

INDEX TO CLAUSES

PART 1 - GENERAL

- 1.1 Work Included
- 1.2 Related Sections
- 1.3 Reference Standards
- 1.4 Shop Drawings
- 1.5 Codes, Bylaws, Ordinances and Regulations
- 1.6 Certificates
- 1.7 Handling and Storage

PART 2 - PRODUCTS

- 2.1 General
- 2.2 Concrete Bases
- 2.3 Conduits
- 2.4 Pull Pits and Junction Boxes
- 2.5 Transformer Bases
- 2.6 Signal Cable
- 2.7.1 Inductive Detector Loops
- 2.7.2 Preformed Detector Loops
- 2.7.3 Wireless Detector
- 2.7.4 Radar Detector
- 2.8.1 Poles, Mast Arms - Aluminum
- 2.8.2 Poles, Mast Arms - Steel
- 2.9 Signal Mounting Brackets
- 2.10 Traffic Signal Heads
- 2.11 Pedestrian Signal Heads
- 2.12 Pedestrian Push Buttons
- 2.13 Opticom Equipment
- 2.14 Pedestrian (RA-5) Signals
- 2.15 Uninterrupted Power Supply
- 2.16 Audible Pedestrian Signals

PART 3 - EXECUTION

- 3.1 Excavation and Backfilling
- 3.2 Concrete Bases
- 3.3 Conduit Installation
- 3.4 Installation of Detector Loops
- 3.5 Installation of Transformer Bases, Poles and Mast Arms
- 3.6 Installation of Push Button Assemblies
- 3.7 Installation of Traffic Signals and Pedestrian Signals
- 3.8 Installation of Pedestrian (RA-5) Signals
- 3.9 Installation of Opticom Equipment
- 3.10 Wiring of Poles and Mast Arms
- 3.11 Mounting of Traffic Signal Controller Cabinet
- 3.12 Installation of Pedestrian (RA-5) Signal Controller
- 3.13 Removal and Disposal of Damaged and Obsolete Equipment

PART 1 - GENERAL

- 1.1 Work Included
- .1 This section specifies the requirements for the installation of traffic and pedestrian crossing signal systems. The Work consists of furnishing all labour, tools, and equipment, and performing all operations necessary to complete the installation of the traffic signal, pedestrian crossing items, UPS - Battery Backup, and any other supplementary systems (Wavetronic, Sensys, APS etc.) (if specified) as shown on the drawings.
- .2 Unless otherwise specified on the contract drawings and/or the Measurement and Payment Section, the Contractor shall do all work and provide all materials to complete the specified system and turn over to HRM the completed system in operational order.
- .3 Those materials which are not specified and/or indicated but are necessary for the complete installation of the work shall be deemed the responsibility of the Contractor and shall be included at no extra cost to the Contract.
- .4 Field work on traffic signal systems shall be performed by or directly supervised by a journeyman electrician with a minimum International Municipal Signal Association (IMSA) Traffic Signals Level 1 Certification.
- In addition, Traffic Signals work within the Control Cabinet and involving the Control Cabinet wiring and equipment shall be performed by or directly supervised by a Licensed Journeyman Electrician with IMSA, Traffic Signals Level 2 Certification or an Electrical or Electronics Technician / Technologist with IMSA, Traffic Signals Level 2 Certification.
- 1.2 Related Sections
- .1 Concrete Section 03 30 00
- .2 Earthwork Section 31 20 00
- .3 Walks, Curbs, and Gutters Section 32 16 00
- .4 Topsoiling and Finish Grading Section 32 91 19
- .5 Reinstatement Section 32 98 00
- .6 Hot Mix Asphalt Concrete Section S-1
- .7 Performance Graded Asphalt Binder Section S-2
- 1.3 Reference Standards
- .1 Canadian Standards Association
- .2 Canadian Electrical Code Part 1 (latest edition)
- .3 Canadian Electrical Manufacturers Association
- .4 International Municipal Signal Association (IMSA) Official Wire and Specifications Manual (latest edition)
- 1.4 Shop Drawings
- .1 Submit shop drawings in accordance with Section 01 10 00.

