signal Station Cable

*The following Standard Drawing is applicable to this item: E-3.30.*

The Contractor shall install accessible pedestrian signal station cable in the location(s) shown on the Drawings.

Accessible pedestrian signal station cable shall be Belden Inc., #8720 Series, stranded, #14 gauge, twisted pair cable with shielding (Beldfoil) and polyethylene insulation, or Equivalent.

The cable shall be installed in accordance with Standard Drawing E-3.30 and shall run through the conduit system from the accessible pedestrian signal station to the central control unit in the traffic signal controller cabinet.

Accessible pedestrian signal stations assigned to each pedestrian phase shall have a dedicated home run cable (i.e. one (1) home run cable per pedestrian phase).

Measurement for Payment

Measurement for payment shall be per metre (m) of accessible pedestrian signal station cable supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E602 Supply and Install Wire Inductive Loop Including Lead-In

*The following Standard Drawings are applicable to this item: E-3.24, E-3.25, E-3.27 and E-3.28.*

[Delete this paragraph if it does not apply - it only applies to RINs 15-32, 16-18, 16-10, 16-12, 16-14, 16-15, 16-16] **The existing asphalt within the limits of this Contract contains asbestos. The Contractor shall take all necessary precautions in accordance with the *Occupational Health and Safety Act,* RSO 1990, c. O.1, including but not limited to O. Reg. 278/05, and the *Workplace Safety and Insurance Act, 1997,* SO 1997, c. 16**.

The Contractor shall supply and install wire inductive loop including lead-in in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.24, E-3.25, E-3.27 and E-3.28.

The saw cut for the loops shall be wet cut.

Loop wire shall be #14 AWG, Type RWU 90 (X-link) stranded copper conductor.

Foam backer rods shall be used for the installation of the loop detector. They shall be installed on top of the loop wire, spaced every 600 mm.

Hot poured rubberized asphalt joint sealing compound shall be installed on top of the backer rods, completely sealing the opening and leaving a convex surface on the top of the sealant.

**When grinding and repaving, all loop wire must be installed in the base course of asphalt.**

Each loop wire installation shall be sealed to the satisfaction of the Owner, in a way that prevents the entry of moisture and mechanical damage.

The loop lead-in wire from the edge of the loop to its respective pole and/or handwell shall be twisted together to form a consistent lay of 10 turns per metre (m).

All connections of the loop lead-in wire to its respective home run cable shall be made in the location(s) shown on the Drawings. All connections between the lead-in wire and home run cable shall be soldered. All connections made in a handwell shall be made with an Owner-approved splicing kit.

The Contractor shall perform megger tests on all inductive loops, record the test readings and submit them to the Owner. The acceptable megger test value is a minimum of 10 mega ohms (MΩ).

[Delete this paragraph if this is not a resurfacing contract] Loops shall be reconnected at their original splice point.

Measurement for Payment

Measurement for payment shall be per metre (m) of wire inductive loop installed, based on the measurement of the perimeter of the loop only. Lead-in cuts will not be included in this measurement.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E603 Supply and Install Ducted Preformed Loop Detector Including Lead-In

*The following Standard Drawings are applicable to this item: E-3.24, E-3.25, E-3.27 and E-3.28.*

The Contractor shall supply and install ducted preformed loop detector in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.24, E-3.25, E-3.27 and E-3.28.

Loops shall be #14 AWG, Type RWU 90 (X-link) stranded copper conductor (number of turns to be determined by the Contractor) encased in a 20 mm diameter rigid PVC duct with a wall thickness of 2.9 mm (0.113 inches).

Saw cutting of asphalt and concrete shall be done with a wet saw.

The corners of the loop shall be either 90o PVC fittings or heated and bent. The loop lead-in shall be accessed by a tee fitting.

All joints in conduit shall be made in accordance with the manufacturer’s recommended practice for joining conduit.

The conduit shall be filled with petroleum jelly (White Fonoline or Equivalent) to prevent the loop wire from moving.

Each loop wire installation shall be sealed to the satisfaction of the Owner, in a way that prevents the entry of moisture and mechanical damage.

The loop lead-in wire from the edge of the loop to its respective pole and/or handwell shall be twisted together to form a consistent lay of 10 turns per metre (m).

All connections of the loop lead-in wire to its respective home run cable shall be made in the location(s) shown on the Drawings. All connections between the lead-in wire and home run cable shall be soldered. All connections made in a handwell shall be made with an Owner-approved splicing kit.

The Contractor shall perform megger tests on all inductive loops, record the test readings and submit them to the Owner. The acceptable megger test value is a minimum of 10 mega ohms (MΩ).

Measurement for Payment

Measurement for payment shall be per metre (m) of ducted preformed loop supplied and installed, based on the measurement of the perimeter of the loop only. Lead-in cuts will not be included in this measurement.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E604 Supply and Install Home Run Cable for Wire Inductive Loop

The Contractor shall supply and install home run cable in the location(s) shown on the Drawings.

Home run cable shall be Belden Inc., #8720 Series, stranded, #14 gauge, twisted pair cable with shielding (Beldfoil) and polyethylene insulation or Equivalent.

Each home run cable in the controller cabinet shall be identified with a PVC sleeve marker showing the phase number, direction and movement.

The home run cable shall be installed:

* aerially on temporary wood poles and lashed to aerial suspension cables; and/or
* in the underground conduit system.

Each loop shall have its own home run cable. The home run cable shall be installed from the splice point of each loop to the controller as indicated on the Drawings.

Measurement for Payment

Measurement for payment shall be per metre (m) of home run cable supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement, but is a horizontal measurement taken from the Drawings between handwells, poles and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E605 Supply and Install Cable Splicing Kit or Gel Pack Enclosure

The Contractor shall supply and install a resin power cable splicing kit or gel pack enclosure to connect the loop wire to the home run cable in a handwell and/or pole base in the location(s) shown on the Drawings.

The installation of each splicing kit or gel pack enclosure shall be in accordance with the manufacturer’s requirements.

Measurement for Payment

Measurement for payment shall be a count of each cable splicing kit or gel pack enclosure supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E606 Supply and Install Suspension/Stabilizing/Support Cables

*The following Standard Drawings are applicable to this item: E-3.01 and E-3.02.*

The Contractor shall supply and install 10 mm, Grade 160, stranded galvanized steel suspension, stabilizing and support cables in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.01 and E-3.02.

When it is necessary for the Contractor to work within 3 metres of primary hydro lines, the Contractor shall arrange for the Local Hydro Authority to be present to assist in overseeing the work.

Fiberglass extension rods may be required on spans running between hydro neutral and energized cables above.

When span distances (pole to pole) are 50 m or greater, or at the discretion of the Owner, a support cable shall be installed above the upper suspension cable. Suspension cable shall be secured to support cable with aluminum suspension wire clamps (Sentinel Traffic Part #SWC or Equivalent) installed at maximum intervals of 2 m. When a support cable (3rd span) is installed, a second guy anchor shall be installed adjacent to the poles at each end of the span.

