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## SECTION 9

ROADWAY LIGHTINGDESIGN9.1 SCOPE

Design of street and parking lot lighting systems shall be prepared by a Professional Electrical Engineer, registered with the Association of Professional Engineers of British Columbia. A copy of the lighting calculations shall be submitted.

9.2 DECORATIVE LIGHTING

Unless otherwise approved by the Engineer, decorative lighting is required for streets and parking lots. Alternative decorative lighting may be required by the Engineer or submitted by the developer for Engineers approval.

9.3 ILLUMINATION

Roadway lighting shall be designed in accordance with the illuminating Engineering Society, Standard Practice for Roadway Lighting. Illuminance requirements shall satisfy the following Average Maintained Illuminance Values (E avg.) in lux for Pavement Classification R-3 (typical highways).

<u>Street Classification</u>	<u>Area Classification</u>	<u>Illuminance (E.avg.)</u>	<u>Illuminance Uniformity Ratio (E.avg. to Emin.)</u>
Arterial	Commercial or		
	Downtown	17	3 to 1
	Intermediate	13	
Residential	9		
Collector or Local	Commercial or		
	Downtown	12	4 to 1
	Intermediate	9	
Residential	6		
Cul-De-Sac	Commercial or		
	Downtown	9	6 to 1
	Intermediate	7	
Residential	4		

**9.4 STREET CLASSIFICATION DEFINITIONS**

**"Arterial Street"** means a street that carries the major traffic flows between the principle areas of traffic generation; and connects to arterial and collector streets. Direct access of arterial streets to abutting properties should be limited.

**"Collector Street"** means a street that carries traffic between local and arterial streets and is intended to carry through traffic. A collector street generally provides direct access to abutting properties and can carry large volumes of traffic.

**"Local Street"** means a street that primarily carries traffic with an origin or destination along its length and is not intended to carry through traffic other than to immediately adjoining streets. A local street provides direct access to abutting properties and is not intended to carry large volumes of traffic.

**"Cul-de-sac"** means a local street that has only one connection to the street system and which cannot reasonably be extended and which terminates in an area for the turning of motor vehicles.

**9.5 AREA CLASSIFICATION DEFINITIONS**

**Commercial** - A densely developed business area which attracts a relatively heavy volume of nighttime vehicular and/or pedestrian traffic on a frequent basis, with a high demand for parking.

**Intermediate** - Areas with moderately heavy night time pedestrian activity, such as recreation centres, large apartment buildings or neighborhood retail stores, with less demand for parking.

**Residential** - Areas characterized by few pedestrians at night, such as single family houses, townhouses, and/or small apartment buildings with a low demand for parking.

**9.6 DISTRIBUTION**

Light emanating from the luminaries is to be directionally controlled and proportioned in accordance with the roadway width, luminaire spacing, and mounting locations. The Average Horizontal Illuminance (E avg.) divided by the Minimum Horizontal Illuminance (E min.) should not exceed the values shown above under Illuminance Uniformity Ratio. All luminaries to be semi-cutoffs or cutoff control type.

**9.7 LIGHTING POLE LOCATION**

Spacing and location of street light poles shall be governed by road width, road configuration and property lines. Where possible, poles shall be located in line with intersecting property lines. See Section 7 Standard Drawings for pole locations.

**9.8 LUMINAIRES CONTROLLER**

9.8.1 Luminaires shall be connected to a common controller located at the luminaires load centre. The controller shall include the service equipment, a contractor, a test switch and a photoelectric control.

9.8.2 Where few lights are involved, one of two methods of control shall be used:

- (a) luminaire where possible shall be connected to existing adjacent luminaire controlled by an existing controller
- (b) luminaire shall have individual photoelectric control.

9.9 **CONDUIT**

- 9.9.1 **Bury** - the minimum depth of cover on conduit below finished grade shall be 0.9 m.
- 9.9.2 A 150 mm minimum separation between the bottom of conduit and excavated rock surface shall be provided.
- 9.9.3 Conduits shall be parallel or perpendicular to the roadway, and routed to run in a direct line between adjacent poles. Bends shall be of large radius type unless otherwise approved by the Engineer.
- 9.9.4 Conduits shall be placed in a common trench with BC Hydro and Telephone wherever possible.