- 1.5 Codes, Bylaws, Ordinances and Regulations
- .1 All work covered by this section shall be performed according to applicable Halifax Regional Municipality and Nova Scotia Power Incorporated (NSPI) Codes, Bylaws, Ordinances, and Regulations.
 - .2 Nova Scotia Department of Transportation and Infrastructure Renewal “Temporary Work Place Traffic Control Manual” (latest revision).
 - .3 HRM’s Traffic Control Manual Supplement.
- 1.6 Certificates
- .1 Submit manufacturer’s specification and test data that proposed products and materials meet requirements of this Section in accordance with Section 01 10 00.
 - .2 Obtain final certificate of approval from NSPI.
- 1.7 Handling and Storage
- .1 All poles, mast arms, tenons, signal heads, and other equipment shall be shipped complete with all required hardware.
 - .2 On delivery, all poles and mast arms shall be carefully stockpiled.
 - .3 Store electronic equipment in an indoor environment with proper humidity and temperature controls.

PART 2 - PRODUCTS

- 2.1 General
- .1 All material supplied shall be new.
 - .2 Equivalent products other than those specified shall be approved by HRM prior to ordering.
- 2.2 Concrete Bases
- .1 Cast in place base, to Section 03 30 00, 20 mm maximum size, min 35 MPa at 28 days, to sizes and dimensions shown on standard drawings.
- 2.3 Conduits
- .1 Detector home runs: 38 mm diameter rigid PVC: to CSA C22.2 no. 136.
 - .2 Home-run detector loops: 19 mm diameter rigid PVC, to CSA C22.2 no.136.
 - .3 Signal Cable: Rigid PVC to CSA C22.2 no.136. Sizes shown on drawing.

		.4	Pole Risers: to Section 03 30 00, 20 mm maximum size, min 35 MPA at 28 days, to sizes and dimensions shown on drawings.
2.4	<u>Pull Pits and Junction Boxes</u>	.1	Pull pit: as per HRM standard drawing HRM 77.
		.2	Junction Box: (Above Ground): Septor, type H666, flanged, PVC junction box complete with fibre reinforced cover.
		.3	Junction Box: (In Concrete or in Ground): Synertech 280UPH121212_DET
		.1	Synertech - Spec Sheet (http://www.synertechproducts.com/CADdrawing/English/Box/280UPH121212_DET.pdf)
2.5	<u>Transformer Bases</u>	.1	Feralux TB-24 or approved equivalent, complete with hinged access door fastened with stainless steel hinges and screws. Bolt circles to match poles and bases.
2.6	<u>Signal Cable</u>	.1	To be supplied by Engineer.
		.2	Colours as specified by Engineer.
2.7.1	<u>Inductive Detector Loops</u>	.1	Loop Cable: RWU 90., #14 AWG to IMSA 51-3 (1997).
		.2	Sealant: 3M Detector Loop Sealant or approved equal.
		.3	Inground Lead-in-Cable: Two core with ground and foil shield. BELDIN 8720 series or equivalent.
		.4	Overhead Lead-in-Cable: 2 × 2 core with ground and foil shield. BELDIN or equivalent complete with 5 mm support wire.
2.7.2	<u>Preformed Detector Loops</u>	.1	PLH Series: Designed to be overlaid with hot asphalt or embedded in concrete.
		.2	Prefabricated Loop designed to be paved over or installed in 3/8 inch saw cuts.
		.3	Each component of the PLH (loop cable, lead-in cable, and splice enclosure) is designed to maximize durability, minimize water penetration, and maintain a flexible form that is easy to install and handle.

.1 Reno A&E - Spec Sheet

[http://www.renoae.com/traffic/files/PLH/Model%20PLH%20Data%20Sheet%20%202007%2007%2010%20\(551-3416-00\).pdf](http://www.renoae.com/traffic/files/PLH/Model%20PLH%20Data%20Sheet%20%202007%2007%2010%20(551-3416-00).pdf)

.4 PLH-R Series: Designed for use in direct burial in dirt or gravel roadways.

.1 designed to maximize durability, minimize water penetration, and maintain a flexible form that is easy to install and handle.