Measurement for Payment

Measurement for payment shall be per metre (m) of suspension, stabilizing and support cables supplied and installed, measured from centre to centre of poles.

**Measurement will be made for each individual cable.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E607 Supply and Install Traffic Signal Cable

*This Specification shall be read in conjunction with OPSS.MUNI 2409 (Nov 2018).*

*The following Standard Drawings are applicable to this item: E-3.01, E-3.02, E-3.03 (aerial installation only), E-3.04, E-3.06, E-4.01, E-4.02 and E-4.03.*

The Contractor shall supply and install sufficient fourteen (14) gauge, colour coded traffic signal runner and riser cable to accommodate all equipment and installation operations specified in this Contract.

The traffic signal cable shall meet the requirements of OPSS.MUNI 2409.

Traffic signal cable shall be installed in the location(s) shown on the Drawings and in accordance with Standard Drawings E-3.01, E-3.02, E-3.04, E-3.06, E-4.01, E-4.02 and E-4.03.

Runner cables for vehicle signal heads shall have 12 solid conductors.

Runner cables for pedestrian signal heads shall have seven (7) solid conductors.

Traffic signal heads for each phase of the intersection shall be wired independently in order to allow for the addition of advance green movements or split phases without additional wiring being required.

Traffic signal cable for each pedestrian phase (i.e. north-south on east leg, north-south on west leg, east-west on north leg and east-west on south leg) shall be brought back to the controller separately in order to accommodate separate “walk” and “don't walk” movements for each phase independently of each other.

The Contractor shall label all groups of traffic signal conductors in the controller cabinet, indicating the phase number, direction and movement.

The Contractor shall seal all conduit ducts in the controller pad with duct seal once all of the cables have been pulled into the controller cabinet.

Buried Installation

Each riser cable inside a pole for traffic signal head(s) and pedestrian head(s) shall be seven (7) conductors and five (5) conductors, respectively. Riser cables shall have stranded conductors.

All joints shall be made above ground level and inside the handhole of a steel pole.

Each wiring aperture drilled into a steel pole shall be deburred and painted with grey, zinc, rich paint. Rubber grommets shall be installed after the paint is dry.

Aerial Installation

Aerial traffic signal cable shall be secured to the upper suspension span using stainless steel lashing wire.

The Contractor shall leave 3 metres of traffic signal cable coiled at each temporary traffic signal head for future relocation of the head.

A PVC junction box, secured to the upper suspension span, shall be used for splicing the traffic signal cable where required.

All joints shall be made above ground level in Owner-approved PVC junction boxes or inside the handhole of a steel pole.

PVC junction boxes shall be installed in accordance with Standard Drawing E-3.03.

Measurement for Payment

Measurement for payment shall be per metre (m) of traffic signal cable supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E608 Supply and Install Extra Low Voltage Cable for Pedestrian Pushbutton

*This Specification shall be read in conjunction with OPSS.MUNI 2410 (Nov 2017).*

*The following Standard Drawings are applicable to this item: E-4.02 and E-4.03.*

The Contractor shall supply and install sufficient two (2) conductor, #14 AWG, ELV cable with shielded core and cover in the location(s) shown on the Drawings.

ELV cable shall be installed:

* aerially from the pedestrian pushbutton to the controller; and/or
* from the pedestrian pushbutton(s) to the controller through the underground conduit system.

ELV cable shall be Belden Inc., polyethylene insulated, polyethylene belted, polyvinyl chloride jacketed, communication cable with 100% electrical shielding, or Equivalent.

ELV cable shall meet the requirements of OPSS.MUNI 2410 and shall be installed in accordance with Standard Drawings E-4.02 and E-4.03.

Pushbutton(s) allocated to each pedestrian phase require a dedicated home run cable.

The Contractor shall label all groups of ELV pedestrian pushbutton cables in the controller cabinet, indicating the phase number and leg of intersection.

Buried Installation

Each wiring aperture drilled into a steel pole shall be deburred and painted with grey, zinc rich paint. Rubber grommets shall be installed after the paint is dry.

All joints shall be made above ground level and inside the handhole of the steel pole(s).

Aerial Installation

All joints shall be made above ground level in Owner-approved PVC junction boxes or inside the handhole of a steel pole.

Measurement for Payment

Measurement for payment shall be per metre (m) of ELV cable supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E609 Supply and Install Aerial Luminaire Wire

The Contractor shall supply and install all wires and accessories required to complete the wiring of the proposed luminaire and/or four-way flashing LED beacon to the service pole in the location(s) shown on the Drawings.

Aerial wire shall be a 600V duplex, type NSF-2 cable for spans less than, or equal to,
38 m. For spans greater than 38 m, two (2) single conductor, 600V, RWU90 cables shall be lashed to a 10 mm, grade 160, bare messenger.

Aerial wire shall be sized so as to satisfy the voltage drop requirements of the electrical equipment and shall not exceed 5%.

Each joint in the aerial wire shall be made above ground in a pole handhole or junction box unless otherwise specified in the Contract Documents.

The Contractor shall ensure that all equipment is adequately grounded.

Connection to the luminaire riser cable shall be made using one (1) single pole, waterproof fuse holder with one (1), 10 amp midget ferrule fuse. The fuse holder shall be installed inside the pole or with an Owner-approved waterproof connector.

Fuse holders shall be Eaton Bussmann Series, "Tron" Catalogue No. HEB-AA or Equivalent.

10 amp midget ferrule fuses shall be Eaton Bussmann Series, Type "KTK" or Equivalent.

The ground wire for the luminaire and/or four-way flashing LED beacon shall be supplied and installed under Item E611.

Aerial wire shall be brought back and connected to the circuit breaker supplied and installed at the service pole under Item E416.

Measurement for Payment

Measurement for payment shall be per metre (m) of aerial luminaire wire supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included) but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E610 Supply and Install Buried Luminaire Wire

*This Specification shall be read in conjunction with OPSS.MUNI 604 (Nov 2017).*

The Contractor shall supply and install all wire and accessories required to complete the wiring of the proposed luminaire to the service pole.

The luminaire wire shall be installed in the new underground conduit in the location(s) shown on the Drawings. Luminaire wire shall not be run into poles without a luminaire.

Luminaire wire shall be single conductor, stranded copper, rated 600 volts and RWU90.

Low voltage wire shall meet the requirements of OPSS.MUNI 604.

Luminaire wire shall be sized so as to satisfy the voltage drop requirements of the electrical equipment and shall not exceed 5%.

Each wire aperture drilled in a steel pole shall be deburred and painted with grey, zinc rich paint. Rubber grommets shall be installed after the paint is dry.

Connection to the luminaire riser cable shall be using one (1) single pole, waterproof fuseholder with one (1), 10 amp midget ferrule fuse. The fuse holder shall be installed inside the pole or with an Owner-approved waterproof connector.

Fuse holders shall be Eaton Bussmann Series, "Tron" Catalogue No. HEB-AA or Equivalent.

10 amp midget ferrule fuses shall be Eaton Bussmann Series, Type "KTK" or Equivalent.