9.10 **CONDUCTORS**

Conductor colour coding and sizes shall be as outlined in the Canadian Electrical Code and shall be shown on the construction drawings. Voltage drop shall not exceed 5% from Hydro to point of utilization.

9.11 **SERVICE PANEL**

- 9.11.1 Service panels shall be mounted inside the service base unless otherwise approved by the Engineer.
- 9.11.2 Use of exterior service panels shall only be allowed where the source of power is from an overhead BC Hydro system and further extension of the lighting system will not be required.

9.12 **CONCRETE BASE**

- 9.12.1 The Consulting Engineer shall assess the existing soil conditions at the proposed concrete base installations to determine if modifications to the standard drawings are required.
- 9.12.2 The Consulting Engineer shall submit for approval by the Engineer the design modifications to the standard drawings that are required to meet the existing soil conditions.

**SPECIFICATIONS**

9.20 **APPROVAL LABELS**

9.20.1 Materials supplied and installed shall be new and in accordance with the construction and standard drawings. All materials shall meet or exceed the Canadian Electrical Code Requirements and the Canadian Standards Association Standards, where applicable, and are subject to the approval of the Electrical Safety Branch Inspector prior to installation.

9.20.2 All similar items of materials shall be of one type and from the same manufacturer.

9.21 **CONDUIT**

9.21.1 **Exposed Conduit**

- (a) Exposed conduit shall be rigid steel. Conduit clamps and fittings shall be hot-dip galvanized malleable iron.
- (b) Rigid steel conduit shall be hot-dipped galvanized and shall conform to CSA C22.2 No. 45. All rigid conduit ends shall be reamed and all necessary bushings, locknuts, elbow and bends shall be provided. All joints shall be made with threaded couplers.

9.21.2 **Buried Conduit**

- (a) Buried conduit run shall be rigid unplasticized PVC. PVC couplings shall be threadless type, approved for solvent cement welding. PVC fittings, coupling and conduit shall be of the same manufacturer. Minimum size of PVC shall be 38 mm diameter unless otherwise approved by the Engineer.
- (b) Rigid PVC conduit shall conform to CSA C22.2 No. 211.2. Where rigid PVC conduit is used it shall be surrounded by minimum 75 mm of bedding sand above and 75 mm of bedding sand below.

9.21.3 **Conduit Bends, Sweeps and Fittings**

- (a) PVC conduit bends, sweeps and offsets shall be made with factory fabricated fittings for sizes larger than 50 mm.
- (b) A male PVC conduit shall not be installed into a steel female hub or coupling. PVC conduit used with steel hubs or couplings shall be of the female type.

9.21.4 Concrete for conduit encasement shall have a minimum compressive strength of 15 MPa at twenty-eight (28) days and be in accordance with Section 10 - Concrete.

9.22 **UTILITY WARNING TAPE**

Underground utility warning tape shall be 250 mm wide yellow polyethylene and be labeled "CAUTION -

**ELECTRICAL LINE BURIED BELOW".**9.23 **CONDUCTORS**

9.23.1 Conductor shall be stranded copper Type TW75 or RW-90 (XLPE) and insulated and sized as shown on the construction drawings. Conductors shall be colour coded and sized as outlined in the Canadian Electrical Code and shown on the construction drawings.

9.23.2 Shielded cable for detector loops shall be 2 pair No. 16 AWG cable.

9.24 **GROUNDING**

9.24.1 Ground rod shall be 20 mm x 3 meters galvanized steel with hot forged point and supplied with brass wire connector clamp.

9.24.2 Clamps shall be brass.

9.25 **JUNCTION BOX**

9.25.1 Underground junction boxes, where authorized by the Provincial Electrical Safety Officer, shall be plastic or precast concrete certified to meet CS600 loading requirements and approved for electrical use.

9.25.2 The lids shall have a bolt-locking device and marked "electric" on outside face of cover with permanent legible lettering.