.2 High visibility (red) outer jacket is formulated from Thermoplastic Elastomer (TPE) for superior abrasion resistance

.3 Flexible cable for easy installation

.4 Cross-linked polyethylene (XLPE) wire insulation and cable jackets

.1 Reno A&E - Spec Sheet

[http://www.renoae.com/traffic/files/PLH/Model%20PLH-R%20Data%20Sheet%20%202007%2001%2019%20%20\(551-3429-00\).pdf](http://www.renoae.com/traffic/files/PLH/Model%20PLH-R%20Data%20Sheet%20%202007%2001%2019%20%20(551-3429-00).pdf)

2.7.3 Wireless Detector

.1 Sensys™ Wireless Vehicle Detection System

.1 Access Point: Access Point, Serial Interface AP240-S

.2 Repeater: Repeater-Sensys RP240-BH-LL

.3 Contact Closure Card: Contact Closure Card CC240, and Expansion Contact Closure Card EX240 (if required).

.4 Sensor: VSN240 Wireless Flush- Mount Sensor

- 2.7.4 Radar Detector
- .1 Wavetronix SmartSensor Matrix WX-SS-225
 - .2 Intersection preassembled backplate AC/DC: WX-SS-B01-0002/3/4/5
 - .3 Contact Closure File Card: WX-SS-112/114 – Click 112/114 rack cards
- 2.8.1 Poles, Mast Arms - Aluminum
- .1 Round seamless tubes of aluminum alloy 6063-T6, free from longitudinal welds with No. 120 grit belt surface finish.
 - .2 Height, diameter, wall thickness, and taper: as indicated.
 - .3 Mast arms: aluminum alloy truss style complete with aluminum alloy T6-6063 brackets, stainless steel nuts, bolts, and washers.
- 2.8.2 Poles, Mast Arms - Steel
- .1 Steel pole and mast arms are to be round in cross-section and have a constant linear taper of 0.14in/ft. Shaft is to be one piece with no circumferential welded splices.
 - .2 Tube seam welds for poles and mast arms are to be free of cracks and excessive undercut, performed with an automatic process with a smooth finish and have a minimum penetration of 60%. Seams within 4" of a flange or base plate shall be 100% penetration. Poles are to be fabricated to ASTM A572 or ASTM A595 Grade A with a minimum yield strength of 55 ksi.
 - .3 Hand Hole is to be 100 x 250 mm with the cover located 26-153 mm from pole base and arm base.
 - .4 All mast arms up to 50' in length are to be manufactured and shipped in one piece. Each arm is to be provided with a cast end cap secured in place with set screws.
 - .5 Poles and arms are to be designed in accordance with Canadian Standards Association (CSA) S6-06 Bridge Code for Structural Supports.
 - .6 Anchor bolts are to be included with each pole and size to be determined by fabricator
 - .7 Fabricator is to be certified to AISC Fabricator Certified Quality Program.

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| | | .8 | www.Valmont.com
http://www.valmont.com/docs/CatSpecs.aspx?id=97 |
| | | .9 | All nuts to be double nutted and tightened to manufactures recommended torque. |
| 2.9 | <u>Signal Mounting Brackets</u> | .1 | Pole Mounted: 38 mm diameter aluminum tubing and cast fittings unpainted unless specified on drawings. |
| | | .2 | Mast Arms: Astro-Brac tenon mount, by Pelco, with stainless steel hardware, (double pivot type). |
| | | .3 | Tenons: aluminum alloy complete with stainless steel 19 mm Band-it # C206 banding, Band-it Buckles # C256, pole plates, one way top bracket assembly, and one way bottom bracket assembly. |
| | | .4 | Pole Plate: Double Band-it type MH/AL/100 by Pelco or approved equal. |
| | | .5 | Color: as specified by Engineer. |
| 2.10 | <u>Traffic Signal Heads</u> | .1 | Housing: Polycarbonate with polycarbonate lenses and black visors unless otherwise specified on the drawings |
| | | .2 | Color: Yellow unless otherwise specified on the drawings. |
| | | .3 | Size: as indicated on drawings. |
| | | .4 | Lamps: All signals to have L.E.D. modules built to the latest ITE specifications |
| | | .5 | Snow Shield: Snow Sentry ® |
| 2.11 | <u>Pedestrian Signal Heads</u> | .1 | Housing: Bimodal polycarbonate housing. |
| | | .2 | Color: Yellow unless otherwise specified on the drawings. |
| | | .3 | Lamps: All Pedestrian signals to have Square L.E.D modules built to the latest ITE specifications. |
| | | .4 | Countdown Pedestrian Signal Heads as shown on the drawings. |
| 2.12 | <u>Pedestrian Push Buttons</u> | .1 | Pedestrian push buttons: Polara Bull Dog BDLM-Y with non latch. |
| | | .2 | Color: Yellow or as specified. |