All joints in luminaire wire shall be made above ground in a pole handhole unless otherwise specified in the Contract Documents.

The Contractor shall ensure that all equipment is adequately grounded in accordance with the Ontario Electrical Safety Code.

Ground rods and ground wire for the luminaire pole shall be supplied and installed under Items E414 and E611.

Luminaire wire shall be brought back and connected to the circuit breaker supplied and installed at the service pole under Item E416.

Measurement for Payment

Measurement for payment shall be per metre (m) of buried luminaire wire supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E611 Supply and Install Ground Wire

*The following Standard Drawings are applicable to this item: E-3.01 (aerial installation), E-5.01, E-5.02, E-5.03, E-5.05, E-5.08, E-5.09, E-5.10, E-5.11, E-5.12 and E-5.13. [List only applicable drawing numbers]*

The Contractor shall supply and install a #6 AWG, RWU green, stranded copper ground wire in the location(s) shown on the Drawings.

Aerial Installation

Aerial ground wire shall be installed in accordance with Standard Drawing E-3.01.

Aerial ground wire shall be connected to span wire shall using a compression or impact connector.

Luminaire fixtures shall be bonded to the ground system using a #12 AWG, R90 green, stranded copper ground wire.

A continuous #6 AWG, RWU90 green, stranded copper ground wire shall be installed from the lower stabilizing cable on a temporary pole to the junction box on the same pole for connection to the green traffic signal conductor for the pedestrian head.

Buried Installation

Buried ground wire shall be installed through the entire main conduit system and connected to the service.

Buried ground wire shall be connected to all steel poles, the junction boxes on wood poles, the ground lugs attached to covers and frames in handwells, and new ground rods in handwells, in the location(s) shown on the Drawings.

Buried ground wire is not required outside of the main conduit system where there are no low voltage cables in the ducts.

[Delete the following paragraphs, if not required]

There is an existing ground wire through the existing conduit system which is connected to the existing poles and ground rods.

A continuous #6 AWG, TWU green, stranded copper ground wire shall be installed from the new poles to the existing system ground in the handwell closest to those poles.

A #6 AWG, RWU90 green, stranded copper ground wire shall be installed from the existing system ground in each of the existing handwells to the proposed ground lug attached to the frame of the handwell.

A ground lug shall be installed on the metal frame of the handwell by drilling and tapping a hole in the frame and securely attaching the ground lug with a threaded machine bolt.

All ground wire splices shall be made with thermit weld connections or copper compression ground tap figure “C” connectors.

A continuous #12 AWG, R90 green, stranded copper ground wire shall be installed from the new luminaire fixture to the ground lug in the luminaire pole.

Aerial and Buried Installations

A separate continuous #6 AWG, RWU90 green, stranded copper ground wire shall be installed from the controller to the service.

The controller shall not be connected to the system ground.

A continuous #6 AWG, RWU90 green, stranded copper ground wire shall be installed from the span wire on a pole to the ground rod located adjacent to the pole.

A continuous 2/0 bare, stranded copper ground wire shall be installed from the service enclosure to the four (4) ground rods located adjacent to the pole. (Refer to Standard Drawings E-5.01, E-5.02, E-5.03, E-5.05, E-5.08, E-5.09, E-5.10, E-5.11, E-5.12 and E-5.13). [List only applicable drawing numbers]

The green/yellow conductor in the traffic signal head and pedestrian signal head riser cable shall be connected to the system ground in a pole handhole and/or a junction box.

A green conductor used as ground shall be tagged “ground” in the pole handhole and/or junction box.

Connection to each ground rod shall be made with a thermit weld connector.

The Contractor shall ensure that all equipment is adequately grounded.

Measurement for Payment

Aerial Ground Wire

Measurement for payment shall be per metre (m) of aerial ground wire supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included) but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Buried Ground Wire

Measurement for payment shall be per metre (m) of buried ground wire supplied and installed, based on plan quantity measurement.

The 2/0 cable for the ground grid at the service will not be measured for payment purposes; all costs associated with the 2/0 cable shall be included in the unit price(s) for this item.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E612 Supply and Install Wire for Power Supply

*This Specification shall be read in conjunction with OPSS.MUNI 604 (Nov 2017).*

The Contractor shall supply and install power supply cable from the service to the traffic signal controller.

Power supply cable shall be single conductor, stranded copper, rated 600 volts and RWU90.

Low voltage cables shall meet the requirements of OPSS.MUNI 604.

The cable shall be sized so as to satisfy the voltage drop requirements of the electrical/electronic equipment and shall not exceed 5%.

Measurement for Payment

Measurement for payment shall be per metre (m) of wire for power supply supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E613 Pull Back and Reinstall Existing Traffic Signal Cable, Luminaire Wire and Ground Wire

The Contractor shall pull back all of the existing traffic signal cable, luminaire wire and ground wire from the pole(s) and handwell(s) that are to be removed. These cables shall be reinstalled and connected to the equipment on the relocated and/or new pole(s) and handwell(s).

The Contractor shall stage this work in a way that minimizes the amount of down time to the existing traffic signals.

Measurement for Payment

Measurement for payment shall be per metre (m) of cable pulled back and reinstalled, based on plan quantity measurement.

**Measurement will be made for the group of cables pulled back and reinstalled and not for each individual cable.**

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E614 Supply and Install Optical Pre-Emption Detector Cable

*The following Standard Drawings are applicable to this item: E-3.17 (detector mounted on pole/mast arm) and E-3.35 (detector installed on span wire).*

The Contractor shall supply and install sufficient optical pre-emption detector cable to connect each optical pre-emption detector to the controller.

The cable shall be installed in the proposed conduit system and pole in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.17 (detector mounted on pole/mast) or E-3.35 (detector installed on span wire).

The cable shall be Global Traffic Technologies, No. M-138, or Equivalent, three (3) conductors, #20 AWG stranded, individually tinned copper, colour coded yellow, blue and orange with an aluminized polyester shield and #20 AWG stranded drain wire.

Splices between the detector and the controller are not allowed.

The Contractor shall make the connection to the controller. Testing and implementation shall be carried out by the Owner. The Contractor shall be responsible for any problems with the connection made at the detector or the controller.

Measurement for Payment

Measurement for payment shall be per metre (m) of optical pre-emption detector cable supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E615 Supply and Install Power Feed Cable for Flashing Amber or Red LED Beacon

*This Specification shall be read in conjunction with OPSS.MUNI 604 (Nov 2017).*

*The following Standard Drawings are applicable to this item: E-7.11, E-7.12, E-7.13, E-7.14, E-7.15, E-7.16, E-7.24, and E-7.31. [Select Applicable]*

The Contractor shall supply and install all power feed cable and accessories required to complete the wiring of the flashing beacon to the service pole in the location(s)shown on the Drawings and in accordance with Standard Drawings E-7.11, E-7.12, E-7.13, E-7.14, E-7.15, E-7.16, E-7.24, and E-7.31. [Select Applicable]

Power feed cable shall be single conductor, stranded copper, rated 600 volts and RWU90.