9.25.3 Knockouts for conduits and ducts shall be provided in the junction box.

9.26 **SERVICE PANEL**

9.26.1 Exterior service panels if approved shall be made of a CEMA 3 enclosure ASA #61 grey outside and white inside. The service panel shall contain a service breaker, lighting contactor, selector switch, bus fitting with fuses and terminal blocks.

9.26.2 Service panels mounted inside the base shall be stainless steel mounted inside a EEMAC 3 waterproof enclosure.

9.26.3 The service enclosure shall have only those openings necessary to accommodate conduits at the time of installation. Unused openings in the sheet steel panels shall be plugged with press-in plugs. All conduits shall enter or leave enclosure through threaded hubs.

9.26.4 Circuit breakers shall be of the molded case, bolt on type. Breaker sizes shall be as shown on the construction drawings.

9.26.5 A type-written panel directory shall be installed in the service panel.

9.27 **SERVICE BASE**

- 9.27.1 The service base shall be sized to accommodate the service panel and shall be complete with galvanized bolts and nuts of appropriate size. The assembly is to be CSA certified for service entrance use.
- 9.27.2 A side opening shall provide easy access to the service equipment for maintenance. At the top of the opening, there shall be a horizontal slot and securing eye of efficient diameter to accommodate a lock with a shackle 12 mm in diameter.
- 9.27.3 The finished surface of the service base shall be galvanized for cobra head lighting and shall be one coat primer and two coats of flat black enamel for ornamental light fixtures.

9.28 **CONCRETE BASE**

- 9.28.1 Concrete shall be as specified in Section 10 - Concrete.
- 9.28.2 Concrete bases shall have a minimum compressive strength of 20 MPa after 28 days.
- 9.28.3 **Anchor Bolts**
- (a) Anchor bolts shall be provided by the pole supplier.
  - (b) As a minimum anchor bolts shall be a single section of intermediate grade deformed reinforcing steel bars in accordance with CSA G30.12, Grade 400.
  - (c) As a minimum anchor bolts shall be 25 mm in diameter, 900 mm in length with one end threaded for 100 mm to accommodate one UNC galvanized hexagonal nut and cut washer.
  - (d) Anchor bolts shall be hot-dipped galvanized for the full length.

9.29 **POLES**

- 9.29.1 Street lighting poles shall be designed to sustain loads produced by 160 kmh wind loading (+1.3 Gust Factor) acting on the shaft, and the luminaire.
- 9.29.2 Lighting poles extensions and arms for cobra head fixtures shall be hot-dip galvanized steel, octagonal, tapered davit type, complete with anchor base and nut covers.
- Lighting poles extensions and arms for shoe-box head fixtures shall be square steel. They shall have one coat of primer and two coats of flat black enamel, complete with anchor base and nut covers.
- Pole finishes shall be uniform in color and have no bumps or runs.
- 9.29.3 Steel base plates and flanges shall be secured to poles and arms with continuous circumferential welds inside and out in accordance with CSA W.59.
- 9.29.4 Poles, extensions and arms shall be free from dents, pitting and corrosion, rust and sharp edges.



