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**2.25 HIGHWAY STREET LIGHTING**

2.25.1 GENERAL

This work shall consist of the supply and installation of highway lighting and all associated electrical work in accordance with these specifications, and in conformity with the dimensions, details and requirements shown on plans and drawings, at locations as indicated and as established by the Consultant. The electrical installation shall be in accordance with the current edition of the “Canadian Electrical Code”, regulations of the Electrical Inspection Department having jurisdiction and as determined by the Consultant. Any work, even if not shown or specified, which is obviously necessary or reasonably implied to complete the work, shall be done as if it were both shown and specified.

All electrical installation work shall be performed by qualified tradesmen experienced in such work.

The Contractor shall obtain all permits and approvals and pay all related fees required for the work and submit a copy of all permits and associated documents to the Consultant.

2.25.2 ABBREVIATIONS AND DEFINITIONS

Wherever in these Specifications the following abbreviations are used, the intent and meaning shall be as follows:

C.S.A.: The Canadian Standards Association  
CEMA: Canadian Electrical Manufacturers Association  
EEMAC: Electrical and Electronic Manufacturer’s Association of Canada

Reference to regulations and standards in all cases shall mean the latest amendment or revision current at the closing date of the tender.

2.25.3 MATERIALS

The Contractor shall supply all materials required for the installation of the highway lighting including associated electrical components.

All material supplied shall be new and built in accordance with EEMAC standards and shall be C.S.A. approved unless otherwise approved by the local inspection authority. The Contractor shall obtain approval of the local inspection authority and shall bear all inspection charges levied and any modification costs required for any materials not C.S.A. approved.

Material shall also comply with the plans, drawings and as required by the “Canadian Electrical Code”. Where there is lack of specification in the plans and drawings, the materials shall comply with the special provisions, standard specifications, or as specified by the Consultant.

When the work necessitates the removal, salvage and reinstallation of lighting structures, only materials from existing installations shall be used. Contractor stockpiles of used material from other sources will not be acceptable.

**2.25.3.1 PVC Conduit**

The Contractor shall supply, in accordance with the applicable C.S.A. standards and as shown on the drawings, 50 or 100 mm DB2 PVC conduit with all necessary bends, caps, couplings and cement.

**2.25.3.2 Wiring**

All wiring within the poles to the luminaires shall be #12 Cu. RW90 X-Link. All conductors shall be copper.

The Contractor shall supply secondary electrical cable as shown on the drawings. All teck cables shall be copper and have 1000 V cross link insulation. Teck cable shall be HL rated.

**2.25.3.3 Luminaires and Standards(Poles)**

The Contractor shall supply new luminaires complete with lamps, davit or high mast standards, and bases as shown on the plans and drawings. All standards shall be hot dip galvanized in accordance with C.S.A. standard G164-M. Double dipping will not be permitted.

**2.25.3.4 Sand Bedding and Backfill**

All bedding sand shall be supplied by the Contractor and shall be free of clay, rocks and organic materials. The sand shall be a Designation 5 Class 10A in accordance with Specification 3.2, Aggregate Production and Stockpiling or as approved by the Consultant.

When native material excavated from a ditch or trench is unacceptable as backfill, the Contractor shall supply sand or other approved backfill material. At no time shall backfill material containing ice, snow, organic or frozen material be used. All backfill material will be subject to the approval of the Consultant.

**2.25.3.5 Concrete Bases**

The Contractor shall supply all materials for the construction of pole and cabinet bases and the bases shall be constructed of concrete in accordance with CAN3-A23.1-M90. Concrete shall be Type 50, Class C in accordance with Specification 5.5, Portland Cement Concrete. Reinforcing shall be Grade 400, deformed bars in accordance with CSA G30.12-M77 complete with 10M ties as shown on the plans.

Anchor bolts shall be supplied in accordance with the requirements of the pole or base manufacturer. Generally the top 300 mm of the anchor bolts shall be hot dipped galvanized unless otherwise specified.

