CORPORATION OF THE CITY OF BURLINGTON

STANDARD SPECIFICATIONS FOR

TRAFFIC SIGNAL INSTALLATION - SPECIFICATION NO. SS4

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GENERAL

This specification covers the requirements for all signal work in the City of Burlington. Unless otherwise amended herein, or as specified in the contract drawings and documents, the provisions of the City of Burlington's Standards and the provisions of the Ontario Provincial Standard Specifications (OPSS) listed under Uniform Traffic Signal Control (UTSC) - Specifications and Standards for Operating Authorities within the Region of Halton, Section 2 - REFERENCES shall apply to this work.

ABBREVIATIONS

ACI – shall mean "American Concrete Institute"
AODA - shall mean "Accessibility for Ontarians with Disabilities Act"
ASTM - shall mean "The American Society of Testing Materials"
AWG - shall mean "American Wire Gauge"
CSA - shall mean "Canadian Standards Association"
ESA - shall mean "Electrical Safety Authority"
IMSA - shall mean "International Municipal Signals Association"
ITE - shall mean "Institute of Transportation Engineers"
LED - shall mean "Light Emitting Diode"
OPSD - shall mean "Ontario Provincial Standard Drawings"
OPSS - shall mean "Ontario Provincial Standard Specification"
OTM - shall mean "Ontario Traffic Manual"
UTSS – shall mean "Uniform Traffic Control Signals and Specifications for Operating Authorities within the Region of Halton"
UL – shall mean "Underwriters Laboratories"

Whenever a publication of any one of the above or similar organization is mentioned in these specifications, such mention shall refer to the latest issue of the said publication, including all appendices and revisions.

CONTRACTOR QUALIFICATIONS & RESPONSIBILITIES

All electrical work shall be performed under the direct supervision of a licensed (Construction and Maintenance 309A or 309D or Master) electrician with a minimum of five (5) years previous experience in traffic signal installations as well as related experience in the assembly and maintenance of traffic signal control equipment.

All persons employed by the Contractor to work on the above ground traffic signal installation must have successfully completed the I.M.S.A. Level II Traffic Signal Technician Certification program. The Contractor shall provide proof that the individuals performing the electrical work are currently certified as part of the tender submission.

The Contractor shall provide an unconditional warranty on the work done by the Contractor for a period of one year from the date of acceptance by the City of the completed installation.

Contractors currently qualified and permitted by the City to bid on this project are:

- Ducon Utilities Limited
- Guild Electric Limited
- Utility Installation Limited (Weinmann Electric)
- E.C. Power & Lighting Limited
- TM3 Electrical Contractors Inc
- Black & McDonald Limited
- Beacon Utility Contractors Limited

Contractors not presently pre-qualified and wishing to become so for future bid opportunities are invited to complete the required certification programs and submit the respective documentation as well as proof of relative experience as detailed above. The pre-qualification process may take up to four (4) weeks to complete.

MATERIALS GENERAL

Unless otherwise specified in the Contract, all materials shall be new, of uniform pattern throughout the work and fabricated and supplied by recognized equipment manufacturers to meet the requirements of the City of Burlington. All materials, components or completed assemblies of components shall be approved and certified by either:

a) Canadian Standards Association,
b) An organization that has been accredited by the Standards Council of Canada; or
c) Electrical Safety Authority.

All materials shall be stored in accordance with manufacturer's instructions to prevent damage, soiling, or finish spoilage. New poles shall be stacked to prevent bending or warping and shall be protected against any condition that may cause chipping or pitting in the finish.

The Contractor shall supply all materials as specified in the contract documents and any miscellaneous hardware and material (electrical tape, marrettes, connectors, etc.), required for installation.

If the Contractor is unable to comply with all items in this specification but still wishes to submit a bid, all variances from this specification must be submitted in writing to the Contract Administrator prior the Tender.

WORK BY CITY TRAFFIC SIGNAL MAINTENANCE STAFF

City Traffic Signal Maintenance staff will supply and install the controller cabinet, which shall include all intersection and system control equipment contained within the cabinet.

City Traffic Signal Maintenance staff will be responsible for the final signal hookup (pedestal/controller cabinet) and must be present for signal turn on after final approval by the ESA. The Contractor shall notify the Contract Administrator three (3) working days in advance of signal work completion, so arrangements can be made for City Traffic Signal Maintenance staff to complete final pre-activation inspection of the installation. The new traffic signal installation shall not be activated until all deficiencies have been rectified or a mutually agreed upon plan for correction has been established.

The City Traffic Signal Maintenance staff shall complete the following:

a) Test the emergency vehicle pre-emption equipment installed by the Contractor;
b) Program and test the accessible pedestrian pushbutton equipment installed by the Contractor;
c) Splice/terminate all communication cable installed by the Contractor;

PART I - TRAFFIC SIGNALS -- UNDERGROUND

A. WORK INCLUDED

Underground Work – consists of the supply of all labour, equipment and material for the installation of conduit, concrete pole bases, electrical chambers, service boxes, bell boxes, junction boxes, concrete controller base, island marker bases and any other items as shown on the contract documents. The quantities listed in the contract documents may be subject to change; therefore, the Contractor must be willing to perform additional work using the same unit prices.

These installations shall be made as shown on the contract document(s) which form part of this tender. All work on any one intersection must be complete within 21 days after starting. If the contractor does not fulfill this requirement, the Contractor shall be liable to a penalty of Five Hundred dollars ($500.00) for each calendar day that exceeds the said time period, regardless of the type of delay.