Low voltage wire shall meet the requirements of OPSS.MUNI 604.

Power feed cable shall be sized so as to satisfy voltage drop requirements of the electrical equipment and shall not exceed 5%.

The power feed cable shall be installed in the new underground conduit.

The Contractor shall ensure that all equipment is adequately grounded.

The ground wire for the flashing beacon shall be installed under Item E611.

Power feed cable shall be brought back and connected to the circuit breaker at the service pole.

Measurement for Payment

Measurement for payment shall be per metre (m) of power feed cable supplied and installed, based on plan quantity measurement.

Plan quantity measurement is not a true quantity measurement (riser cables are not included), but is a horizontal measurement taken from the Drawings between handwells, poles, transformers and controller cabinets.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E617 Supply and Install Traffic Control Cabinet Fibre Distribution Terminal

[Designer Note: Current locations with fibre may require this item. Contact Alex Leonienco to determine whether this item is required]

The Contractor shall supply and install a traffic control cabinet fibre distribution terminal, including all associated hardware for mounting purposes. The fibre distribution terminal shall be Fiber Connections Inc. GatorPatch Part # G620U012LNB-150-0 or Equivalent.

Connections and disconnects of new and existing fibre shall be performed by York Telecom Network’s maintenance contractor.

Measurement for Payment

Measurement for payment shall be a count of each fibre distribution terminal supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E701 Supply and Install Cantilever Sign Assembly for Overhead Signs (Type 1)

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18 and E-7.07.*

The Contractor shall supply and install a cantilever sign assembly in the location(s) shown on the Drawings and in accordance with Standard Drawings E-2.17, E-2.18 and E-7.07. The Contractor shall also install Owner-supplied signs as specified.

Cantilever sign assemblies shall be a Valmont West Coast Engineering, Cantilever Octagonal Tapered Shaft Assembly or Equivalent.

Octagonal tapered shafts shall be hot dipped galvanized steel and shall be supplied complete with a pole cap and base plate.

The Contractor shall verify the bolt circle requirements with the manufacturer prior to constructing the concrete pole base.

The pole shall be installed directly on top of the concrete pole base and levelled with galvanized steel shims. Double nutting of a pole will not be allowed.

The Contractor shall install the following signs, which will be supplied to the Contractor by the Owner, in accordance with Standard Drawing E-7.07:

* Rb-41 “Special” (90 cm x 90 cm) lane designation signs;
* a temporary “New” (Wb-3) sign between the lane designation signs; and
* all overhead signs specified in the Drawings

The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Lane designation signs shall be securely covered until the lane markings are in place and the fully protected left turn signals have been activated.

Overhead signs and tabs signs that are not associated with the traffic signals shall be securely covered until the lane markings are in place.

The Contractor shall remove the “New” sign 50 Days after the completion of the traffic control signal modification and return it to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

Measurement for Payment

Measurement for payment shall be a count of each cantilever sign assembly supplied and installed with the Owner-supplied signs.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified, including the removal of the “New” sign.

Item E702 Supply and Install Cantilever Sign Assembly for Overhead Signs (Type 2)

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18, E-7.08,
E-7.36 and E-7.37.*

The Contractor shall supply and install an octagonal hot dipped galvanized steel pole complete with a pole cap and base plate and an aluminum single member arm in the location(s) shown on the Drawings and in accordance with Standard Drawings E-2.17, E-2.18, E-7.08, and E-7.36. The Contractor shall also install Owner-supplied signs as specified.

Octagonal steel poles with pole cap and base plate shall be Valmont West Coast Engineering, 8624 Series, Catalogue No. 8624, or Equivalent.

Aluminum single member arms shall be Sentinel Pole and Traffic Equipment Ltd., Catalogue No. TH20SMA, or Equivalent.

The Contractor shall verify the bolt circle requirements with the manufacturer prior to constructing the concrete pole base.

The pole shall be installed directly on top of the concrete pole base and levelled with galvanized steel shims. Double nutting of a pole will not be allowed.

The Contractor shall install the following signs, which will be supplied to the Contractor by the Owner, in accordance with Standard Drawings E-7.08, E-7.36, and E-7.37:

* Rb-41 “Special” (90 cm x 90 cm) lane designation signs;
* Rb-87 (90 cm x 120 cm) “No Days & Times” reserved lane sign;
* Rb-87 (90 cm x 150 cm) “Specific Days & Times” reserved lane sign;
* Rb-184t “Begins” tab;
* Rb-185t “End” tab;
* a temporary “New” (Wb-3) sign between the lane designation signs; and
* overhead signs specified in the Drawings.

The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Lane designation signs shall be securely covered until the lane markings are in place and the fully protected left turn signals have been activated.

Overhead signs and tabs signs that are not associated with the traffic signals shall be securely covered until the lane markings are in place.

The Contractor shall remove the “New” sign 50 Days after the completion of the traffic control signal modification and return it to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

Measurement for Payment

Measurement for payment shall be a count of each cantilever sign assembly supplied and installed with the Owner-supplied signs.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified, including the removal of the “New” sign.

Item E703 Supply and Install 6.1 Metre Aluminum Traffic Signal Mast Arm for Overhead Lane Designation Sign Assembly

*The following Standard Drawings are applicable to this item: E-7.07 (Type 1 Assembly) and E-7.08 (Type 2 Assembly).*

The Contractor shall supply and install a 6.1 m aluminium traffic signal mast arm, complete with a horizontal pole mounting plate to accept a 150 mm diameter arm (size to suit pole) and all attachments and fittings for mounting on a metal pole.

The mast arm shall be installed in the location(s) shown on the Drawings and in accordance with Standard Drawings E-7.07 (Type 1 Assembly) or E-7.08 (Type 2 Assembly).

Traffic signal mast arms shall be Sentinel Pole and Traffic Equipment Ltd, Catalogue No. ATR20SMA-81 aluminium single member arms or Equivalent.

Measurement for Payment

Measurement for payment shall be a count of each aluminum mast arm supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E704 Reinstall Salvaged Road/Street Name Sign on Traffic Signal Mast Arm

*The following Standard Drawings are applicable to this item: E-7.18, E-7.19, E-7.20 and E-7.32.*

The Contractor shall reinstall a salvaged road/street name sign on a traffic signal mast arm in the location(s) shown on the Drawings and in accordance with Standard Drawings E-7.18, E-7.19, E-7.20 and E-7.32.

Measurement for Payment

Measurement for payment shall be a count of each salvaged road/street name sign reinstalled.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E705 Modify and Reinstall Salvaged Road/Street Name Sign on Span Wire

*The following Standard Drawing is applicable to this item: E-7.32.*

The Contractor shall modify and reinstall a salvaged road/street name sign on span wire in the location(s) shown on the Drawings and in accordance with Standard Drawing E-7.32.

The Contractor shall supply all hardware required to reinstall the salvaged road/street name signs.