**2.25.3.6 Frangible Bases (Breakaway Couplings)**

The Contractor shall supply all required frangible bases for light standards as shown on the drawings or in the Special Provisions.

**2.25.3.7 Site Lighting Distribution Enclosure and Components**

The Contractor shall supply the required distribution enclosure in accordance with the drawings and as determined by the Consultant.

The enclosure shall be a weatherproof CEMA4 design complete with padlockable door, hinged on one side. The enclosure shall be of sufficient size to house panel boards, disconnects, breakers, lighting contactors, control transformers, splitters and controls. Refer to details on drawings. The enclosure shall be C.S.A. approved with components installed. The entire system in the enclosure shall be concealed in conduit or other acceptable means. Exposed wiring will not be accepted. The Contractor shall provide all wiring schematics for future reference.

Panel boards shall be commercial or industrial grade complete with breaker. Rating of panel boards and number and type of breakers shall be as indicated on drawings. Breakers shall be bolt in style only to match panels. Acceptable manufacturers are Westinghouse, Square D, FPE or approved equal.

Main disconnect shall be commercial or industrial grade CEMA 1 breaker enclosure suitable for service entrance. Rating and phases shall be as indicated on drawings. Acceptable manufacturers shall be Westinghouse, Square D, FPE or approved equal.

Lighting contactors shall have a minimum of 600 volt rated contacts and 120 volt operating coil. The contactor shall be mounted in a CEMA 1 enclosure and have a rating and number of phases as indicated on drawings. Acceptable manufacturers shall be Westinghouse, Allen Bradley, Square D or approved equal.

Control transformer (if required) shall be 2000 VA rated and mounted in CEMA 1 enclosure. The transformer shall have voltage ratings and phases as indicated on drawings.

Control circuit disconnect (if required) shall be rated at 15 amp and shall be mounted in a CEMA 1 enclosure. Voltage ratings and phases shall be as indicated on drawings. Acceptable manufacturers shall be Westinghouse, Square D, FPE or approved equal.

Hand-Off-Auto switch shall be a 3-position selector switch with capabilities to override photocell and shall be mounted in a CEMA 1 enclosure.

Photocell shall be rated 1500 watt, 120 volt, drift free minimum "turn on level" of 1.5-foot candles. It shall be integrally wired into distribution enclosure and shall be of vandal proof design.

#### 2.25.4 DRAWINGS

The Contractor shall submit shop drawings of electrical work, which includes poles, luminaires, distribution enclosures and frangible bases to the Consultant for approval, a minimum of 14 days before the scheduled start of the work. Shop drawings shall be stamped and signed by a Professional Engineer. Work shall not commence until all shop drawings have been approved by the Consultant.

The Contractor shall maintain a set of drawings on the site at all times and record any changes approved by the Consultant that may occur and on the set mark "AS BUILT". These drawings shall be submitted to the Consultant upon completion of the project.

2.25.5 CONSTRUCTION

2.25.5.1 **Existing Underground Utilities**

The Contractor shall hand expose all underground utilities in all areas of excavation. Hand exposure shall be as specified by the utility owner. The exposure and backfilling of the utilities shall be undertaken by the Contractor under the direct supervision of the company's representative.

2.25.5.2 **Removal and Salvage of Existing Standards**

Where required as shown on the drawings, the Contractor shall remove, salvage and store existing light standards. Existing pre-cast bases and all other components shall be removed and disposed of in an acceptable manner. The Contractor shall backfill and compact holes left from pole removal before nightfall. Material damaged by the Contractor during the removal shall be replaced with new material by the Contractor at his own expense.

When standards are salvaged for reuse, the existing galvanizing shall be repaired to the satisfaction of the Consultant prior to installation.

When painted standards are designated to be salvaged and reinstalled, they shall be hauled to a plant equipped to do the work, stripped of all paint and rust and hot dip galvanized in accordance with CSA Standard G164-M.

2.25.5.3 **Removal and Disposal of Existing Lighting Fixtures**

Where required as shown on the plans, the Contractor shall remove and dispose of existing light fixtures including standards, bases and luminaires in a manner and location as approved by the Consultant. All materials shall become the property of the Contractor.