- 9.29.5 Steelwork shall conform to CSA/CAN 3 G40.21M, grade 300W.
- 9.29.6 Poles for shoe box head fixtures shall be 7.6 metres high with a davit arm of 1.0 m. Poles for cobra fixtures shall be 9.1 meters high with 2.4 metres davit arm and a davit radius of 2.3 meters. The tenon shall be 60 mm O.D. and 180 mm long.
- 9.29.7 The nominal length of a lighting pole on a service base shall be 0.9 meter shorter than other lighting poles to allow for the height of the service base.
- 9.29.8 Each pole shall have a reinforced type handhole with gasketed cover assembly. Inside the pole handhole, a mounting plate shall be provided to mount luminaire fuse-fittings and terminal blocks. A 91 mm by 20 mm grounding stud welded inside the pole shall be provided complete with 2 nuts and 2 washers.
- 9.29.9 Poles shall be hard-stamped with the trademark and year of manufacturing prior to galvanizing. Stamp shall be located on the topside of the flange, near the base plate and shall be visible after galvanizing.
- 9.29.10 Each pole shall be supplied with the required number of shims, nuts, washers and nutcovers and one template shall be provided to permit accurate spacing of the anchor bolts.
- 9.29.11 The bolt hole pattern for the anchor bolts in the base of the pole shall conform to the pattern as shown on the standard base detail.
- 9.29.12 Holes drilled in the pole larger than 32 mm in diameter shall have a threaded welded hub.
- 9.30 **LUMINAIRES**
- 9.30.1 Luminaires shall be high pressure sodium and shall be complete with integral constant watt induction (CW) type ballasts (120v) and lamps. High pressure sodium lamps for residential applications shall be 100 watt. Lamps used in applications requiring higher illuminance shall be 150 watt.
- 9.30.2 The refractors for all luminaires shall be polycarbonate. Acrylic or glass refractors shall not be accepted. The refractor shall be firmly held and a gasket shall be provided to prevent the entry of moisture and dust into the luminaire.
- 9.30.3 The body of the luminaire shall be of cast aluminum.
- 9.30.4 The luminaire shall be complete with an adjustable slip fitter and adjustable lamp socket.
- 9.30.5 The luminaire on the service pole shall be equipped with a twist-lock receptacle to accept a photo-electric controller.
- 9.30.6 The integral ballast shall be suitable for operation at -34 deg C and shall be connected to a terminal block with quick detachable spade connectors.

9.30.7 High intensity discharge ballasts shall be specification grade and operation at 90% power factor or better. The capacitor shall be thermally isolated from the windings.

9.30.8 The noise level shall be the lowest available, as determined by the Consulting Engineer.

9.30.9 Ballasts used for line to line application shall be of the 2 winding type having an isolated secondary and lampholder shell shall be grounded. Ballasts used for line to grounded neutral application may be of the single winding type and the lamp shell shall not be grounded. The neutral lead shall be identified to assure connection to the property polarity.

9.31 **LUMINAIRE PROTECTION**

Fuse holders shall be in line, weather proof and complete with a 10A KTK fuse and two insulating boots.

9.32 **PHOTO-ELECTRIC CONTROLLER**

9.32.1 Photo-electric controller shall be cadmium sulphide type having externally adjustable sensitivity and shall be provided with a twist-lock base to match the receptacle provided in the luminaire.

9.32.2 Operating voltage shall be 120 volts, the integrally contained control relay shall be capable of switching at least 1000 volt amperes. The action of unit shall be such that in daylight the relay is energized, holding open its normally closed contacts. The unit shall have a built-in surge protector and a lighting arrestor.

9.32.3 Operating temperature shall range from -40 deg. C to +70 deg. C. Delayed action of up to 1 minute is desirable.

9.32.4 Photo-electric controller shall be oriented as required by the manufacturer.

9.33 **CONNECTORS**

9.33.1 Conductor connections shall be made with wire-nut type solderless connectors sized to suit wire sizes, wrapped with self-holding tape (four wraps minimum) and sealed with PVC tape.

9.33.2 All conductor connection in underground junction boxes shall conform to Section 10.34.1 and shall be double-dipped in a silicone rubber based sealant.

9.33.3 Ground rod connectors shall be brass.

9.34 **CONDUIT BEDDING MATERIAL**

Conduit bedding materials shall be 13 mm (minus) sand approved by the Consulting Engineer.

**INSTALLATION**

9.40 **PERMITS**

The Contractor shall obtain and pay for all permits, arrange for all electrical inspections covering his work, pay all other fees and charges, and make all deposits that are in any way connected with the installation of the roadway lighting. He shall give all necessary notices to authorities having jurisdiction and shall be responsible for complying with all applicable public ordinances.

9.41 **RULES AND REGULATIONS**

9.41.1 The equipment installation, and wiring methods shall conform to the Rules and Regulations contained in the Electrical Energy Inspection Act and the Rules for Overhead and Underground Electric-Line Construction as issued by the Ministry of Labour, Province of British Columbia, and all Bulletins issued thereto, any local or provincial bylaws or statutes in effect at the site, and the Fire Marshall and Workers' Compensation Acts, hereinafter collectively called "the rules and regulations".