Measurement for Payment

Measurement for payment shall be a count of each salvaged road/street name sign modified and reinstalled.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E706 Install “Traffic Signals Ahead” Sign and “Be Prepared To Stop” Tab with a Flashing Amber LED Beacon

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18, E-7.04 and E-7.31.*

The Contractor shall install a “Traffic Signals Ahead” sign and a “Be Prepared To Stop” tab with a flashing amber LED beacon on a 150 mm x 150 mm x 4.3 m long pressure treated wood post/pole/existing pole in the location(s) shown on the Drawings.

**For new signal installations, the Contractor shall also install a “New” sign above the “Traffic Signals Ahead” sign in accordance with Standard Drawing E-7.04.**

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and sign supports shall be supplied and installed by the Contractor.

The “Traffic Signals Ahead” sign, “Be Prepared To Stop” tab and sign support shall be installed in accordance with the Ontario Traffic Manual, Book 6.

The beacon shall be a one-section, 200 mm flashing amber LED beacon.

The amber LED display shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent, with a solid state flasher and aluminum one-way vertical bracket with a 275 mm aluminium extension.

The flashing amber LED beacon shall be mounted using brackets in accordance with Standard Drawing E-7.31.

The signs, flashing amber LED beacon, aluminum brackets, ground rods, sign support and all necessary conduit shall be installed in accordance with Standard Drawings E-2.17, E-2.18 and E-7.31. The grounds rods shall be supplied and installed under Item E414.

The signs shall not be installed until the Day of the traffic signal turn on.

The Contractor shall remove the “New” sign 50 Days after the traffic signal turn on and return it to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

Measurement for Payment

Measurement for payment shall be a count of each “Traffic Signals Ahead” sign, “New” sign and “Be Prepared To Stop” tab with flashing amber LED beacon installed on a sign support supplied by the Contractor.

**Measurement will be made for the group of signs, tabs and beacons installed on a sign support and not for each individual sign, tab and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified, including the removal of the “New” sign.

Item E707 Install “Stop” Sign with Flashing Red LED Beacon

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18 and E-7.11.*

The Contractor shall install a 1.2 m x 1.2 m “Stop” sign (Ra-1101) with a flashing red LED beacon on a 150 mm x 150 mm x 4.3 m long pressure treated wood post or pole in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and sign supports shall be supplied and installed by the Contractor.

The “Stop” sign and sign support shall be installed in accordance with the Ontario Traffic Manual, Book 5.

The beacon shall be a one-section, 300 mm flashing red LED beacon.

The red LED display shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent, with a solid state flasher and aluminum one-way vertical bracket with a 275 mm aluminum extension.

The signs, flashing red LED beacons, aluminum brackets, ground rods, sign supports and all necessary conduit shall be installed in accordance with Standard Drawings E-2.17, E-2.18 and E-7.11. The grounds rods shall be supplied and installed under Item E414.

**Measurement for Payment**

Measurement for payment shall be a count of each “Stop” sign with flashing red LED beacon installed on a sign support supplied by the Contractor.

**Measurement will be made for the group of signs and beacons installed on a sign support and not for each individual sign and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E708 Install Warning Sign with Flashing Amber LED Beacon on Wood Post

*The following Standard Drawing is applicable to this item: E-7.12.*

The Contractor shall install a 1.2 m x 1.2 m “Warning” sign and supplementary tab sign with a flashing amber LED beacon on a 150 mm x 150 mm x 4.3 m long pressure treated wood post in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and wood sign supports shall be supplied and installed by the Contractor.

Wood post shall be set at a depth of 1.5 m.

The “Warning” sign, supplementary tab sign and wood post shall be installed in accordance with the Ontario Traffic Manual, Book 6.

The beacon shall be a one-section, 300 mm flashing amber LED beacon.

The amber LED display shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent, with a solid state flasher and aluminum one-way vertical bracket with a 275 mm aluminum extension.

The signs, flashing amber LED beacons, aluminum brackets, ground rods, wood posts and all necessary conduit shall be installed in accordance with Standard Drawing E-7-12. The grounds rods shall be supplied and installed under Item E414.

Measurement for Payment

Measurement for payment shall be a count of each “Warning” sign and supplementary tab sign with flashing amber LED beacon installed on a wood post supplied by the Contractor.

**Measurement will be made for the group of signs and beacons installed on a wood post and not for each individual sign and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E709 Install \_\_\_\_\_\_\_\_\_\_ Sign with Alternating Flashing Amber LED Beacons

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18, E-7.13,
E-7.14, E-7.15 and E-7.16. [Select applicable drawings]*

The Contractor shall install a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sign with two (2) alternating flashing amber LED beacons on a 150 mm x 150 mm x 4.3 m long pressure treated wood post/pole/existing pole in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and sign supports shall be supplied and installed by the Contractor.

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sign and sign support shall be installed in accordance with the Ontario Traffic Manual, Book 6.

The beacons shall be one-section, 200 mm flashing amber LED beacons.

The amber LED display shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent, with a solid state flasher and two (2) aluminum one-way vertical brackets with 275 mm / 400 mm [Select applicable length] aluminum extensions.

The alternating flashing amber LED beacons shall be mounted using brackets in accordance with Standard Drawings E-7.13, E-7.14, E-7.15 or E-7-16. [Select applicable drawing]

The signs, alternating flashing amber LED beacons, aluminum brackets, ground rods, sign supports and all necessary conduit shall be installed in accordance with Standard Drawings E-2.17, E-2.18, E-7.13, E-7.14, E-7.15 or E-7.16. [Select applicable drawing] The grounds rods shall be supplied and installed under Item E414.

Measurement for Payment

Measurement for payment shall be a count of each \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sign with alternating flashing amber LED beacons installed on a sign support supplied by the Contractor.

**Measurement will be made for the group of signs and beacons installed on a sign support and not for each individual sign and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E710 Install “Traffic Signals Ahead” Sign and “Be Prepared To Stop” Tab with Solar Powered Flashing Amber LED Beacon On Wood Post

*The following Standard Drawings are applicable to this item: E-7.04 and E-7.27.*

The Contractor shall install a “Traffic Signals Ahead” sign and a “Be Prepared To Stop” tab with a solar powered flashing amber LED beacon on a 150 mm x 150 mm x 4.3 m long pressure treated wood post in the location(s) shown on the Drawings.

**For new signal installations, the Contractor shall also install a “New” sign above the “Traffic Signals Ahead” sign in accordance with Standard Drawing E-7.04.**

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and wood posts shall be supplied and installed by the Contractor.

The wood post shall be set at a depth of 1.5 m.

The “Traffic Signals Ahead” sign, “Be Prepared To Stop” tab and wood post shall be installed in accordance with the Ontario Traffic Manual, Book 6.

The solar powered flashing amber LED beacon shall be Carmanah Technologies Corp., Model No. R247C, or Equivalent.

The Contractor shall cut out the amber section of the “Traffic Signals Ahead” sign.

The flashing amber LED beacon shall be mounted using brackets in accordance with Standard Drawing E-7.27.