The Contractor shall backfill and compact the disturbed areas prior to nightfall.

2.25.5.4 **Saw Cutting**

Wherever specified, saw cutting shall be to a sufficient depth so the pavement structure including any concrete and soil cement layers can be excavated leaving a clean straight vertical butting edge against which new material can be effectively placed and compacted. Rough, jagged edges will not be acceptable.

All cut away material shall be disposed of by the Contractor at his expense.

2.25.5.5 **Excavation and Backfill**

No trenching or excavation work will be permitted over existing power, communication cable, pipeline or other underground utilities without the supervision of the appropriate authority. The Contractor shall call Alberta First Call and the respective utilities to locate and mark existing underground utilities. Damage to any utilities is the responsibility of the Contractor.

Trench digging machinery will be permitted except where its operation will cause damage to trees, buildings, or existing structures above or below ground. At such locations, alternative methods shall be

used subject to the approval of the Consultant.

Excavation and backfill shall be executed where required for electrical installation unless otherwise stated on plans and drawings. Trenches shall be a minimum of 150 mm wide along alignments. Trenches shall be a minimum of 0.9 metres to a maximum of 1.1 metres below finished grade level. The trench bottom shall be free of stones, loose material and sharp objects. In backfilled areas, the trench bottom shall be kept level to facilitate laying-in of the cable. The excavation shall be performed in such a manner as to cause the least possible damage to the adjacent embankment surface and other improvements.

No deviation shall be made from the required line or grade except with written approval of the Consultant.

Trenches shall not be left open unattended or unprotected without written permission from the Consultant. In such cases, the open trench shall be properly marked and barricaded with flashers. In locations where flooding may occur or public hazard is created by open trench, the Consultant at his discretion may require that the excavation be appropriately covered.

Temporary support, adequate protection, and maintenance of all underground and surface utilities structures, drains, sewers, and other obstructions encountered in the progress of the work shall be provided by the Contractor at his own expense.

Backfill material shall be mechanically compacted in maximum lifts of 150 mm to a minimum of 95% of Standard Proctor Density for the full depth of the excavation. Compaction tests shall be on a minimum of one density test per 150 metres of trench for compacted vertical backfill. Additional tests may be required at the discretion of the Consultant. The cost of all testing shall be the responsibility of the Contractor.

All disturbed areas shall be restored to the conditions existing prior to the disturbance or a condition satisfactory to the Consultant.

Disposal of all excess material shall be the responsibility of the Contractor.

#### **2.25.5.6 Sand Bedding**

Sand used as bedding or backfill in excavated areas beneath roadway, driveways, and sidewalks shall be compacted to a minimum of 100% of Standard Proctor Density and provide a minimum of 50 mm covering on all sides of the conduit. In all other cases, unless otherwise specified by the Consultant, sand shall be compacted to a minimum of 95% of Standard Proctor Density.

#### **2.25.5.7 Street Light Bases**

Street light bases shall be cast in place as detailed on the drawings. Bases shall be constructed a minimum of 21 days prior to installing the poles, unless adequate and approved braces are provided.

The Contractor is advised to assess the nature of the existing soil types and conditions prior to tender. The Contractor shall have no claim against the Department for difficulties in the constructability of the bases and footings due to soil types and conditions.

**2.25.5.8 Luminaires and Standards (Poles)**

The Contractor shall install all davit and high mast standards (to the height specified), luminaires, lamps and frangible bases according to the plans and drawings and as determined by the Consultant.

Standards shall be installed plumb and level. Shims may be used for levelling, however any gaps between standards and bases shall be appropriately filled with grout.

Each luminaire shall be aligned and aimed correctly as indicated on the plans or as determined by the Consultant.

The Contractor shall complete all associated wiring, fusing and galvanizing in accordance with C.S.A. standard G164-M for the installation of the unit.