B. MATERIAL

Materials supplied by the Contractor shall meet the following specifications:

CONDUIT

a. Open cut installations shall be rigid polyvinyl chloride (PVC) conforming to CSA Standards C.22.2 No. 211.2 as manufactured by Scepter Manufacturing Co. or approved equivalent.
b. Directional boring road crossings shall be High Density Polypipe conforming to CSA Standards B137.

CONCRETE

CITY OF BURLINGTON – OPS AMENDMENTS FOR CONCRETE

The requirements of OPSS 904, 1002, 1212, 1301, 1302, 1303, 1305, 1306, 1308, 1315 and 1350 shall apply except as modified:

a. Slag cement is not permitted in concrete mix on hot and windy days or after November 1st. The City will accept a maximum of 25% of slag by mass in the total quantity of Portland cement in the mix design. No fly ash is permitted in any concrete mix design supplied to any City of Burlington projects.
b. Crushed percentage for coarse aggregate shall not be less than 80%, shall be fractured on two faces, and must meet A.C.I. Gradation.
c. Approved concrete mix design by Type "A" certified lab shall be submitted two weeks prior to structural pours over 10m3 including the cement content.
d. All concrete plants shall be approved by the Contract Administrator or his representative.
e. The Contact Administrator or their representative shall have access without prior notice to premises of the concrete plant for the purpose of inspection.
f. Prices for preparation and placement of concrete in hot and cold weather including concrete, labour and materials forms shall be included in the unit cost items.
g. OPSS 1350.05.02.01 Table I Materials

The following table for cement content shall apply to concrete mixes unless otherwise specified:	
Class of Concrete	Min. 32 Mpa @ 28 days
Cement Content	Type 10 (325 kg/m3)
Coarse Aggregate	19 mm nominal maximum size
Air Content (%)	5.0-8.0
Maximum Slump	110 mm

C. PROCEDURES

UG-1 CONDUIT

Conduit shall be installed in sizes specified on contract documents and as shown on Standard Drawing S-302. The installed conduits must be free of any obstructions (dirt, stones, etc.). A bull line made of 100% polypropylene or equivalent must be placed in each conduit. Conduit shall be capped to ensure that it remains clean and free of obstructions.

UG-2 CONCRETE CONTROLLER BASE

The concrete controller base shall be constructed as shown on Standard Drawing S-304 or S-304-A. These drawings are a guideline only and are not specific to any one intersection. A detailed controller pad drawing showing conduit layout and bell box placement (if specified) is shown on the Traffic Signal construction drawing. **The controller base must have a smooth concrete (Class 'A') finish.**

UG-3 CONCRETE POLE BASES

The pole bases shall be constructed per contract documents and Standard Drawing S-302. Richmond anchor assembly shall be spaced and supported by means of a template. Before the concrete is poured, **the Contractor shall "spin" the studs in the anchor assembly down to leave a maximum 50mm from the top of the template to the top of the stud**. After pouring and setting of the concrete, the template shall be removed and the projecting threads greased and protected with a sleeve held in position with the nuts required for holding down the metal pole. Sonotube above ground level shall also be removed.

UG-4 TRAFFIC HAND HOLE/SERVICE BOX/ELECTRICAL CHAMBERS

The Traffic Hand Hole/Service Box shall be installed as shown on contract documents and Standard Drawing S-302.

When specified, traffic hand hole/steel frame & cover shall be constructed where indicated on the contract documents. They shall be constructed as shown on Standard Drawing S-339. After pouring and setting of concrete, all interior sonotube and outside sonotube above ground level shall be removed.

The Contractor shall supply and install a 20mm diameter by 3000mm copper clad ground rod with a CSA approved U-Strap ground wire connector or a 600mm x 600mm x 10mm hot dipped galvanized plate (where required) in all types of new and existing Traffic Hand Holes.

The following Traffic Hand Hole/Service Box assemblies are approved for installation:

		Type I – 13x24		**Type II – 17x30**	
Brand	**Item**	**Straight**	**Flared**	**Straight**	**Flared**
Quazite (Hubbell)	Enclosure	PG1324 BA18	PD1324BA18	PG1730BA18	PD1730BA18
	Cover	PG1324HA0046		PG1730HA0046	
Oldcastle (Synertech)	H-Series Enclosure	PC1324 -18S	PC1324-18F	PC1730-18S	PC1730-18F
	Cover	PC1324-T22 TRAFFIC SIGNAL		PC1730-T22 TRAFFIC SIGNAL	

UG-5 JUNCTION BOXES

Junction boxes shall be Quazite #PC1212BA12 with cover #PC1212HA0046 or Synertech H-Series PC1212-12 with cover #PC1212 TRAFFIC SIGNAL. Junction boxes shall be installed as shown on Standard Drawing S-303.

UG-6 GENERAL

All installations shall be made to the satisfaction of the Contract Administrator. The Contractor shall take all necessary measurements in the field in order to enable him/her to completely confirm the dimensions on all drawings. The Contractor shall demonstrate that the supplied material meets the standards set forth in the specifications. The Contractor at his/her expense shall correct all defects.

UG-7 BASIS OF PAYMENT

Measurement of conduit shall be in meters and shall be along the horizontal from centre of a hand hole or pole base to centre of a hand hole or pole base. No additional payment will be made for bends, risers, etc. unless specifically indicated.