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- 2.13 Opticom Equipment
- .1 M721 Opticom Detector by GTT
 - .2 M752 Opticom Phase Selector by GTT, including auxiliary harness.
 - .3 One 152 m spool of Opticom Detector Cable by GTT; unused portion of cable to be returned to HRM.
 - .4 <http://www.gtt.com>
- 2.14 Pedestrian (RA-5) Signals
- .1 Type: RA-5 Crosswalk Sign illuminated face walking man symbol 600 mm × 750 mm – man walking inside white border complete with 200 mm amber lenses attached to each side of sign if specified.
 - .2 Body:
 - .1 Aluminum, treated to prevent premature peeling and blistering using interprime 5519 etch primer and 519 converter prior to painting. Sign to be painted 514 crosswalk yellow.
 - .2 All seams to be welded in main body construction.
 - .3 Bottom of sign opening to be wire mesh.
 - .4 No exposed wiring inside sign except for terminal ends in bottom.
 - .5 Stainless steel hinges with removable pins to hold both door faces of sign to main sign, and stainless latch to close door faces to main sign. Doors to swing upwards freely with no obstructions.
 - .6 CSA labeled.
 - .7 Wiring diagram with completed parts list.
 - .3 Lens:
 - .1 Lexan 5 mm thick slide in, slide out, replacement
 - .2 Facelight source to be metal halide 175 watt 120/130 volt lamp, mogul base (lamp to be included). Ballast to be mounted in plate with quick detachable socket for wiring.
 - .3 Down light source to be metal halide 175 watt 120/130 volt lamp, mogal base (lamp to be included). Ballast to be mounted in plate with quick detachable socket for wiring.
 - .4 Switch inside to provide disconnect to lamp socket.

- .4 Mounting:
- .1 Mast Arm: top of fixture to be reinforced with minimum 7 mm aluminum plate to absorb strain of the hanger. Fortran cushion hanger to be supplied with sign. Supply safety chains and eye bolts on top to prevent signs from turning in high winds.
- .1 Fortran Cushion Hanger, rubber cushioned mast wire hanger HAN555 of equivalent
- www.Fortran_Traffic_Hanger
- http://fortrantraffic.com/content/products-services/product-profile.cfm?PRODUCT_CATEGORY_ID=6&PRODUCT_ID=19
- .2 Doors to swing upwards freely with no obstructions.
- .2 Span Wire: top of fixture to be reinforced with minimum 7 mm aluminum plate. Provide double span wire suspension hangers (Fortran HAN501 or equivalent) with wire entrance port c/w wire clamp and protector. Bottom suspension wire to be clamped with suitable clamping device capable of supporting total weight of signs in the event of primary messenger failure.
- .1 Span Wire Hanger Spec Sheet
- http://www.signalcontrol.com/products/pelco_prod/Pelco_Span_Wire_Mounts.pdf
- .5 For Beacon: Each sign complete with two (2) 300mm Amber LED Lens Polycarbonate Traffic Signals, one attached to each side of the sign.
- .6 Light Source: 175W metal halide lamp, mogal base with 120/347 ballast to be mounted on plate with quick detachable socket for wiring. Lamp to be included.
- .7 Complete sign assembly to be CSA certified.
- 2.15 Uninterrupted Power Supply
- .1 UPS - Battery Backup Systems for Traffic Signals.
- .1 Must supply power for a minimum of 4 hours, based on total wattage being used at intersection.
- .2 Must transfer to and from batteries without any power interruption.