Terminations in the pole base shall be completed using insulated crimping connectors, not wire nuts (amp type or approved equal). All aluminum to aluminum or aluminum to copper connections shall be made using PENETROX, or an approved equivalent, in an approved manner.

**2.25.5.9 Underground Electrical Conduit**

PVC conduit shall be installed beneath all roadway, walkways, driveway crossings and other locations as indicated on the drawings. The installation shall be for the entire length of the crossing plus an additional metre on each side. Installation shall be in accordance with the plans and drawing and as determined by the Consultant.

Pushed or trenched underground electrical conduit shall be installed in accordance with Specification 2.7, "Underground Electrical Conduits" and the applicable drawings.

**2.25.5.10 Site Lighting Distribution Enclosure**

The Contractor shall install the required distribution enclosure in accordance with the drawings and as determined by the Consultant. The sand bedding for the enclosure shall be compacted to a minimum of 100% of Standard Proctor Density.

A concrete base shall be constructed to the dimensions shown on the plans. All connections to the enclosure shall run through the concrete base.

The Contractor shall situate the base and cabinet to ensure that the photocell operation is not effected by outside light sources.

**2.25.5.11 Secondary Electrical Cable**

Secondary electrical cable shall be placed in trenches in random separation with great care to ensure no kinking or damage to the sheath (splices are unacceptable). Cables crossing all roadways shall be placed in a 50 or 100 mm PVC conduit as specified, one duct for each cable.

Secondary electrical cable shall be installed as shown on the drawings or determined by the Consultant.

**2.25.5.12      **Grounding****

The entire installation shall be grounded in accordance with the latest edition of the "Canadian Electrical Code" and as shown on the drawings.

**2.25.6      TESTING**

The electrical installation shall be completely tested, including but not limited to megger and ground testing, and certified by a qualified licensed electrician demonstrating to the satisfaction of the Consultant that the equipment and system installed perform in the manner intended. The Consultant shall be notified 24 hours in advance of the certification testing.

**2.25.7      WARRANTY**

Notwithstanding any extended warranties proffered by specific suppliers or manufacturers, the warranty period for this installation shall be one year. All manufacturers' and suppliers' warranty documentation shall be submitted to the Consultant at the completion of the Work.

**2.25.8      MEASUREMENT AND PAYMENT**

Payment for the following items will be compensation in full for all equipment, labour, tools and incidentals necessary to complete the work.

**2.25.8.1      **Trench and Backfilling****

Trenching and backfilling for wiring installation will be measured by the lineal metre along the centreline of the trench.

Payment will be made at the unit price bid per lineal metre for "Trenching and Backfilling". This payment will be full compensation for trenching, supply, placement and compaction of any required sand bedding, backfilling, disposal of the spoil as required and replacing original sod with topsoil and grass seed.

**2.25.8.2      **Hand Expose Existing Underground Utilities****

There will be no separate or additional payment for hand exposing and backfilling existing underground utilities. Costs will be considered incidental to the work.

**2.25.8.3      **Underground Electrical Conduit****

Measurement and payment for PVC pipe installation will be in accordance with Specification 2.7.4, "Underground Electrical Conduit - Trench Excavation" or "Underground Electrical Conduit - Pushed Conduit" as applicable.



**2.25.8.4 Secondary Cable**

The quantity of secondary cable considered for payment will be based on the length in metres of trench excavated for the installation of underground wiring as measured along the centreline of the trench. No additional allowance or payment will be made for the requirement for extra connecting cable at run terminations or for cable wiring installed at variance with a straight line.

Payment will be made at the unit price bid per metre for "Secondary Cable - Supply & Install" for the type specified. This payment will be full compensation for the supply and installation of the cable.

**2.25.8.5 Electrical Wiring and Materials**

Except for the secondary electrical cable, no separate or additional payment will be made for the supply and installation of electrical materials required for the proper installation of the luminaires and electrical operating systems. All wiring, fusing, connectors, insulators and any other materials necessary for the proper operation of the system will be considered incidental to the Work.