9.41.2 Wherever the drawings or specifications call for workmanship, arrangement or construction of a superior quality than is required by the rules and regulations, the drawings and specifications shall prevail. Otherwise, should there be a conflict between the rules and regulations and the drawings and specifications, the rules and regulations shall prevail.

9.42 **TRENCH EXCAVATION, BEDDING AND BACKFILL**

9.42.1 Refer to Section 3 - Trench Excavating, Bedding and Backfill for installation requirements.

9.42.2 Where soil conditions and/or foundations are unstable, the Contractor shall notify the Consulting Engineer in order that a standard pole base design change can be considered.

9.43 **CERTIFICATE OF INSPECTION**

The Contractor shall submit to the Consulting Engineer, prior to requesting the final inspection, the Certificate of Inspection signed by the local electrical inspector, Safety Engineering Services Division, Ministry of Labour.

9.44 **CONDUIT INSTALLATION**

9.44.1 Unless otherwise noted on the drawings or approved by the Engineer, the minimum depth of cover on conduit below finished grade shall be 900 mm.

9.44.2 Conduit shall have a minimum bedding thickness of 75 m. There shall be a 150 m minimum bedding thickness to any excavated rock surface.

9.44.3 Conduits shall be installed parallel or perpendicular to the roadway, and routed to run in a direct line between adjacent poles. Bends shall be of large radius type unless otherwise specified on the construction drawings.

- 9.44.4 During construction, conduits shall be capped or covered when electrical work is not actually in progress. A manufactured PVC cap shall be used.
- 9.44.5 Empty conduits shall be provided with a nylon pull string and capped.
- 9.44.6 Buried conduit shall be capped and identified at both ends prior to pouring of concrete or backfilling.
- 9.44.7 Conduit shall extend a minimum of 75 m above the top of the concrete base.
- 9.44.8 Conduits laid in the same trench with the communication and power cables shall maintain the required minimum spacing throughout.
- 9.44.9 Conduits laid near underground pipes and the underground portion of overhead structures shall maintain the required minimum clearance.
- 9.44.10 Crossovers shall be kept to a minimum.
- 9.44.11 Grade conduit to permit drainage to junction boxes.
- 9.45 **UTILITY WARNING TAPE**
- Underground utility warning tape shall be installed 300 m above and directly over the conduit.
- 9.46 **CONDUCTOR INSTALLATION**
- 9.46.1 Before pulling conductors through the conduit, the conduit shall be blown out with compressed air from both ends and then swabbed out to remove all stones, dirt, water and other foreign material from the conduit.
- 9.46.2 No conductor shall be drawn into any raceway until all work of any nature that may cause injury to the conductor or its insulation has been completed. During pulling, the conductors shall be fed carefully into the raceway to prevent stretching, twisting, kinking or looping. Only talc or other CSA approved lubricants shall be used to assist in the pulling operations. Grease type lubricants shall not be permitted.
- 9.46.3 Conductor connections in the base of the poles shall be made accessible from the handhole.
- 9.46.4 Where connections are made or conductors pass through junction boxes as described in Section 9.48 the conductors shall have 300 m slack in each junction box and the conductors shall be stranded copper and insulated with RW90. Ground conductors shall be stranded copper and insulated with TW75.
- 9.46.5 Conductor connections in underground junction boxes shall be secured with solderless connectors. Each conductor connection shall be sealed with a minimum of four wraps of self-bonding tape

covered with PVC tape and dipped in silicon rubber based sealer.

9.47 **GROUNDING**

9.47.1 **General**

- (a) The combined ground resistance shall not exceed 10 ohms. The above requirements shall be realized by connection to artificial grounding electrodes.
- (b) Ground rod shall be imbedded in the concrete base and extend 75 mm above top of base.

9.47.2 **Equipment Grounding**

- (a) The following shall be grounded:
  - non-current carrying parts of electrical apparatus
  - service panel
  - metal poles
- (b) A ground wire shall be run with all the feeders and be connected at each pole grounding stud.
- (c) Where a ground conductor is below grade or below a concrete slab, splices or connections shall be joined by cadweld or approved compression connectors.