- .2 UPS Unit
 - .1 Complete conditioning and uninterruptible Power Supply backup to ensure clean, reliable AC power for traffic intersections.
 - .2 Must have a Generator bypass feature. Must have front access connections and test points for easy monitoring and maintenance.
 - .3 Flexible installation options for rack, wall and shelf configurations.
 - .4 Must be able to operate in wide temperature range from -40°C to +74°C. Unit shall be able to temperature-compensate for battery charging to maximize battery life.
 - .5 **Approved Unit** - Alpha Novus TP 1800 Outdoor UPS and Alpha Novus FXM 2000 Outdoors UPS.

- .3 Batteries
 - .1 Designed to provide battery power for outdoor traffic intersections.
 - .2 Sealed Valve Regulated Lead Acid Battery specifically designed for NEMA traffic signal systems.
 - .3 Approved to CalTrans specifications. Lead acid battery, with 99.7% pure lead calcium grids. Long life, absorbent glass mat design.
 - .4 Batteries to be 100% recyclable materials.
 - .5 Batteries to be rechargeable with no cycling required.
 - .6 Batteries to come with minimum 5 year warranty.
 - .7 **Approved Unit** - Alpha Traffic Gel Battery.

- .4 Enclosure
 - .1 All Batteries, UPS unit and additional equipment to be contained in a weather proof aluminum enclosure.
 - .2 Engineered to accommodate outdoor powering equipment in pole or wall mount configurations. Durable, outdoor design Kiosk, CSA approved, NEMA 3R weather resistant UPS enclosure.
 - .3 All aluminum welded construction and durable powder coat finish provides superior corrosion resistance.
 - .4 Sliding battery trays with lock-in / lock-out features standard. A variety of configurations available to support specific powering needs. Portable generator cabling access panel.
 - .5 Single or multiple power supply enclosure to support distributed powering architectures. The power supply is located on the equipment shelf above the batteries for maximum convection cooling.

- .6 Enclosure comes with a removable lockable door and easy opening lid, high magnetic circuit breaker and a duplex AC receptacle.
- .7 Dimensions: 30W x 48H x 18D unless otherwise specified.
- .8 **Approved Unit** - SP05-001-07
- .5 Additional Equipment
 - .1 External Breaker Box rated at 120v 20 amps input.
 - .2 ATS Automated Transfer Switch
 - .3 Battery Heater Mat(s)
 - .4 Lightning / Surge protection
 - .5 External Indicator Light
- .6 Approved Manufactures
 - .1 Alpha UPS only
 - .2 Approved suppliers:
 - .1 Curtis Agencies
 - .2 TVC Canada
- 2.16 Audible Pedestrian Signal
 - .1 Type:
 - .1 Polara Navigator EN4.

<http://www.polara.com/enspecifications.html>
 - .2 Novax DS100, DS3000

<http://www.novax.com/products/aps.html>
 - .2 Sounds: As per latest recommendation by the Canadian National Institute for the blind as confirmed by the Engineer.

PART 3 - EXECUTION

- 3.1 Excavation and Backfilling
 - .1 Do excavation and backfilling to Section 31 20 00.
- 3.2 Concrete Bases
 - .1 Do cast in place concrete to Section 03 30 00
- 3.3 Conduit Installation
 - .1 Location, number, and size of conduit as indicated on drawings or as directed by Engineer.
 - .2 Excavation and backfilling to Section 31 20 00
 - .3 Concrete to Section 03 30 00.
 - .4 Obtain permits from NSPI.