The signs, solar powered flashing amber LED beacon, solar panel, wood post and all necessary conduit shall be installed in accordance with Standard Drawing E-7.27.

The signs shall not be installed until the Day of the traffic signal turn on.

The Contractor shall remove the “New” sign 50 Days after the traffic signal turn on and return it to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

Measurement for Payment

Measurement for payment shall be a count of each “Traffic Signal Ahead” sign, “New” sign and “Be Prepared To Stop” tab with solar powered flashing amber LED beacon installed on a wood post supplied by the Contractor.

**Measurement will be made for the group of signs, tabs and beacons installed on a wood post and not for each individual sign, tab and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified, including the removal of the “New” sign.

Item E711 Install “Stop” Sign with Solar Powered Flashing Red LED Beacon on Wood Post

*The following Standard Drawing is applicable to this item: E-7.28.*

The Contractor shall install a 1.2 m x 1.2 m “Stop” sign (Ra-1101) with a solar powered flashing red LED beacon on a 150 mm x 150 mm x 4.3 m long pressure treated wood post in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and wood posts shall be supplied and installed by the Contractor.

The post shall be set at a depth of 1.5 m.

The “Stop” sign and wood post shall be installed in accordance with the Ontario Traffic Manual, Book 5.

The solar powered flashing red LED beacon shall be Carmanah Technologies Corp., Model No. R247C, or Equivalent.

The sign, solar powered flashing red LED beacon, solar panel, wood post and all necessary conduit shall be installed in accordance with Standard Drawing E-7.28.

Measurement for Payment

Measurement for payment shall be a count of each “Stop” sign with solar powered flashing red LED beacon installed on a wood post supplied by the Contractor.

**Measurement will be made for the group of signs and beacons installed on a wood post and not for each individual sign and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E712 Install “Warning” Sign with Solar Powered Flashing Amber LED Beacon on Wood Post

*The following Standard Drawing is applicable to this item: E-7.29.*

The Contractor shall install a “Warning” sign with a solar powered flashing amber LED beacon on a 150 mm x 150 mm x 4.3 m long pressure treated wood post in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and wood posts shall be supplied and installed by the Contractor.

The post shall be set at a depth of 1.5 m.

The “Warning” sign and wood post shall be installed in accordance with the Ontario Traffic Manual, Book 6.

The solar powered flashing amber LED beacon shall be Carmanah Technologies Corp., Model No. R247C, or Equivalent.

The sign, solar powered flashing amber LED beacon, solar panel, wood post and all necessary conduit shall be installed in accordance with Standard Drawing E-7.29.

Measurement for Payment

Measurement for payment shall be a count of each “Warning” sign with solar powered flashing amber LED beacon installed on a wood post supplied by the Contractor.

**Measurement will be made for the group of signs and beacons installed on a wood post and not for each individual sign and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E713 Install “Traffic Signals Ahead” Sign and “Prepare To Stop When Flashing” Tab with Alternating Flashing Amber LED Beacons

*The following Standard Drawings are applicable to this item: E-2.17, E-2.18, E-7.04 and E-7.24.*

The Contractor shall install a “Traffic Signals Ahead” sign and a “Prepare To Stop When Flashing” tab with two (2) alternating flashing amber LED beacons on a 150 mm x 150 mm x 4.3 m long pressure treated wood post/pole/existing pole in the location(s) shown on the Drawings.

**For new signal installations the Contractor shall also install a “New” sign above the “Traffic Signals Ahead” sign in accordance with Standard Drawing E-7.04.**

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons and sign supports shall be supplied and installed by the Contractor.

The “Traffic Signals Ahead” sign, “Prepare To Stop When Flashing” tab and sign support shall be installed in accordance with the Ontario Traffic Manual, Book 6.

Beacons shall be one-section, 200 mm flashing amber LED beacons.

The amber LED display shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent, with a solid state flasher and two (2) aluminum one-way vertical brackets with 400 mm aluminium extensions.

The alternating flashing amber LED beacons shall be mounted using brackets in accordance with Standard Drawing E-7.24.

The signs, alternating flashing amber LED beacons, aluminium brackets, ground rods, sign supports and all necessary conduit shall be installed in accordance with Standard Drawings E-2.17, E-2.18 and E-7.24. The grounds rods shall be supplied and installed under Item E414.

The signs shall not be installed until the Day of the traffic signal turn on.

The Contractor shall remove the “New” sign 50 Days after the traffic signal turn on and return it to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

Measurement for Payment

Measurement for payment shall be a count of each “Traffic Signals Ahead” sign, “New” sign and “Prepare To Stop When Flashing” tab with alternating flashing amber LED beacons installed on a sign support supplied by the Contractor.

**Measurement will be made for the group of signs, tabs and beacons installed on a sign support and not for each individual sign, tab and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified, including the removal of the “New” sign.

Item E714 Install “Warning” Sign with Solar Powered Flashing Amber LED Beacon on Concrete Base Mounted Steel Pole

*The following Standard Drawing is applicable to this item: E-7.35.*

The Contractor shall install a “Warning” sign and supplementary tab sign with a solar powered flashing amber LED beacon on a concrete base mounted steel pole in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Beacons shall be supplied and installed by the Contractor.

The steel pole and concrete base shall be supplied and installed under Items E201, E204, E205 and E206, as applicable.

The “Warning” sign and supplementary tab sign shall be installed in accordance with the Ontario Traffic Manual, Book 6.

The solar powered flashing amber LED beacon shall be Carmanah Technologies Corp., Model No. R247C, or Equivalent.

The signs, solar powered flashing amber LED beacon, solar panel and all necessary conduit shall be installed in accordance with Standard Drawing E-7.35.

The sign, solar powered flashing amber LED beacon, solar panel, wood post and all necessary conduit shall be installed in accordance with Standard Drawing E-7.29.

Measurement for Payment

Measurement for payment shall be a count of each “Warning” sign and supplementary tab sign with solar powered flashing amber LED beacon installed on a concrete base mounted steel pole.

**Measurement will be made for the group of signs and beacons installed and not for each individual sign and beacon installed.**

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E715 Install Special “Opposite Left Turning Traffic Uses Both Lanes” Sign

The Contractor shall install a special high intensity “Opposite Left Turning Traffic Uses Both Lanes” sign in the location(s) shown on the Drawings.

The signs shall be supplied to the Contractor by the Owner. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements to pick up the signs.

Signs mounted over the road surface shall be mounted at a minimum height of 5.0 m.

Signs mounted in the boulevard shall be mounted between 2.0 m and 2.5 m above finished grade.

The sign shall be banded to the mast arm or pole with 16 mm stainless steel strappings, 4.5 kN ultimate strength, on both the top and bottom of the sign. Two (2) washers shall be used for each bolt; one (1) flat 9.4 mm x 19 mm diameter nylon washer placed against the sign surface and one (1) flat 9.4 mm x 19 mm diameter stainless steel washer on top of the nylon washer.