Payment for conduit shall include the supply and installation of the conduits, fish line, all bends, risers, caps, spacers, concrete, excavation of trenches, removal and disposal of materials, bedding, backfill and compaction.

UG-8 INSPECTION

All underground work (ducts, pole bases, junction boxes, controller pad, THH's, etc.), must be inspected by one of the City Traffic Signal Maintenance staff before the above ground installation can proceed.

PART II - TRAFFIC SIGNAL ABOVE GROUND

A. WORK INCLUDED

Aboveground Work – consists of the supply of all labour, equipment and materials (excluding City-supplied materials as specified in the contract documents) required for the above ground installation of signalized traffic control and roadway lighting devices. These installations shall be made as shown on the contract documents. The quantities listed in this tender may be subject to change; therefore, the Contractor must be willing to perform additional work using the same unit price.

B. MATERIAL

Unless otherwise specified in the Contract, the City of Burlington shall supply the Contractor with the following items ONLY:

- Assembled traffic signal controller cabinet (City to install as well);
- Traffic Signal Pedestals complete with terminal strip (for installation on the controller pad, if specified);
- Street name signs

The items supplied by the City may be picked up at the Operations Centre, 1340 Brant Street, Burlington, Ontario. The Contractor shall phone the City signal shop at 905-335-7600, ext 6163 between 7:00 A.M. and 3:00 P.M. Monday to Friday to arrange for pickup of material. A minimum of 24 hours notice is required.

C. PROCEDURES

The installation shall be made in a manner to the satisfaction of the Contract Administrator. **The above ground installation shall not proceed until all deficiencies noted in the underground inspection have been corrected**. Upon completion of the installation, the Contractor shall test all cable, signal heads, pedestrian heads and loops to ensure that there are no short circuits or open circuits, and that all exposed equipment is grounded. All defects disclosed by testing shall be corrected by the Contractor at their expense until all equipment is accepted as satisfactory by the Contract Administrator. Installation of the controller cabinet by the City Traffic Signal Maintenance staff shall not proceed until all deficiencies have been corrected.

If required, the Contractor shall be responsible to arrange for Pay Duty Police to control traffic during the activation of the traffic control system.

The Contractor shall provide the Contract Administrator a minimum of three (3) working days notice prior to scheduling the traffic signal control activation. This is to ensure that the signal equipment and system are fully operational and all noted deficiencies identified during inspections have been corrected. Please note that activations/turn on is restricted to Tuesdays, Wednesdays, or Thursdays.

D. VARIANCE FROM SPECIFICATION

If the Contractor is unable to comply with all items in this specification, but still wishes to submit a bid, all variances from this specification must be submitted in writing to the Contract Administrator.

Any variations from this specification must be approved in writing by the Contract Administrator prior to the installation.

The decision of the Contract Administrator as to the suitability of any or all installations shall be final.

E. SUPPLY AND/OR INSTALLATION

AG-1 TRAFFIC SIGNAL POLES

The Contractor shall supply and install Valmont West Coast Engineering 8620 (6.1m) and 8315 (4.6m) poles, or Spina Steel OCT-T-20H and OCT-T-15, in quantities as outlined in the contract documents, or as directed by the Contract Administrator. These poles shall be complete with pole caps and hand holes for underground wiring. The poles shall be erected in accordance with procedures specified by manufacturer and/or Contract Administrator.

On poles requiring an extension for mounting luminaires and/or video detection cameras, the Contractor shall use pole extensions as manufactured by Valmont West Coast Engineering or Spina Steel to the City of Burlington Specification detailed in S-322.

Where poles are perforated for cables or cut for any reason, any sharp edges shall be filed, then treated with a zinc rich compound and fitted with rubber grommets.

AG-2 TRAFFIC SIGNAL ARMS

The Contractor shall supply and install the following types or approved equivalent of single member mast arms in quantities as outlined in the contract documents and in locations as shown on contract drawings or as directed by the Contract Administrator or their representative.

Description	Size	Type
Mast arm	0.6m	R2-JA
Mast arm	1.2m	R4-JA
Mast arm	1.8m	TR6SMA-78
Mast arm	3.0m	TR10SMA-78
Mast arm	3.6m	TR12SMA-78
Mast arm	4.6m	TR15SMA-78
Mast arm	6.1m	TR20SMA-78
Mast arm	6.7m	TR22SMA-78

The mast arms and tapered elliptical arms shall be installed in accordance with procedures specified by the manufacturer and/or Contract Administrator. All mounting hardware must be either stainless steel or hot dipped galvanized. Where applicable, all banding used for installation of traffic signal arms shall be BAND-IT C20699, 0.75" width and 0.030" thickness, or approved equivalent.

AG-3 TRAFFIC SIGNAL HEADS

The contractor shall supply and install traffic signal heads and mounting hardware as specified in the contract documents. Signal heads shall be polycarbonate with a yellow front (door) section and grey rear (housing) section. Polycarbonate backboards shall have a yellow front surface and a grey back surface. The front surface shall include 3” wide “3M Fluorescent Yellow 4081” reflective sheeting applied along the perimeter of the backboard. During installation of the backboard to the signal head, a #10 x ¾” x 3/64” washer is to be installed between the screw head and the polycarbonate backboard.

Cable termination shall be made in the amber housing with approved wing-nut connectors. Terminal strips shall not be used to make connections in the traffic signal heads.