- .5 Install non-concrete encased conduit in accordance with standard drawing number HRM 76.
- .6 Install concrete encased conduit in accordance with detail indicated on the drawings.
- .7 Use wood forms for concrete encased conduit rather than place concrete in direct contact with the sides of excavation.
- .8 Join conduit in accordance with manufacturer's instructions. Ream the ends of all conduit to ensure smooth interior finish that will not damage the insulation of the wires.
- .9 Protect conduit stubs from construction related damage with caps to prevent entrance of foreign materials.
- .10 Ensure conduit stubs are located correctly and terminations are suitable for installation of equipment.
- .11 Provide complete connections between conduit ends and terminal boxes of electrically operated equipment.
- .12 Remove all water and foreign material from conduit and raceways by swabbing out the conduit or by using compressed air.
- .13 Draw conductors and/or wire, and pull string through conduit. Use approved lubricants for drawing conductors through conduit. Leave *at least* one metre of slack in each conductor at panel boards, outlet boxes, and other devices to facilitate the making of joints.
- .14 Cover all non-concrete encased conduit along entire length with 38 mm × 140 mm treated wood plank. Plank to pressure treated with pentachlorophenol to retention of at least 3.6 kg as per CSA Standard S6 and CSA Standard 080.
- .15 Place electrical Brady tape identoline tape UT20-Y3 or equivalent on conduit 150 mm to 250 mm below grade.
- .16 Install concrete pole riser to cover pipes that run to the surface on all wooden poles as per HRM standard drawing HRM 84. Dowel riser into pole using stainless steel bolts. A metal guard plus expansion joint can be used in place of the concrete pole riser on a wooden pole with single conduit run.
- .17 Leave pull wire in each empty duct. Fasten pull string to end of conduit with duct tape.

- 3.4 Installation of
Detector Loops
- .18 Conduit to be inspected and approved by the Engineer prior to backfilling.
 - .19 Surface reinstatement to section 32 98 00.
 - .1 Approximate location and dimensions indicated on drawings.
 - .2 Final location and dimensions to be approved by Engineer prior to saw cutting.
 - .3 Unless otherwise directed, saw cut an 8 mm wide slot in pavement to a uniform depth between 50 mm and 75 mm.
 - .4 Ensure that slots are clean with no sharp corners which could damage loop wire prior to laying the loop wire. Remove chips and moisture using dry air at a pressure of at least 900 kPa. A heat wand may be used to dry the saw cut.
 - .5 Lay loop wire in one continuous length of wire around the saw cut as per the drawings or as directed by the Engineer. Loop wire shall be continuous from junction box at the curb around the loop and back to the curb. No splices are permitted in this section of wiring.
 - .6 Number of turns as directed by the Engineer.
 - .7 Tag or label clearly with permanent ink, loop lead in-cable at controller to indicate assigned phase and function, and top and bottom of loop.
 - .8 Place wire in saw cut in accordance with detector loop sealant manufacturer's recommendation.
 - .9 Gain access to curbside junction box by saw cutting curb from street side to back of curb. Saw cuts to be of sufficient depth to provide a minimum depth of 38 mm to 50 mm cover over loop wires.
 - .10 Tightly twist loop wires, from the saw cut to the curb side junction box, at a rate of least 15 turns per metre.
 - .11 Seal curb and saw cuts using 3M 5000 Detector Loop Sealant or approved equal. Ensure that no voids are formed between saw cut, loop wire, and sealant when sealant is being applied.
 - .12 Splice between detector loop cable and detector lead-in cable in junction box shall be soldered. Protect splice point with

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- moisture proof seal. (DBR-6 3M product or approved outdoor shrink wrap).
- .13 Conduct **Loop insulation test** with 500 volt Megger from loop lead-in to earth ground. Obtain a reading of 100 megohm or greater.
- Conduct **Loop continuity test** at loop lead-in cable termination ends. Obtain a resistance of 5 ohms or less.
- Provide test results to Engineer.
- .14 Loop tails to cabinet termination ends longer than 23 metres shall require shielded Belden lead-in cable.
- .15 Where lead-in cable must be longer than planned, the loop inductance shall be equal or greater than the lead-in cable. Loop inductance less than the lead-in cable will typically be considered unacceptable.
- 3.5 Installation of Transformer Bases Poles and Mast Arms
- .1 Secure transformer base to concrete base anchor bolts using galvanized nuts and manufacturers approved washers 10 mm and 13 mm thick at top of transformer base. Nuts shall be tightened and torqued an equal amount in accordance with the manufacturer's recommendations. Provide a plywood cap on all bases that do not have a pole.
- .2 Ensure poles are installed and secured to a vertical alignment which meets Engineer's approval.
- .3 Install mast arms and other required fixtures once pole is plumbed and secured.
- 3.6 Installation of Push Button Assemblies
- .1 Aluminum and Steel Poles
- .1 Pole to be drilled and tapped prior to installation
- .2 Ensure that all contact points between push button and pole face are silicon sealed.
- .3 Ream apertures through pole to ensure smooth interior finish and prevent damage to the insulation of the wires.
- .4 Drill drain hole in bottom of push button.
- .2 Wooden Poles
- .1 Attach push button assembly to pole using a #10 x 50 mm Robinson head stainless steel screw.
- .2 Install wiring through bottom of push button using liquid tight flex to prevent condensation or leakage shorting out the actuator.