9.47.3 **System Grounding**

The neutral of the 120/240 volts service voltage shall be grounded at the neutral terminal block of the service panel.

9.48 **JUNCTION BOX INSTALLATION**

9.48.1 **Concrete Type**

- (a) The junction box shall be assembled with a concrete brick base as shown on the standard drawing. The brick base shall cover the bottom of the junction box and extend 50 mm beyond the outside wall of the junction box on all sides.
- (b) The elevation of the bases for the junction boxes shall be carefully controlled to ensure that the top of the junction box assembly is flush with the top of the finished grade.
- (c) The conduits and ducts shall enter the junction boxes through knockouts provided in the junction box sections. Each conduit or duct shall be neatly grouted in the knockout hole.
- (d) The junction box shall be located behind the pole base or as directed by the Consulting Engineer, subject to approval by the Electrical Safety Inspector.

9.48.2 Plastic Type

Junction boxes shall be installed as directed by the Consulting Engineer, subject to the approval by the Electrical Safety Inspector.

9.48.3 Concrete Vaults

Concrete vaults shall be installed as directed by the Consulting Engineer, subject to the approval by the Electrical Safety Inspector.

9.49 SERVICE PANEL AND SERVICE BASE INSTALLATION

9.49.1 Service panels shall be mounted in a service base or mounted in an enclosure at a location as directed by the Consulting Engineer and acceptable to the Electrical Safety Officer.

9.49.2 Service panels and other electrical equipment in them shall be properly protected against the entrance of dust, dirt, and moisture, and protected against mechanical injury while rough, dirty, wet or dusty work is in progress.

9.49.3 Unused openings in the sheet steel panels shall be plugged with approved press-in plugs.

9.50 CONCRETE BASE INSTALLATION

9.50.1 Where possible, the hole for the concrete base shall be dug without disturbing the surrounding soil. If the soil remains firm and hole dimensions conform to those specified, no formwork need be used except for the top 200 m of the base.

9.50.2 The pedestal portion of the base shall be neatly formed to the given dimensions. The top of the base shall be trowelled smooth and level and edges shall be bevelled.

9.50.3 An accurate template shall be used to locate conduits and pole anchors.

9.50.4 Anchor bolts shall be set with a template to suit the poles.

9.50.5 Before mounting poles, the concrete base shall be allowed to cure for a minimum of 7 days and all formwork shall be removed and backfill placed around the base and compacted to 95% of Modified Proctor Density (ASTM D1557).

9.50.6 Bases shall be neatly grouted after pole installation ensuring that drain holes are not plugged. Temporary protective covers shall be provided over any concrete pole base that has exposed wiring prior to the installation of the steel pole.

9.51 POLES INSTALLATION

9.51.1 Poles shall be erected plumb, using the shims supplied if required. No more than 5 shims shall be

used for any one pole.

- 9.51.2 If more than six (6) shims are required, break off the top 150 mm of the concrete base and reform using methods and materials approved by the Consulting Engineer.
- 9.51.3 Davits and mast arms shall be installed at right angle to the centreline of the road.
- 9.51.4 Prior to pole installation, anchor bolts shall be given a liberal coat of non-oxidizing grease.
- 9.51.5 Anchor nuts shall be tightened to the manufacturer's recommended torque. There shall be at least one exposed anchor bolt thread above the anchor nut. Exposed anchor bolts and nuts shall be given a liberal coat of non-oxidizing grease.
- 9.51.6 Nut covers shall not be installed until anchor nut installation is inspected and approved by the Consulting Engineer.
- 9.51.7 Poles shall be cleaned after erection.

9.52 **LUMINAIRES**

- 9.52.1 Luminaires shall be cleaned after pole erection and plumbing is complete.
- 9.52.2 Luminaires shall be securely fastened to the lighting poles and oriented to produce the required light distribution.