The City's current traffic signal head specifications are as follows:

Signal Type	Description	Vendor/Product Number
200-200-200	Pre-assembled 3-section x 200mm signal head including RAG Bicycle LED modules. Visors and bird stops.	Fortran Traffic Systems Ltd: P2B1000
300-200-200	Pre-assembled 300-200-200mm (12-8-8) Poly Signal, Grey Body/Yellow Doors, R-Y-G XL - LEDs, Cap Visors, Yellow/Grey Poly Backboard w/ 3M Reflective Tape	McCain: ITS Part Number ACSB83F303XLGP-3M
300-300-300	Pre-assembled 3-section x 300mm signal head including LED modules, visors, bird stops, and polycarbonate backboard Pre-assembled 3x300mm (3x12) Poly Signal, Grey Body/Yellow Doors, R-Y-G XL - LEDs, Cap Visors, Yellow/Grey Poly Backboard w/ 3M Reflective Tape	Fortran Traffic Systems Ltd: P3LHM00/BSP3374R/SCC001 McCain: ITS Part Number APSB83F300XLGP-3M
300-300-300-300 (Type 9A)	Pre-assembled 4-section x 300mm signal head including LED modules, visors, bird stops, and polycarbonate backboard Pre-assembled 4x300mm (4x12) Poly Signal, Grey Body/Yellow Doors, R-Y-G-LBM XL - LEDs, Cap Visors, Yellow/Grey Poly Backboard w/ 3M Reflective Tape	Fortran Traffic Systems Ltd: P3LEM00/BSP3474R/SCC001 McCain: ITS Part Number APSB84F499XLGP-3M

The following table is a general guideline of typical traffic signal mounting hardware applications. The contractor shall supply and install hardware as specified in the contract documents.

Signal Type	Mounting Location	Hardware
200-200-200	Face/Side Mount	Rigid Arm Brackets
	Mast Arm	Cushion Hanger
300-300-300	Face/Side Mount	Rigid Arm Brackets
	Mast Arm	Plumbizer/Dual End Bracket
(300-300-300-300)	Face/Side Mount	Rigid Arm Brackets
	Mast Arm	Dual End Bracket

Mounting hardware shall be:

- Cushion hangers: Fortran HAN555, or Sentinel STE4025, or Traffic Hardware & Design RCH-001N
- Plumbizers: Sentinel AP4020-T or Traffic Hardware & Design PLU-001N
- Dual end brackets:
    - Sentinel VSB-C-46 or Traffic Hardware & Design CCL-300VN for 3-section heads
    - Sentinel VSB-C-58 or Traffic Hardware & Design CCL-400VN for 4-section heads
- Rigid Arm Pairs:

- 0.4m - Sentinel DB-RDPSA-16-2 or Traffic Hardware & Design DPA-16T
- 0.6m - Sentinel DB-RDPSA-24-2 or Traffic Hardware & Design DPA-24T

Signal heads and mounting hardware shall be installed in accordance with procedures specified by the manufacturers and/or Contract Administrator. When installed over the travelled portion of the roadway, the bottom of the signal head backboard must be between 5.0m and 5.4m above roadway. All signal heads shall be covered with burlap or black plastic bags while mounted in place but not in operation.

The Contractor shall install all signal heads as indicated on the contract drawings and in quantities as noted in the contract documents.

AG-4 PEDESTRIAN SIGNAL HEADS

The Contractor shall supply and install pedestrian signal heads and mounting hardware as indicated on the contract drawings and in quantities as noted on the contract documents. Pedestrian heads shall have yellow front (door) and yellow rear (housing) sections.

The City's current pedestrian signal head specifications are as follows:

Type	Description	Vendor Product Number
Countdown Pedestrian Head	Pre-assembled 2 section Pedestrian head which includes LED modules and visors installed Pre-assembled 2x300mm (2x12) Square Poly Pedestrian Signal, Yellow, CND Square Hand/Man Over Square ITE Countdown LEDs, Standard Ped Visors	Fortran Traffic Systems Ltd: P4LO440I McCain: ITS Part Number AMPPB82B799
Single-section Pedestrian Head	Pre-assembled 1 section Pedestrian head which includes LED module visors and bird stop installed Pre-assembled 1x300mm (1x12) Square Poly Pedestrian Signal, Yellow, CND Square Hand/Man LED, Standard Ped Visor	Fortran Traffic Systems Ltd: P4LU440/SEA500 McCain: ITS Part Number AMPPB81BHM
Countdown Module	300mm Square L.E.D. Pedestrian Countdown Retrofit Module Portland Orange Numeric Display	Fortran Traffic Systems Ltd: LEDCS12I EOI #TRP-030D32E2
Walk/Don't Walk Module	300mm Square L.E.D. Pedestrian Retrofit Module 2 color LUNAR WHITE MAN/PORTLAND ORANGE HAND	Fortran Traffic Systems Ltd: LEDP12SQ EOI #TRP-C30DD2C3

Pedestrian heads mounted with rigid arm pairs shall be wired from the bottom of the head directly into the pole (no drip loop required).

Countdown indications shall only count the Flashing Don't Walk and have a blank indication when resting in Don't Walk.

The bottom of the pedestrian heads shall be mounted at heights as indicated on the contract drawings. All pedestrian heads shall be covered with burlap or black plastic bags, or turned away from traffic while mounted in place but not in operation.

AG-5 PEDESTRIAN PUSH BUTTONS

Unless otherwise specified on the contract documents, the contractor shall supply and install push buttons as per OPSS 620.

Push buttons shall be placed on the poles as indicated on the contract drawing or as directed by the Contract Administrator.

