

**Part 1 General****1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements that are common to NMS sections found in Division 26 and 34.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-02, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 MEASUREMENT AND PAYMENT**

- .1 The electrical works will be paid as a lump sum. The price must include all electrical works identified on plans and specifications and all required materials and man power necessary to achieve the work as per detail shown on plans.

**1.4 SCOPE OF WORK**

The work proposed under this contract includes:

- .1 Remove existing taxi lights (3), including lights, supports, transformers and cables between lights;
- .2 Supply and install 6 new taxi lights yellow and blue, included with, mounting conduit, grounding clamp, transformers, transformer boxes and cables as specified in the drawings. The lights are supplied by the airport;
- .3 Replace 4 lenses yellow and blue on existing light;
- .4 Supply and install 4 projectors similar to existing, to light the new parking on an existing pole, including modifications of the existing power distribution.

**1.5 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels in English and French.

- .4 Use one nameplate or label for both languages.

## **1.6 SUBMITTALS**

- .1 Product Data: submit WHMIS MSDS in accordance with this system.
- .2 Shop drawings:
  - .1 Submit three (3) copies of drawings and product data.
  - .2 If changes are required, notify Ministry Representative of these changes before they are made.
- .3 Quality Control:
  - .1 Provide CSA certified equipment and material.
  - .2 Permits and fees: in accordance with General Conditions of contract.

## **1.7 SITE MEETINGS**

- .1 Hold site meeting as per departmental representative requirement.

## **1.8 OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

## **1.9 QUALITY ASSURANCE**

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians [who hold valid Master Electrical Contractor license or apprentices in accordance with as per the conditions of Provincial Act respecting manpower vocational training and qualification.
  - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

**1.10 SYSTEM STARTUP**

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service Engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

**Part 2 Products**

**2.1 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates and labels as follows:
  - .1 Nameplates: lamicoid 3 mm, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
  - .2 Sizes as follows:

**NAMEPLATE SIZES**

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Ministry Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Transformers: indicate capacity, primary and secondary voltages.

**2.3 WIRING IDENTIFICATION**

- .1 Install markers on cable identifying circuit numbers in each pullpit. Identify wiring with permanent indelible identifying markings, numbered coloured inox. steel tapes (Thomas and Betts, serial Ty-Rap, cat. ERO), on both ends of phase conductors of feeders and branch circuit wiring.
- .2 In each pulpit, transformer housing and transformers direct buried cables shall be identify with an auto-adhesive blue tape, installed close to the primary connectors to indicate

cables coming from left and red tape for cable coming from right, when situated face to the runway.

.3 Colour coding: to CSA C22.1.

**2.4 CONDUIT AND CABLE IDENTIFICATION**

- .1 Color code conduits.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall or floor, and at 15m intervals.
- .3 Colours: 100 mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue

**2.5 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

**3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

**3.3 FIELD QUALITY CONTROL**

- .1 Conduct before commencing works, the following tests:
  - .1 Taxiway and apron lighting circuit.
  - .2 Insulation resistance testing:
    - .1 Megger 5000 V circuits, feeders and equipment with a 5000 V instrument.
  - .2 Test all new sections, the reading of the new section shall be at least 1 Gigaomhs.
  - .3 The reading of the circuit including the new section shall be at least equivalent or higher.
  - .4 If required by departmental representative, perform test in his presence. All the values shall be transmit to the departmental representative.

- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

**3.4 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1        CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.
- .2        CAN/CSA-C22.2 No. 131-M89(R1994), Type TECK 90 Cable.

**1.2                PRODUCT DATA**

- .1        Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

**1.3                WASTE MANAGEMENT AND DISPOSAL**

- .1        Separate and recycle waste materials
- .2        Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3        Fold up metal banding, flatten and place in designated area for recycling.

**Part 2            Products**

**2.1                BUILDING WIRES**

- .1        Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2        Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

**2.2                TECK CABLE**

- .1        Cable: to CAN/CSA-C22.2 No. 131.
- .2        Conductors:
  - .1        Grounding conductor: copper.
  - .2        Circuit conductors: copper, size as indicated.
- .3        Insulation:
  - .1        Chemically cross-linked thermosetting polyethylene rated type RW90, 1000 V.
- .4        Inner jacket: polyvinyl chloride material.
- .5        Armour: interlocking aluminum.
- .6        Overall covering: polyvinyl chloride material.
- .7        Fastenings:

- .1 One hole aluminum straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at 300 mm centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
  - .1 Watertight, approved for TECK cable.