9.53 **CLEANUP**

- 9.53.1 The interior of enclosures, pole handholes and wiring areas shall be cleaned of dust, dirt and loose materials, vacuum-cleaned and all water and moisture removed.
- 9.53.2 All fastening screw holes provided in enclosures shall have a fastening screw installed.
- 9.53.3 Any spots where the galvanizing is damaged due to drilling, tapping, reaming, welding, or surface damage during transportation and erection, shall be finished with cold galvanizing compound. The application of this cold galvanizing compound shall be in accordance with the following:
  - (a) The surface preparation and application of the compound must be performed under the supervision or authorization of the Consulting Engineer. Any unsupervised or unauthorized application shall be completely removed and reapplied under proper supervision at the Contractor's expense.
  - (b) The surface shall be mechanically cleaned with a wire brush or grinder and chemically cleaned to remove all welding flux, grease, oil, rust, scale and other detrimental foreign matter.
  - (c) The surface shall be absolutely dry and the ambient temperature shall be over 10 deg. Celsius.

- (d) The cold galvanizing compound shall be thoroughly stirred before using until it has a completely uniform appearance.
- (e) A single brush coat shall be applied. This coat shall be as thick as possible without causing runs in the finished surface.
- (f) The brush shall be dipped to the bottom of the can each time. Periodic stirring of the can during painting is required.
- (g) The cold galvanizing compound shall be used as supplied by the Manufacturer. No thinning agent shall be added unless the Contractor is instructed to do so by the Consulting Engineer.
- (h) Complete drying time can be as long as 48 hours so the application shall be timed so that the treated surface is not subjected to damage or abrasion due to other work within 48 hours of the time of application.
- (i) As an alternative, the Contractor may supply and use zinc rich primer (cold galvanizing spray coating for metal). The manufacturer's application instructions must be strictly adhered to.

9.54 **TESTING AND CALIBRATION**

9.54.1 The Contractor shall carry out all adjustments and tests necessary to ensure that the entire electrical installation and all its equipment, materials and components are in satisfactory physical condition electrically and perform the intended function and operations. Adjustments required to make the system operate in the manner intended by the Consulting Engineer shall be made.

9.54.2 At the completion of the job, property systems operation shall be demonstrated to the Consulting Engineer.

**FINAL APPROVAL**

9.60 **FINAL INSPECTION**

Prior to requesting a final inspection of the works by the Municipality, the Consulting Engineer and Contractor shall carry out a thorough review of the project to identify and remedy any deficiencies. The Inspection Checklists contained in Appendixes "A" and "B" shall be used as references. The system shall be tested to confirm it performs the intended functions and operations and shall be energized with a generator if necessary. The Consulting Engineer shall also thoroughly review as-built record information and make any changes necessary.

Upon request for a final inspection, the Consulting Engineer shall submit the following:

- (a) Two copies of the as-built drawings.



- (b) A copy of the Contractor's Declaration.
- (c) Completed copies of the Final Inspection Checklist.

Following receipt and review of the above noted information, a final inspection shall be carried out with the Consulting Engineer, Contractor and Engineer in attendance. If required by the Engineer, the operation of the lighting system shall be demonstrated. The Consultant shall provide the Contractor and Engineer with a written summary of the final inspection, listing any deficiencies and the proposed course of action.

9.61 **FINAL APPROVAL SUBMISSION**

Prior to requesting final approval and acceptance of the works, the Consulting Engineer shall ensure that the following has been submitted to the Municipality:

- (a) Two sets of certified as-built drawings and one certified, reproducible set.
- (b) Confirmation that all deficiencies noted during the final inspection have been corrected.
- (c) A copy of the Contractor's Declaration and confirmation that it has been sent to the Electrical Inspector and BC Hydro.
- (d) Confirmation of payment of BC Hydro connection charges. System not to be energized until authorized by the Municipality.
- (e) Number and type of streetlights installed.
- (f) Date of completion and proposed maintenance bond amount.

9.62 **ENERGIZING SYSTEM**

The system shall not be energized until authorized by the Municipality. Following final approval of the works, and when deemed appropriate, the Municipality will advise BC Hydro to energize the system and initiate the billing process.