The push button shall be mounted 1.0m above the sidewalk, and on the pole face indicated on the drawings, or as specified by the Contract Administrator. Wiring shall be carried down inside the poles.

All new installations shall include Accessible Pedestrian Signals (APS). The Contractor shall supply and install Polara iNS with yellow face plates, touchless operation, and Bluetooth functionality.

APS systems shall be supplied and installed complete with the push button units, signs, control units, Bluetooth connectivity modules for programming, and all required wiring and associated hardware.

APS signs shall be OTM Ra-12 with directional arrow and be double sided with left arrow on one side and right arrow on the other. The sign shall have Aluminum Power Coated Ink Markings.

APS systems will be programmed by City maintenance staff.

AG-6 MAST ARM STREET NAME SIGNAGE

The City shall supply all street name signs. The contractor shall supply all mounting hardware, affix signs to the brackets, and install them as indicated on the contract drawings and in the quantities as noted on the contract documents.

Sign bracket – Sentinel Versa-Brac Sign Assembly VSMB-C, or Traffic Hardware & Design CCS-E of length as specified in the contract documents. Stainless steel hardware shall be used to affix the sign to the bracket.

AG-7 CABLE

The Contractor shall supply and install all cable. All signal cable used must meet City of Burlington specification SS4 Part IV, Section B. Loop detector cable must be either Belden #8720 or Carol 14/2, style 2106, type CL2. ***NO SUBSTITUTION FOR THESE CABLES ARE PERMITTED***. The installation of cables shall be carried out in the following manner and according to construction drawings:

1. Materials used to facilitate the pulling of cables in conduit must first be approved by the Contract Administrator. Cable shall not be pulled at temperatures below -6 degrees C.

2. Cable runs shall be continuous between poles. Signal cable splices shall only be made at poles (steel/aluminum pole hand holes or wood pole junction boxes). No signal cable splices are permitted below ground level.

3. Sufficient length of free cable shall be left in pole hand holes or junction boxes to permit proper connection to be made with cable coming from signal and/or pedestrian heads.

4. Cable from signal and/or pedestrian heads on steel poles shall run inside the mast arms and carry on down inside the pole to the hand hole. Pedestrian head cables shall run inside the rigid arm and directly into the pole.

5. Cable from signal and /or pedestrian heads on wood poles shall run inside the mast arms and carry on up or down the outside of the pole to a 200mm x 200mm x 100mm (8" x 8" x 4") PVC watertight junction box. The junction box shall be mounted 5m above finished grade. Cable shall be attached to the wood pole using appropriate fastening devices, and drip loops shall be provided at entry points to mast arms and junction boxes.

6. Loop detector cable from the vehicle detector loop junction box shall be brought to the controller pad through the designated conduit and 1.5m coiled up on the pad. These cables shall be one continuous piece with no splices and run from the curbside junction box to the controller pad.

7. Wires for luminaires shall be installed in accordance with procedures specified by the Contract Administrator.

8. All signal cables shall terminate at the controller pad (or in the bell box, if specified), and be properly labeled by cable number as indicated on the wiring layout.

9. A wiring schedule showing the distribution of cables from the bell box, color and number coding, and detailed hook-up instructions shall be supplied by the City at the time of installation.

AG-8 VEHICLE DETECTION

Loops

Unless otherwise specified on the contract documents, the contractor shall supply and install all labour, equipment, and material required for the installation of vehicle detector loops. The installation shall be made as shown on the contract drawings and Standard Drawing S-303. City Traffic Signal Maintenance staff will pre-mark the loop layout.

The Contractor shall use RWU-90 #14 AWG stranded wire for the loop and 3M Detector Loop Sealant 5000 sealer for sealing the road cut.
The following procedure shall be adhered to:

1. Loops may not be installed under conditions where temperatures are below 10 degrees C. Each loop shall be completed the same day the road cut is made. Road cuts are NOT to be left open overnight

2. Unless otherwise specified, all loops are to be installed in the final layer of asphalt; the slot is to be 10mm wide and cut to a depth that places the last loop 50mm below the roadway surface. Recommended depths for slots having 2 turns are 60mm and for slots having 3 turns are 65mm.

3. Corners of all loops shall be cut diagonally as shown on City of Burlington Standard Drawing S-303. The slot must be wet cut, and then blown dry with all debris and dust removed from the slot.

4. A 7mm layer of sealant is placed in the slot before laying the wire. The loop wire must be a continuous wire beginning and ending inside the junction box. The loop wire must be installed in a clockwise direction, the designated number of turns. Absolutely no splices are allowed. **The lead end of each loop must be identified and each loop pair must be marked to identify the**

loop location in the road as per the construction drawing (i.e. LP1, LP2, etc.). The two lead wires between the junction box and loop are to be twisted symmetrically at a rate of 2 - 5 turns per 300mm.

5. The Contractor shall measure and record DC wire resistance and leakage resistance with a "Megger". If the loop resistance measures between 1 and 5 ohms and leakage resistance measures 10 megohms, complete the filling of slot with sealer. If high DC resistance (5 ohms or more) or less than 10 megohms of leakage resistance occurs, the complete loop wire must be replaced. The sealant shall completely encapsulate the loop wires to prevent movement of wires and roadway abrasion to insulation. Only pure sealer shall be used to fill the entire slot, with no excess overflow.

6. The Contractor shall measure and record the inductance of each loop at the junction box ensuring a minimum inductance reading of 150 uh and maximum reading of 400 uh. One Belden cable shall be installed for each traffic lane. The cabinet end of the lead-in must be labeled by loop number as labeled on the construction drawing.

