

# **SPECIFICATIONS FOR**

**Electrical –  
Northwest Regional Airport  
Terrace-Kitimat**

**New Taxi C**

**Issued for Tender**

**March 2026**

**ELECTRICAL SPECIFICATIONS****Division 26 – Electrical**

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**Part 1 General****1.1 RELATED SECTIONS**

- .1 Section 26 05 20 – Wire and Box Connectors 0-1000 V
- .2 Section 26 05 21 – Wires and Cables (0-1000 V)
- .3 Section 26 05 22 – Connectors and Terminations
- .4 Section 26 05 28 – Grounding – Secondary
- .5 Section 26 05 31 – Splitters, Junction, Pull Boxes and Cabinets
- .6 Section 26 05 34 – Conduit Fastenings and Conduit Fittings
- .7 Section 26 05 43.01 – Installation of Cables in Trenches and Ducts
- .8 Section 33 65 76 – Direct Buried Underground Cable Ducts
- .9 Section 34 43 10 – Airfield Lighting – General

**1.2 GENERAL INSTRUCTIONS**

- .1 The "Instructions to Bidders", "The General Conditions", (and addenda thereto) form an integral part of this division and shall be read in conjunction herewith. All addenda or corrections issued during the time of bidding become part of the contract documents, and shall be covered in the Contractor's bid.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
  - .2 CAN3-C235-83(R2006), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  - .3 Underground Systems: To C22.3, No. 7, except where specified otherwise.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- .3 Transport Canada, TP312, 5<sup>th</sup> Edition, Aerodrome Standards and Recommended Practices.

**1.4 DEFINITIONS**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

**1.5 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, 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 for control items in English.

**1.6 MEASUREMENT FOR PAYMENT**

- .1 Electrical work shall be measured as Lump Sum or unit price Items as described in unit price table. Payment at the tendered Lump Sum or unit price shall be full compensation for supply of all materials and labour required to complete the work as described in the Contract Documents.
- .2 Record Drawings and O&M Manuals
  - .1 Payment shall be on a lump sum basis for full completion and submittal of the red-line record drawings and O&M Manuals.
  - .2 Red-line drawings to be submitted as mark-up prints or scanned PDF documents.
  - .3 O&M Manuals shall be a record of new equipment supplied, included data sheets, approved shop drawings, as-built information, and vendor supplied operations and maintenance instructions. O&M Manuals shall be supplied in both hard copy (3 binders, with tabbed dividers) and PDF formats.
- .3 Site Clean-up / Restoration
  - .1 Payment shall be on a lump sum basis and shall include all clean-up related to electrical work undertaken on site, including removal of construction debris, cleaning of surfaces and equipment, and restoration of all surfaces and equipment affected by electrical construction activities.
  - .2 All trenching/excavation/backfill areas (not in pavement areas) shall be restored by a layer of topsoil, seed, and mulch.
- .4 Electrical Mobilization / Demobilization / General Conditions
  - .1 Payment of lump sum price bid shall include for Mobilization / Demobilization / General Conditions, and all other costs not covered under separate unit price items.
  - .2 Partial payment for this item will be made once per month as work progresses. The partial payments will be made as follows:
    - .1 When 25% of the original contract amount is earned, 25% of the amount bid for this item will be paid.
    - .2 When 50% of the original contract amount is earned, 50% of the amount bid for this item will be paid.
    - .3 When 75% of the original contract amount is earned, 75% of the amount bid for this item will be paid.

- .4 When 100% of the original contract amount is earned, 100% of the amount bid for this item will be paid.

## **1.7 INTERPRETATION OF DRAWINGS**

- .1 The drawings and specifications provide together a complete and workable facility, with all components in satisfactory and operating condition. These drawings and specifications shall form a basis for the bid price and shall be used to provide a complete electrical installation as directed in each or both documents. Do not scale from electrical drawings.
- .2 All notes on drawings, which make exception to these specifications, have precedence except addenda where specific reference is made.

## **1.8 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
  - .1 Submit drawings stamped for all major electrical equipment being supplied under this contract. All engineering drawings must be stamped by an engineer registered to practice in British Columbia. Shop drawings shall be submitted to the engineer/owner for review, prior to installation.
  - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
  - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  - .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .5 For unit sub-stations and other equipment, as required, submit shop drawings showing manufacturer's recommended concrete foundation/base for the equipment.
  - .6 Submit 3 copies of 216 x 279 mm minimum size drawings and product data to engineer/owner. Alternatively, shop drawings may be submitted in PDF electronic document format.
  - .7 All shop drawings must be certified by the manufacturer and carefully checked by the Trade Contractor noting all changes required and shall bear the Trade Contractor's approval stamp and signature. Shop drawings must be clearly labelled as to job, contractor and manufacturer. All stamps and labelling shall appear on the front of the shop drawings in order to reproduce properly. Drawings shall incorporate a minimum 100 mm x 75 mm space to accept the Engineer's review stamp.
  - .8 The Electrical Consultant's review of shop drawings is for general design only, and does not relieve the Trade Contractor, Trade Sub-Contractor or suppliers from their responsibilities for errors, proper fittings, construction of the work and furnishing of materials. The review shall not be construed as approving departures from the contract document requirements, where such departures are not specifically noted in a covering letter accompanying such drawings. Any work done prior to the return of properly reviewed shop drawings is done at the risk of the Contractor.