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| | | .3 | Ensure that all contact points between push button and pole face are silicon sealed. |
| | | .4 | Drill drain hole in bottom of push button. |
| 3.7 | Installation of Traffic Signals and <u>Pedestrian Signals</u> | .1 | Install traffic signal heads using mounting specified or as directed by Engineer. Mountings to be aluminum complete with hub plates, cast nipples, nuts, bolts, and fitting caps. |
| | | .2 | Seal Marrette connections with 3M Scotch 88 tape or equivalent. Bundle off and tie wrap with Marrettes forming a cap and store bundle high up in traffic signal to minimize water damage to Marrette connection. |
| | | .3 | All threaded connections shall be treated with Never Seize. |
| 3.8 | Installation of Pedestrian (RA-5) <u>Signals</u> | .1 | Install RA-5 sign as per manufacturer's directions. Test photocell flashing beacon, and fixture light after installation. |
| 3.9 | Installation of <u>Opticom Equipment</u> | .1 | Install and test Opticom detector as per manufacturer's directions. Provide all necessary wiring for Opticom equipment to ensure proper operation of preemption system. No splices are permitted. |
| | | .2 | Test detectors using tester provided by Engineer. Provide test results to Engineer. Final tests to be conducted by manufacturer. |
| 3.10 | Wiring of Poles, and <u>Mast Arms</u> | .1 | Keep wire connection to a minimum, both in junction boxes and transformer bases. The use of pull pits for wire connections will not be permitted. Break out of the cable only those wires that are required, leaving unused wires uncut. |
| | | .2 | Use sta-con wire connectors of appropriate size on all wire to screw end terminations. |
| | | .3 | Seal Marrette connections with 3M Scotch 88 tape or equivalent. Bundle off and tie wrap with Marrettes forming a cap and store bundle high up in transformer base to minimize water damage to Marrette connection. |
| | | .4 | Install multi-conductor cable (#14 AWG stranded copper wire) from each signal head location through mast arm and the pole aperture, down through pole to the centre of the access door in the transformer base. Wire to be appropriate number of conductors for each application. |
| | | .5 | Provide an additional 600 mm of cable run for connection. Leave an additional 600 mm of each cable run for connections. |

- .6 Continue multi-connector cable run to controller and leave 1200 mm additional cable.
 - .7 Provide drip loop where cable enters the pole from the bracket.
 - .8 Connect conductors in signal heads to appropriate terminals. Leave spare conductors full length, coiled and end terminated by folding back the last 150 mm of the conductors with insulating tape.
 - .9 Ground all metal equipment to ground terminal in base using separate ground wire.
 - .10 Make final connections. Test the wiring and provide written results to Engineer in duplicate. Obtain approval from Engineer for finished work.
 - .11 Hot test all signals.
 - .12 Label each wire indicating appropriate signal head at pole base.
- 3.11 Mounting of Traffic Signal Controller Cabinet
- .1 Install cabinet on base. If cabinet is to be fastened to a pole, use 19 mm stainless steel band-it strapping.
 - .2 Seal cabinet to concrete base, using rubber gasket and silicone between cabinet and gasket.
 - .3 Connect traffic signal field wires to cabinet field terminals. Test to confirm operation.
 - .4 Connection of Detector Loop and Opticom wires to cabinet to be conducted by HRM.
- 3.12 Installation of Pedestrian (RA-5) Signal Controller
- .1 Install controller cabinet in accordance with manufacturer's directions.
 - .2 If cabinet is to be fastened to a pole, use 19 mm stainless steel band-it strapping.
 - .3 Obtain CSA approval.