7. Connections in the loop junction boxes shall be made by the contractor. Loops shall be connected in series, twisted, and encapsulated using a terminating device suitable for an underground application

8. Final connections in the controller cabinet are to be made by City Traffic Signal Maintenance staff.

Overhead/Non-Intrusive Detection

Unless otherwise specified on the contract documents, the contractor shall supply equipment and materials required for the installation of the overhead/non-intrusive detection system. Systems shall be installed as per contract drawings, and following the manufacturer's installation instructions.
The contractor shall install detection devices on the poles as indicated on the contract drawings or as directed by the Contract Administrator. The Contractor shall connect the cable to the detection device and bring each detection cable from the device(s) to the controller pad and leave 1.5m coiled up on the pad. Cables shall be labeled according to the pole number onto which the corresponding device is mounted (i.e. TS1, TS2, etc.).

All hardware to be installed into the controller cabinet shall be provided to the City two (2) weeks in advance of traffic signal activation for installation by City Traffic Signal Maintenance staff into the controller cabinet. City Traffic Signal Maintenance staff will activate and configure the detection system prior to signal activation.

AG-9 EMERGENCY VEHICLE PRE-EMPTION

Unless otherwise specified on the contract documents, the contractor shall supply and install emergency vehicle pre-emption detectors.

Each of the detectors shall be placed on the poles as indicated on the contract drawing or as directed by the Contract Administrator. The Contractor shall bring each pre-emption cable from the detector(s) to the controller pad and leave 1.5m coiled up on the pad. Cables shall be labeled according to the pole number onto which the corresponding detector unit is mounted (i.e. TS1, TS2, etc.).

Phase selector shall be GTT Opticom Model 764 (as specified in contract). Detectors shall be GTT Opticom Model 722 - mounting brackets will be supplied by the City. Model 138 Detector Cable shall be used (contractor supplied).

AG-10 POWER FEED and DISCONNECT INSTALLTION (PERMANENT and TEMPORARY TRAFFIC SIGNALS)

The power feed and disconnect shall be installed as shown on the wiring schematics, which will be supplied by the City once the above ground work has started. The type of wire, size of conductors and colour coding must be as shown on the wiring schematic.

Unless otherwise specified in the contract documents, for pole-mounted service the contractor shall supply equipment and materials to install the disconnect box including the riser and weather head as specified in the contract documents. The disconnect shall be Fortran 60A – 2 phase disconnect cabinet, part# DISCONCA B-60A. The disconnect box shall be mounted at a height of 1.8m to bottom of disconnect box above final grade. The pole mounted disconnect ground wire is to be run down the outside of the wood pole inside a ½ inch (minimum) PVC conduit. The contractor is to supply and install grounding devices as per ESA standards.

For ground-mounted service, the contractor shall supply and install the load centre and concrete base including breakers. The concrete base shall be Brooklyn Concrete Products BCP-20PED, and the load centre shall be Pedestal Solutions Inc SLS1-X-40 with Square-D QO-120 20amp (traffic signals) and QO-130 30amp (street lights) circuit breakers. Circuit breakers shall be installed as shown on the wiring schematics and in accordance with procedures specified by the Contract Administrator.

The Contractor shall bring one each of #6 TWU black, white and green from the disconnect to the controller pad and leave 1.5m coiled up on the pad. The black and white wires must be one continuous piece from the disconnect to the controller pad with no splices.

The Contractor shall pay for all permits including ESA inspection permits, licenses and fees and the price for these inspections shall be included in the appropriate bid item. The Contractor shall provide the City with a "Certificate of Inspection" certified by the ESA, after which time the City will arrange for the connection of electrical power with the local hydro authority. City Traffic Signal Maintenance staff will install the controller cabinet and connect the power feed in the cabinet after the service has been energized.

AG-11 STREET LIGHTING

The contractor shall supply and install streetlight luminaires as indicated on the contract documents and as shown on contract drawings. Unless otherwise specified, the luminaires shall be cobra head style, single piece die cast aluminum housing containing the light source, associated control gear and mounting mechanism, with an optical aperture with a flat lens, mounted in a fixed position with photometric files tested to IES LM-79-08 using Type C photometry per IES LM-75-01 and designed with a minimum efficacy of 100Lm/W. The wattages will be as indicated on the contract drawings. The unit shall have a 7-pin receptacle for Photoelectric control.

The contractor shall supply and install NMW 12/2 solid copper wire from the luminaire down the inside of the pole to the traffic pole hand hole where it will be spliced to the street light feed. An inline type fuse holder equipped with a 6A HEB-AD-RYC or HEB-AB-RLC-J type fuse shall be installed in the pole hand hole. Unless otherwise specified, the luminaire shall be mounted with a 2.4m tapered elliptical arm, RE-8MA. Where applicable, all banding used for the installation of street light arms shall be BAND-IT C20699, 0.75” width and 0.030” thickness or approved equivalent.

If specified in the contract documents, street light feed connections in the traffic hand hole are to use a watertight direct bury tap. Number of ports to be specified in the contract documents. The contractor shall be responsible for all equipment and materials to energize this system. The City of Burlington’s current standard is the Philips Road Focus series of fixtures.

PART III – TEMPORARY AND/OR OVERHEAD SIGNAL INSTALLATION

A. WORK INCLUDED

This specification covers the requirements of the Contractor to install, maintain, operate, and modify an overhead or a temporary signal installation, as shown on the contract drawings and in accordance with OPSD 2540.01, 2242.02, and 2245.01, as applicable.