**Part 3       Execution**

**3.1       INSTALLATION OF BUILDING WIRES AND TECK CABLES**

- .1 Install wiring as follows:
  - .1 In conduit.
  - .2 In underground ducts in accordance with Section 26 05 34
  - .3 In trenches in accordance with Section 26 05 34

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1        American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineer (IEEE)
  - .1        ANSI/IEEE 837-[1989(R1996)], Qualifying Permanent Connections Used in Substation Grounding.
- .2        Canadian Standards Association, (CSA International)
- .3        CAN/CSA Z32-1999, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

**Part 2            Products**

**2.1                MATERIAL**

- .1        Rod electrodes: copper clad steel 19 mm dia by 3 m long.
- .2        Grounding conductors: bare copper, size as indicated.
- .3        Insulated grounding conductors: green, type THHN.

**Part 3            Execution**

**3.1                INSTALLATION GENERAL**

- .1        Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Install connectors in accordance with manufacturer's instructions.
- .2        Protect exposed grounding conductors from mechanical injury.
- .3        Make buried connections, using copper welding by thermit process to ground rods.
- .4        Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5        Soldered joints not permitted.
- .6        Ground secondary service pedestals.

**3.2                ELECTRODES**

- .1        Install rod electrodes and make grounding connections.
- .2        Bond separate, multiple electrodes together.



- .3 Use copper conductors for connections to electrodes.

### **3.3 FIELD QUALITY CONTROL**

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Ministry Representative and local authority having jurisdiction over installation.
- .2 Perform tests before energizing electrical system.

**END OF SECTION**

**Part 1            General**

**Part 2            Products**

**2.1                CONDUITS**

- .1      Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2      Rigid CPV conduit: to CSA C22.2 No. 211.2.

**2.2                CONDUIT FITTINGS**

- .1      Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2      Factory "ells" where 90 degrees bends are required for 25 mm and larger conduits.

**2.3                FISH CORD**

- .1      Polypropylene.

**Part 3            Execution**

**3.1                INSTALLATION**

- .1      Use rigid CPV conduit underground.
- .2      Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .3      Mechanically bend steel conduit over 19 mm dia.
- .4      Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .5      Install fish cord in empty conduits.
- .6      Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .7      Dry conduits out before installing wire.

**3.2                CONDUITS UNDERGROUND**

- .1      Slope conduits to provide drainage.
- .2      Waterproof joints (CPV excepted) with heavy coat of bituminous paint.

**3.3                CLEANING**

- .1      Proceed in accordance with Section 01 74 11 – Cleaning.

- .2      On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1            General**

**1.1               RELATED SECTIONS**

- .1       Section 26 05 00 - Common Work Results - Electrical.

**1.2               REFERENCES**

- .1       Canadian Standards Association, (CSA International)
- .2       Insulated Cable Engineers Association, Inc. (ICEA)

**1.3               WASTE MANAGEMENT AND DISPOSAL**

- .1       Separate and recycle waste materials.
- .2       Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3       Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4       Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .5       Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Ministry representative..
- .6       Do not dispose of preservative treated wood through incineration.
- .7       Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .8       Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Ministry representative.
- .9       Fold up metal banding, flatten and place in designated area for recycling.

**Part 2            Products**

**2.1               N/A**

**Part 3            Execution**

**3.1               DIRECT BURIAL OF CABLES OR IN CONDUIT**

- .1       After sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.

- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
  - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Cable separation:
  - .1 Maintain 75 mm minimum separation between cables of different circuits.
  - .2 Maintain 300 mm horizontal separation between low and high voltage cables.
  - .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
  - .4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
  - .5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.

### **3.2 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
  - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.
- .5 After installation of cables, seal duct ends with duct sealing compound.

### **3.3 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 1000 megohms.

- .5 Pre-acceptance tests.
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 5000 V megger on each conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Provide Ministry representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
  - .2 LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources
- .3 Canadian Standards Association (CSA International)
- .4 Underwriters' Laboratories of Canada (ULC)

**1.2 RELATED SECTIONS**

- .1 Section 26 05 00 - Common Work Results For Electrical.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 26 05 00 -
- .2 Product literature, datasheet and photometric data :
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide complete photometric data, files.ies electronic data included, prepared by independent testing laboratory for lighting where specified, in accordance with IES LM-79 and LM-80 standards and provide accreditation from TL-430 IAS (International accreditation service inc.) for review by Departmental Representative.