Measurement for Payment

Measurement for payment shall be a count of each sign installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E716 Permanent Roadway Signing

*This Specification shall be read in conjunction with OPSS.MUNI 510 (Nov 2018).*

*The following Standard Drawings are applicable to this item: E-6.03, E-7.01, E-7.04, E-7.06, E-7.07, E-7.08, E-7.18, E-7.19, E-7.20, E-7.32 and E-7.38.*

A sign scheme indicating the location(s), type(s) and number of permanent signs is included in the Drawings.

The Contractor shall install and relocate signs in the location(s) shown on the Drawings and in accordance with the OTM, Books 5 and 6, MTO Sign Support Manual (April 2015) and York Region Signing Bylaws. Sign location(s) as shown on the Drawings are approximate and may have to be adjusted to suit utility or sight line requirements.

The Contractor shall remove all regulatory, warning and information signing, including supports, which are affected by construction activities. The signs shall be removed from their supports and delivered to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury, immediately upon their removal. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements for the delivery of the signs.

“Stop”, “Yield”, fingerboard type street name signs, 911 street address signs, “York Region Transit” (YRT) signs and “GO Bus” signs shall be relocated to suit construction activities for the duration of the Contract. These signs must be positioned to be visible to emergency service vehicles at all times. Upon completion of the Work, these signs shall be transported to, and installed, in their permanent location(s).

The Contractor shall relocate the existing “Keep Right” sign(s) and “Object marker” sign(s) on a 100 mm x 100 mm pressure treated wood post or "U" channel steel post in accordance with Standard Drawing E-7.01. The Contractor shall remove and dispose of the "U" channel steel post and return the 100 mm x 100 mm pressure treated wood post to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

The Contractor shall install, as applicable:

* high intensity “Left Turn Signal” sign(s) (Rb-81 “Special” − 600 cm x 900 cm) in accordance with Standard Drawing E-7.06;
* “Share The Road” sign(s) (Wc-47) and “Share The Road” tab(s) (Wc-47t) on a steel pole or wood post as specified in the Drawings and in accordance with Standard Drawing E-7.38;
* “New” sign(s) in accordance with Standard Drawings E-7.04, E-7.06, E-7.07 and E-7.08;
* “Cross Other Side” sign(s) (Ra-109A) on a steel pole or wood post as specified in Drawings;
* “Keep Right” sign(s) and “Object Marker” sign(s) in median islands in accordance with Standard Drawing E-7.01; and
* road/street name signs in accordance with Standard Drawings E-7.18, E-7.19, E-7.20 and E-7.32.

The signs shall be bagged until the time is appropriate for their display.

Signs installed within a concrete island shall be finished with cold mix asphalt, properly compacted in accordance with Standard Drawing E-6.03.

All signs shall be supplied to the Contractor by the Owner.

The Contractor shall contact the Owner a minimum of 20 Working Days prior to the commencement of the signal installation to arrange for fabrication of the signs and hardware. The Owner will notify the Contractor when the signs are available for pick up.

The retroreflective sheeting types for all signs will be in accordance with the OTM.

The Owner will attach all necessary hardware for road/street name signs being installed on traffic signal mast arms. The Contractor shall supply all other required hardware required.

**All permanent signs must be installed prior to the placement of the top coat of asphalt. The Contractor may be required to install all permanent roadway signs prior to the winter shutdown, at no additional cost to the Owner, as determined by the Owner.**

Sign posts shall be 100 mm x 100 mm pressure treated wood supplied and installed by the Contractor unless otherwise specified in the Drawings.

Existing supports may be reused provided they are in a condition acceptable to the Owner and they meet the requirements of the OTM and this specification; otherwise, all new material shall be used.

In some instances, and only with the prior approval of the Owner and the applicable utility, signs may be mounted using appropriate mounting brackets to adjacent utility poles.

All unused supports that are in good condition shall be delivered to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury.

The Contractor shall dispose of unsuitable materials at a disposal site approved by the Owner.

Holes left from the removal of the wood post shall be back filled with Granular ‘A’ compacted to 100% maximum dry density and 50 mm of cold mix asphalt.

The Contractor shall remove existing “STOP” sign(s) and “STOP AHEAD” sign(s) from their posts immediately following the traffic signal turn on.

The Contractor shall remove the “New” sign(s) from all installations 50 Days after the installation or, in the case of traffic control signals, 50 Days after the traffic control signals have been energized.

“Traffic Signals Ahead” signs in urban areas shall be removed 50 Days after the traffic control signal turn on unless otherwise specified in the Contract Documents.

“Traffic Signals Ahead” signs in rural areas shall remain in place after the traffic control signal turn on.

All salvaged road/street name signs and hardware shall be delivered to the Owner at its Operations Centre located at 90 Bales Drive East, East Gwillimbury, immediately upon their removal. The Contractor shall contact the Owner’s Sign Shop at 1-877-464-9675, extension 75276 and make arrangements for the delivery.

Measurement for Payment

Measurements will not be taken for payment purposes.

Progress payments shall be based on the Owner’s estimate of the percentage of the work completed under this item.

All costs associated with placing cold patch around the sign post shall be included in the unit price for this item.

Basis of Payment

Payment shall be made at the lump sum price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified. The total amount paid under this item shall not exceed 100% of the lump sum price for this item.

Item E801 Supply and Install Rigid PVC Junction Box in Concrete Barrier Wall

*The following Standard Drawing is applicable to this item: OPSD 2302.010 (Nov 2010).*

The Contractor shall supply and install Type P3-1 rigid PVC junction boxes in concrete barrier wall in the location(s) shown on the Drawings and directed by the Owner.

The installation shall be in accordance with OPSD 2302.010.

Measurement for Payment

Measurement for payment shall be a count of each rigid PVC junction box supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E802 Supply and Install Expansion and Deflection Fitting Assembly

*The following Standard Drawing is applicable to this item: OPSD 2302.020 (Nov 2013).*

The Contractor shall supply and install expansion and deflection fitting assemblies for 50 mm diameter duct in the location(s) shown on the Drawing and directed by the Owner.

The installation shall be in accordance with OPSD 2302.020.

Measurement for Payment

Measurement for payment shall be a count of each expansion and deflection fitting assembly supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E803 Supply and Install Rigid PVC Junction Box on Wood/Concrete Pole

*The following Standard Drawing is applicable to this item: E-3.03.*

The Contractor shall supply and install a 150 mm x 150 mm x 150 mm rigid PVC junction box, complete with cover, gasket and brass screws, on a wood or concrete pole for loop lead-in connections to home run cable. The junction box shall be installed in the location(s) shown on the Drawings and in accordance with Standard Drawing E-3.03.

The Contractor shall also install 25 mm or 38 mm diameter rigid PVC conduit on the pole.

Conduit shall be mounted using PVC coated, two-hole steel straps for wood poles and stainless steel banding for concrete poles placed at intervals as specified by ESA Rule
12-1114, based on the conduit size.