The Contractor shall perform all routine and emergency maintenance work required for proper operation of the temporary traffic signal and roadway lighting systems during the period of construction. Routine maintenance of the temporary traffic signal control devices shall include, but not limited to weekly measurement of the traffic signal cable spans to confirm the minimum signal head mounting heights of the overhead traffic signal facilities. The Contractor shall provide a summary of the weekly measurements to the City for review and record. There will be no additional payment for this work.

The Contractor shall arrange for connection of electrical power with the local Hydro Authority and shall pay for all costs associated with installation, energizing, maintenance, operation, and removal of the temporary service connections and traffic control equipment.

Under the different stages of the temporary traffic signal operations, traffic signal heads, pedestrian signal heads, emergency pre-emption detection units, and video detection units may need to be relocated to the positions identified on the Contract drawings or as directed by the Contract Administrator. The Contractor shall be responsible for all costs associated with the relocation.

The Contractor shall notify the City three (3) working days in advance of any work needing to be completed in the traffic controller cabinet, so arrangements can be made for City Traffic Signal Maintenance staff to be on site.

Unless otherwise specified on the Contract, all temporary traffic signal equipment supplied by the Contractor shall remain the Contractor's property at the end of the project, excluding items that are to be transferred to the permanent installation. Pricing for temporary traffic signal installations shall also provide for removal of the same.

B. USED EQUIPMENT AND MATERIALS – Temporary

Used equipment and materials may be utilized in the maintenance and operation of temporary installations (excluding those items that will remain permanently) provided that:

a) All material components or completed assemblies of components have C.S.A or UL approval;
b) Complies with the requirements of the contract; and
c) It is in good condition.

Used equipment and material meeting the specifications shall be acceptable for use for the following items only:

a) Poles
b) Luminaires and Elliptical Brackets
c) Traffic and pedestrian signal heads

The Contractor shall indemnify and hold the City harmless from all and every claim arising from the use of used materials.

C. PAY DUTY POLICE

The Contractor shall notify the Contract Administrator in advance when pay duty officers are required for traffic control in addition to the Ontario Traffic Manual Book 7 Temporary Conditions. Unless

otherwise specified in the contract documents, the Contractor shall be responsible for contacting, scheduling, and payment for services.

The City reserves the right to reject requests made by the Contractor should there be insufficient justification. Where the Contractor elects to contract the services of pay duty officers, all cost associated shall be their responsibility. No payment shall be made by the City for services unless mutually agreed upon in advance.

The Contractor shall note that no payment shall be made without the receipt from the pay duty officers. Payment shall be made based on the hourly rate as identified by the Halton Regional Police Service in accordance with their Service Policy.

PART IV - TRAFFIC SIGNAL CABLE

A. GENERAL

This specification is intended to govern the supply and delivery of 2 conductor pushbutton cable, and 4, 7, and 19 conductor traffic signal cable.

No individual reel shall contain more that 600 meters of cable or be made up of more than one continuous piece. The reels shall not be more than 110 cm (42”) in diameter and 75 cm (30”) high.

The individual conductors of the completed cable shall be capable of withstanding a test application of 3600 volts DC when tested in accordance with A.S.T.M. - D2219 and D2220, latest version.

If, in the opinion of the Contract Administrator, any material used in the construction of any part of the cable is defective, or otherwise unsuitable, or if, in their opinion, the workmanship does not conform with accepted standards, the contractor shall replace such defective cable at the contractor’s own expense.

Any errors or omissions in, or misinterpretation of the specifications, or order shall not relieve the supplier of the responsibility of providing cable conforming to modern practices and the best workmanship.

Cable type and sequential length markings shall be printed every one (1) meter on the surface of the outer jacket.

B. SPECIFICATION

All traffic signal cable shall meet or exceed Ontario Provincial Standard Specification 604/2409.

The coding of the individual conductors forming a cable shall consist of a combination of colour, conductor number and size of conductor as shown in Tables “A” to “D”. The colours used shall be clearly distinguishable under all conditions of illumination and shall be permanent and not subject to fading, bleaching, or darkening due to aging or the action of light, oil, water, abrasion or other causes met within normal usage. The conductor number and wire size shall be printed in black and shall consist of sharp, clearly defined letters and figures, approximately 0.16cm tall, applied in such a way as to resist all normal abrasion. The ink or other material used shall be insoluble in all common liquids, especially water, oil and carbon tetrachloride. The spacing between words or numerals forming one group shall be) .6cm and the spacing between groups shall be 25cm. These markings shall be printed parallel to the conductor.