**1.4 ACCEPTABLE MATERIALS**

- .1 Where materials are specified by trade name refer to the General Instructions to Bidders for a procedure to be followed in applying for approval of alternatives.

**1.5 WARRANTY**

- .1 Provide a five-year written warranty from the initial installation against all fabrication and installation defaults.
- .2 The warranty must be applied to all pieces of DEL set; the guarantee must provide the works to replace the defective pieces.

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**Part 2 Products****2.1 LED LIGHTING FIXTURE :****.1 PRODUCT SPECIFICATIONS:**

- .1 Lights similar to existing fixtures, Beacon modèle Alpha (DEL) cat no:  
AL-D 72NB-220 4K 2X2 347 SF3 HV MTT
- .2 System assembly shall bear a CSA or ,ULc/ cUL label .
- .3 Acceptable product:
  - .1 Alternative Materials: Approved by addendum in accordance with General Instructions to Bidders.

**2.2 CROSSARM****.1 PRODUCT SPECIFICATIONS:**

- .1 Square crossarm, galvanised steel, to provide wiring and tenon similar to existing crossarm.

**2.3 WIRING IN POLES:**

- .1 Connect fixture of light poles to existing lighting circuits, as indicated on drawings.
- .2 For light pole, provide three (8) #12 copper cable type TWU.
- .3 For each power conductor install a 30 A fuse holder and a 3 A fuse.
- .4 Inside poles, provide a specific color insulated jacket for each conductors:
  - .1 Phase conductors ( Black)
  - .2 Neutral conductor: white.
  - .3 Ground conductor: green.

**Part 3 Execution****3.1 COORDINATION AND CONSTRUCTION PROGRESS SCHEDULE**

- .1 During works, never let on tension pieces or wires without electrical, mechanical or physical protection. Provide all secure protection and announcement board "DANGER".

**3.2 INSTALLATION**

- .1 General contractor and sub-contractor must coordinated in accordance with manufacturer's recommendations, manufacturing, location, orientation and installation of new lights in accordance to the drawings and the Department representative.
- .2 Install the crossarm as per drawing.



- .3 Install new wires and support them.
- .4 Install the junction box including the terminals block, connect wires from the fixtures.
- .5 Install fixtures on tenons.
- .6 Check orientation, height lamps level end tilt, in accordance to the level lighting on drawings.

### 3.3 WORKS ON POLE BASE:

- .1 For each pole hand hole:
  - .1 CONNECTORS
    - .1 To connect existing underground supply wires network to the light pole wires, provide U bolts connectors tined, manufactured with high conductivity copper and required dimensions.
  - .2 FUSE PROTECTION:
    - .1 Each fixtures must be supply by a dedicated phase conductor. On each phase conductor, on base of pole, provide a 30A/600V watertight protection kit c/w a 3A cartridge fuse.
      - .1 Fuse-holder reference :
        - .1 65U from Thomas&Betts
      - .2 Fuse reference :
        - .1 ATM3 from Ferraz-Shawmut;
        - .2 KTK-3 from Bussmann
  - .3 ELECTRICAL TAPE:
    - .1 Isolate crimp connectors (compression) and the fuse protectors with two multi layers of electrical tape.
      - .1 First, utilise 2 layers of Ethylene propylene tape # 130 C.
      - .2 Secondly, cover 2 layers with a polyvinyl tape, all purpose of 0,75 inch #88.
      - .3 Thirdly, cover 2 layers of anti abrasive tape 0,75 inch # 1755
      - .4 References: Scotch Model # 1755, 130 C and # 88.
  - .4 GROUNDING:
    - .1 Check continuity and resistance of grounding network in accordance to the local conditions, accepted by the Department Representative and the local authorities.

### 3.4 TESTS AND STARTUP

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical
- .2 Make all tests in accordance to the rules, before to put the installation under electrical power.

### 3.5 CLEANING

- .1 Clean the area.

- .2 After completion of works and tests, remove excess materials, rubbish, tools and equipment.

**END OF SECTION**