**2.25.8.6 Removal and Salvage of Existing Standards**

Payment for the removal and salvage of existing standards will be made at the applicable price bid per unit for "Removal and Salvage of Existing Standards" for the type and size indicated. This payment will be full compensation for the supply of all tools, equipment and labour required to remove, salvage and store the standards; remove and dispose of the remainder of the installation; and backfill, compact and restore the excavated areas to the satisfaction of the Consultant.

**2.25.8.7 Removal and Disposal of Existing Light Fixtures**

Payment for the removal and disposal of existing light fixtures will be made at the price bid per unit for "Removal and Disposal of Existing Light Fixtures". This payment will be full compensation for the supply of all tools, equipment and labour required to remove and dispose of standards, luminaires, concrete bases and electrical components and backfilling, compacting and restoring the excavated areas to the satisfaction of the Consultant.

**2.25.8.8 Concrete Base**

Payment for concrete bases for pole installations will be made at the price bid per unit for "Cast In Place Concrete Base - Supply & Install". This payment will be full compensation for all excavation for the installation, disposal of spoil, supply, placement and compaction of the sand bedding, supply and placement of concrete, rebar and anchor bolts, testing of concrete, supply of saunatube (if necessary), tamping and levelling.

**2.25.8.9 Davit and High Mast Standards**

Payment for the installation of davit or high mast standards will be made at the applicable price bid per unit for "Street Light Standard - Supply & Install" for the type and height specified. This payment will be full compensation for supplying and installing the pole, luminaire, lamp, frangible base, wiring, fusing and all other materials necessary to complete the installation.

When frangible bases are not required, payment for the installation of davit or high mast standards will be made at the applicable price bid per unit for "Street Light Standard (without frangible bases) - Supply & Install" for the type and height specified. This payment will be full compensation for supplying and installing the pole, luminaire, lamp, wiring, fusing and all other materials necessary to complete the installation.

**2.25.8.10 Reinstallation of Salvaged Standards (Poles)**

Payment for reinstalling poles will be made at the applicable unit price bid per pole for "Salvaged Street Light Standard - Install" for the type and height specified. This payment will be full compensation for hauling the poles from the storage location, repairing the galvanizing when necessary, installing the salvaged pole, supplying and installing new luminaire, lamp, frangible base, wiring, fusing and all other materials necessary to complete the installation.

When reinstalling salvaged standards without frangible bases, payment for reinstalling poles will be made at the applicable unit price bid per pole for "Salvaged Street Light Standard (without frangible bases) - Install" for the type and height specified. This payment will be full compensation for hauling the poles from the storage location, repairing the galvanizing when necessary, installing the salvaged pole, supplying and installing new luminaire, lamp, wiring, fusing and all other materials necessary to complete the installation.

**2.25.8.11 Site Lighting Distribution Enclosure**

Payment for the distribution enclosure will be made at the price bid per unit for "Distribution Enclosure - Supply & Install". This payment will be full compensation for supplying and installing all materials necessary to provide the distribution and control of the street lighting system according to the plans and drawings. This shall also include supply and installation of the concrete pad and sand bedding, supply and installation of specified grounding system and the complete system testing and certification.

**2.25.8.12 Galvanizing of Existing Standards**

Measurement will be made of the number of salvaged standards, properly galvanized and reinstalled on the project.

Payment will be made at the applicable unit price bid per pole for "Galvanizing Salvaged Standards" for the type and size indicated. This payment will be full compensation for hauling the standards to the galvanizing plant, removing all paint and rust, galvanizing and returning the standards to the Work site.

**2.25.8.13 Saw Cutting**

Measurement will be made in metres of the length of structure required to be saw cut as specified.

Payment for saw cutting will be made at the unit price bid per metre for "Saw Cutting". This payment will be full compensation for all equipment, tools and incidentals necessary to complete the work including disposal of debris.

**2.25.8.14 Restoring Site Conditions**

No separate payment will be made for any materials, equipment, tools or labour required to restore excavated or disturbed areas to the condition existing prior to construction or as approved by the Consultant, including any required topsoil and seed. All costs will be considered incidental to the Work.