TABLE “A” 2 CONDUCTOR CABLE for Pushbuttons

General Cable part #C4213A

Colour of P.V.C. Insulation	Lettering Imprinted on P.V.C.	AWG Size Conductor Shielded
Black		16
White		16

TABLE "B" 4 CONDUCTOR CABLE

Colour of P.V.C. Insulation	Lettering Imprinted on P.V.C.	AWG Size Conductor
Red	Red One	14
Yellow	Yellow One	14
Blue	Green One	14
White		14

TABLE "C" 7 CONDUCTOR CABLE

Colour of P.V.C. Insulation	Lettering Imprinted on P.V.C.	AWG Size Conductor
Red	Red One	14
Red	Red Two	14
Yellow	Yellow One	14
Yellow	Yellow Two	14
Blue	Green One	14
Blue	Green Two	14
White		14

TABLE "D" 19 CONDUCTOR CABLE

Colour of P.V.C. Insulation	Lettering Imprinted on P.V.C.	AWG Size Conductor
Red	Red One	14
Red	Red Two	14
Red	Red Three	14
Red	Red Four	14
Red	Red Five	14
Yellow	Yellow One	14
Yellow	Yellow Two	14
Yellow	Yellow Three	14
Yellow	Yellow Four	14
Yellow	Yellow Five	14
Blue	Green One	14
Blue	Green Two	14
Blue	Green Three	14
Blue	Green Four	14
Blue	Green Five	14
White	White One	14
White	White Two	14
Black	Not Numbered	14
Orange	Not Numbered	14

TABLE "E" CAT5E
Shielded underground-rated ethernet cable

Colour of P.V.C. Insulation	Lettering Imprinted on P.V.C.	AWG Size Conductor
Black		24

PART V - TRAFFIC SIGNAL COMMUNICATION CABLE

A. GENERAL

The City will supply all communication cable unless otherwise specified in the contract document.

The reels shall not be larger than 150cm (60") in diameter and 85cm (33.5") wide.

The individual conductors of the completed cable shall be capable of withstanding a test application of 3600 volts DC when tested in accordance with A.S.T.M. - D2219 and D2220, latest revision.

If in the opinion of the Contract Administrator, any material used in the construction of the cable is defective, or otherwise unsuitable, or if in his/her opinion, the workmanship does not conform to accepted standards, the supplier shall replace such defective cable at his own expense.
Any error or omission in, or misinterpretation of the specifications or order shall not relieve the supplier of the responsibility of providing cable intended by this specification.
Cable type and sequential length markings shall be printed every one (1) meter on the surface of the outer jacket.

B. SPECIFICATION

1. This cable shall be P.I C. Alpeth Figure 8 Exchange Area cable equal to specification PES-1006 for aerial installation. (Equal to Canada Wire 22T83 figure 8 or 19T83 Figure 8)
   a. 6 pair, 22 AWG
   b. 12 pair, 22 AWG
   c. 25 pair, 22 AWG

2. This cable shall be P.I.C. Alpeth cable equal to specification PES-1021 (filled cable) for underground installation. (Equal to Canada Wire 22C83 WP or 19C83 WP)
   a. 4 pair, 22 AWG
   b. 6 pair, 22 AWG
   c. 12 pair, 22 AWG
   d. 25 pair, 22 AWG

Measurement for payment should be done according OPSS 604/609 and/or the contract documents.

PART VI - MATERIAL SUPPLIERS

Anchor bolts	Ewing Traffic & Lighting Products Sentinel Pole & Traffic Equipment Ltd. Traffic Hardware & Design
Poles & pole extensions	Ewing Traffic & Lighting Products Sentinel Pole & Traffic Equipment Ltd. Spina's Steel Workers Co. Traffic Hardware & Design

	Valmont West Coast Engineering,
Mast arms	Ewing Traffic & Lighting Products Sentinel Pole & Traffic Equipment Ltd. Traffic Hardware & Design
Signal Mounting Hardware	Ewing Traffic & Lighting Products Fortran Traffic Systems Ltd. Sentinel Pole & Traffic Equipment Ltd. Traffic Hardware & Design
Cable	Anixter, Impulse Technologies, Nedco, Shawflex
Traffic and Pedestrian Signal Heads	Fortran Traffic Systems Ltd.
Vehicle Detection Systems (see contract documents for specified system)	Autoscope – Econolite Gridsmart - Electromega Iteris – GGI Road & Traffic Wavetronix – Fortran Traffic System Ltd
APS Pushbuttons	Tacel Ltd (Polara)

Contact Information

Econolite Canada, Inc. 110 Travail Road Markham, Ontario L3S 3J1 Phone: 905-294-9920	Sentinel Pole & Traffic Equipment Ltd 375 Admiral Blvd., Unit #3 Mississauga, Ontario L5T 2N1 Phone: 905-564-2929
Electromega 1155 North Service Road West, Unit 11 Oakville, Ontario L6M 3E3 Phone: 905-847-5458	Shawflex 25 Bethridge Road Etobicoke, Ontario M9W 1M7 Phone: 416-743-2565
Ewing Traffic & Lighting Products 1445 Hopkins Street Whitby, Ontario L1N 2C2 Phone: 905-666-5600	Spina's Steel Workers Co. Ltd. 229 Wilkinson Road, Brampton, Ontario L6T 4M2 Phone: 905-453-2111
Fortran Traffic Systems Ltd. 470 Midwest Road Scarborough, Ontario M1P 4Y5 Phone: 647-801-6879	Tacel Ltd. 179 Bartley Dr, Unit B Toronto, ON M4A 1E6 Phone: 416-750-4646
GGI Road & Traffic 9 Allaura Boulevard, Unit 9 Aurora, Ontario L4G 3N2 Phone: 416-849-2228	Traffic Hardware & Design 1641 Trinity Drive Mississauga, Ontario L5T 1K4 Phone: 905-670-3444
Impulse Technologies Ltd. 170 Admiral Blvd. Mississauga, Ontario, L6T 2N6 Phone: 905-670-1269	Valmont West Coast Engineering 100 Ellis Drive Barrie, Ontario L4N 9B2 Phone: 705-721-1090
Nedco 515 Wilson Street Hamilton, Ontario L8T 1T4 Phone: 905-528-0261	