Measurement for Payment

Measurement for payment shall be a count of each rigid PVC junction box supplied and installed with associated conduit.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E804 Supply and Install Delineator

*The following Standard Drawing is applicable to this item: E-8.01.*

The Contractor shall supply and install a delineator for the protection of a concrete handwell in the location(s) shown on the Drawings.

The delineator shall be installed in accordance with Standard Drawing E-8.01.

Measurement for Payment

Measurement for payment shall be a count of each delineator supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E805 Supply and Install Flexible Delineator

*The following Standard Drawing is applicable to this item: E-8.07.*

The Contractor shall supply and install a flexible delineator to protect a concrete slab raised median island in the location(s) shown on the Drawings.

Flexible delineators shall be Filtrona Extrusion Inc., Model FG 300 UR or Equivalent.

Flexible delineators shall be installed in accordance with Standard Drawing E-8.07.

Measurement for Payment

Measurement for payment shall be a count of each delineator supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E806 Supply and Install a Counting Station Cabinet

The Contractor shall supply and install a pole mounted cabinet for a counting station in the location(s) shown on the Drawings.

The cabinet shall be aluminum (a minimum of 3.175 mm thick) and a minimum of 2 feet wide, 3 feet high and 2 feet deep.

The cabinet shall be a door-in-door type, complete with a Pelco SM1026 or Equivalent door lock and key and finished in grey polyester powder coat baked enamel.

The cabinet shall comply with all applicable NEMA standards.

The main door of the cabinet shall substantially cover the full area of the front of the cabinet and shall be provided with a minimum of 2 positions (90 degree and 120 degree) open stop, which can be locked in place.

The cabinet shall be supplied with three-point latching mechanisms constructed of heavy cadmium plated steel bar and nylon rollers on the locking bar, and a handle which will serve to secure the door. The door stop shall be durable stainless steel, approximately 10mm in diameter, fastened to the door. It shall be sufficient to hold the door securely in all field conditions.

The handle shall be durable stainless steel, with a durable 12.5 mm shank, and shall be subject to approval by the Owner. The handle shall not impede the operation of the lock during opening.

All internal and external cut edges shall be ground smooth to prevent injury or damage.

The cabinet shall contain the following:

* one (1) pullout shelf capable of safely supporting a laptop computer;
* an air vent with air filter and removable aluminium cover;
* an adjustable thermostatically controlled heater (bar type, minimum 250W, CSA approved) and an adjustable thermostatically controlled fan with manual control, which shall be vented to the outside. Thermostats shall be located so as to be easily accessible and the thermostat terminals shall be insulated to prevent accidental shock or shorting;
* two (2) internal 15amp circuit breakers with labels; one (1) for power feed and one (1) for auxiliary equipment;
* two (2) 110V AC duplex power outlets (CSA approved), equipped with a ground fault protection unit. One (1) unit shall be located near the bottom half of the cabinet, the other located above the top shelf;
* a lamp outlet complete with a 60W lamp and switch; and
* a clear plastic cover over the power supply.

The Contractor shall terminate all vehicle detection loops in the counting station cabinet.

The Contractor shall also supply a power connection from the service to the counting station cabinet in preparation for the installation of the counting equipment, by outside sources, after the completion of the Work.

Measurement for Payment

Measurement for payment shall be a count of each counting station cabinet supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E807 Supply and Install Guy (All Types)

*The following Standard Drawings are applicable to this item: OPSD 2235.010 (Nov 2022), E-3.22 (Strut Guy) and E-3.23 (Pole Guy).*

The Contractor shall supply and install:

* a strut guy in accordance with Standard Drawing E-3.22 and OPSD 2235.010; and/or
* a pole guy and in accordance with Standard Drawing E-3.23 and OPSD 2235.01

in the location(s) shown on the Drawings.

Measurement for Payment

Measurement for payment shall be a count of each strut guy and/or pole guy supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E808 Supply and Install Pipe Bumper

*The following Standard Drawing is applicable to this item: E-8.02.*

The Contractor shall supply and install a pipe bumper in the location(s) shown on the Drawings and in accordance with Standard Drawing E-8.02.

Measurement for Payment

Measurement for payment shall be a count of each pipe bumper supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E809 Supply and Install Four-Way Flashing LED Beacons

The Contractor shall supply and install two (2), one-section 300 mm flashing red LED beacons and two (2), one-section 300 mm flashing amber LED beacons in the location(s) shown on the Drawings.

The beacons shall be installed on span cable and orientated using a four-way span cable bracket.

Beacons shall be a pre-qualified Product by the California Department of Transportation (Caltrans) or Equivalent, with a solid state flasher.

Measurement for Payment

Measurement for payment shall be a count of each set of four-way flashing LED beacons supplied and installed.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E810 Supply and Install Solar Panel for Flashing LED Beacons

*The following Standard Drawings are applicable to this item: E-7.04, E-7.27, E-7.28,
E-7.29 and E-7.35. [Select applicable drawings]*

The Contractor shall supply and install a solar panel complete with insulated cabinet, absorbed glass mat battery packs, charging regulator, field terminals, and any additional equipment required for the safe operation of the solar panel. as a power supply for LED beacons in the location(s) shown on the Drawings. The Contractor shall also supply and install all wiring necessary to power the LED beacons.

The solar panel and associated equipment shall be a product of Electromega Ltd. or Equivalent.

The solar panel array shall consist of two (2), 75 watt panels and shall be installed in a southerly direction to maximize charging ability.

The equipment shall be installed in accordance with Standard Drawings E-7.04, E-7.27, E-7.28, E-7.29 and E-7.35. [Select applicable drawing]

The battery capacity shall be 135 amps at 12 VDC. The batteries shall be deep cycle absorbed glass mat and shall include built-in charging circuitry regulated battery voltage.

The cabinet shall be 463.6 mm wide x 775 mm high x 413 mm deep, fabricated of aluminum, and be insulated with encapsulated fibreglass for improved winter battery performance. The lock and key for this cabinet shall be the same as the lock and key for the controller cabinet.

The beacons shall be supplied and installed under Items E710, E711, E712 and/or E714.

The Contractor shall ensure that all equipment is sufficiently grounded.

Measurement for Payment

Measurement for payment shall be a count of each solar panel supplied and installed with the associated equipment.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.

Item E811 Supply and Install Pager Activated Flasher Control

*The following Standard Drawings are applicable to this item: E-7.13, E-7.14, E-7.15 and
E-7.16. [Select applicable drawings]*

The Contractor shall supply and install a pager activated flasher control, complete with antenna, in a weatherproof cabinet in the location(s) shown on the Drawings.

Pager activated flasher controls shall be RTC Manufacturing Incorporated, Model
CPR 2100 or Equivalent.

The cabinet and antenna shall be installed in accordance with Standard Drawings E-7.13, E-7.14, E-7.15 or E-7.16. [Select applicable drawing]

Measurement for Payment

Measurement for payment shall be a count of each pager activated flasher control supplied and installed, complete with antenna and cabinet.

Basis of Payment

Payment shall be made at the unit price and shall be full compensation for all labour, equipment and materials necessary to complete the work as specified.