- .9 Note that a MINIMUM of seven (7) working days is required by the Electrical Consultant to process shop drawings. The Trade Contractor is, therefore, requested to submit all shop drawings with this in mind in ample time in order to avoid unnecessary delay of shipment of materials or construction.
- .10 If changes are required, notify engineer/owner of these changes before they are made.
- .3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to local inspection authorities for special approval before delivery to site. Cover all costs for special approval.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to engineer/owner.
- .4 Record Drawings
  - .1 Engineer will provide two sets of white prints for record drawing purposes.
  - .2 Maintain project record drawings and record accurately deviations from Contract documents.
  - .3 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set, and submit both sets to Engineer.
  - .4 Record the following information:
    - .1 Any existing cables, services, etc., encountered which vary from those shown on contract drawings as existing;
    - .2 Horizontal location of underground cables and appurtenances referenced to permanent surface improvement;
    - .3 Field changes of dimension and detail.
    - .4 Changes made by Change Order or Field Order.

## **1.9 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices (British Columbia Certification) in accordance with authorities having jurisdiction 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.

- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Refer to additional contractor qualifications and experience requirements as indicated in section 34 43 10 – Airfield Lighting – General, item 1.7 – Qualifications, and also as listed on the project tender form.
- .3 Site Meetings:
  - .1 In accordance with Contract Documents.
- .4 Health and Safety Requirements: Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Occupational Health and Safety Regulation for the Province of British Columbia.
- .5 Electrical Permit: Coordinate and pay for all required electrical permits.

**1.10 NOT USED****1.11 SYSTEM STARTUP**

- .1 Instruct owner/engineer 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 all aspects of its care and operation.

**1.12 WORKMANSHIP STANDARDS**

- .1 All phases of the electrical installation shall be executed in a satisfactory workmanlike manner and shall present a neat mechanical appearance when completed. The work considered unsatisfactory to the Engineer shall be corrected at the Contractor's expense.
- .2 Keep on the job during its progress, a competent foreman, holding a First Class Journeymen Certificate, and necessary assistants, all satisfactory to the Airport Authority. The foreman shall not be changed, except with the consent of the Engineer, unless he proves to be unsatisfactory and ceases to be an employee of the Contractor.
- .3 The foreman shall represent the Contractor in his absence and all directions given to him shall be held as being given to the Contractor. Give efficient supervision to the work, using skill and attention.

**1.13 CHANGES IN WORK**

- .1 The Engineer, without invalidating the contract, may alter, add to or deduct from the work, the contract sum being adjusted accordingly. All such changes shall be governed by the conditions of the original contract.

- .2 All changes involving costs shall be approved by the Engineer prior to any actual work being proceeded with.
- .3 All supplemental cost proposals by the Contractor shall be accompanied by a complete itemized breakdown of labour and materials. NO EXCEPTIONS will be made. At the Engineer's request, Contractor's estimating sheets for supplemental cost proposals shall be submitted. Labour must be broken out and allocated to each item of work included in the Notice of Change. Submissions must itemize all material used and shall show labour units assigned to each item of material.
- .4 Location of any device may be changed to within three (3) metres of the position indicated on the drawings, without an extra, providing the Contractor is advised of the change in ample time to avoid removal of any equipment or material installed.

#### **1.14 SUBSTITUTIONS**

- .1 Notwithstanding the General Conditions, the following shall apply.
- .2 No substitutions will be permitted without prior written approval by Engineer.
- .3 Proposals for substitutions may be submitted ONLY AFTER award of contract. Such request must include statements of respective costs of items originally specified and proposed substitutions.
- .4 Substitution proposals will be considered by the Electrical Consultant ONLY IF:
  - .1 Products selected by the Trade Contractor from those specified are not available.
  - .2 Delivery date of products selected from those specified is not available for reasons beyond the Trade Contractor's control, which he could not reasonably have anticipated, and provided that the Trade Contractor diligently verified availability at the commencement of the contract, or
  - .3 Alternative products to those specified, which are brought to the attention of and considered by the Electrical Engineer as alternative to those specified, will result in a credit to the contract amount.
- .5 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other works on the project.
- .6 All credits arising from approval of substitutions will be credited to contract in such amounts as may be determined by the Design Manager and contract price will be adjusted accordingly.

#### **1.15 PERMITS, CODES, AND INSPECTIONS**

- .1 Submit to the Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay the associated fees.
- .3 Consultant will provide the drawings and specifications required by the Electrical Inspection Department and Supply Authority at no cost.

- .4 Notify Consultant of the changes required by the Electrical Inspection Department prior to making changes.
- .5 Installation shall comply with the requirements of the latest edition of the Canadian Electrical Code and all relevant by-laws of a local electrical authority.
- .6 Obtain all permits required and, after completion of the work, furnish to the Engineer a Certificate of Final Inspection and Approval from the Inspection Department. Take out all permits required at the beginning of the work.

#### **1.16 SCHEDULING**

- .1 Project work will be governed by the fact that the other disciplines will be conducting work at the same time as the electrical work is being undertaken. Include in the tender amount all costs associated with the required scheduling. All necessary power shutdowns must be co-ordinated with the Owner.
- .2 Requests for power shut downs shall be submitted in writing a minimum of forty-eight (48) hours prior to scheduled shutdown. Requests shall indicate scope of work, area, circuits, panels affected, as well as the date and time of requested shutdown.

#### **1.17 WORK COORDINATION**

- .1 Where location of work depends upon equipment being installed by others, confirm location of all such equipment with the trade concerned prior to installing any conduit, outlets, etc. Where equipment is being supplied that is being built-in with work of other Contractors, supply the equipment or necessary dimensions to the respective trades concerned.
- .2 Give the work personal supervision, lay out own work, do all necessary levelling and measuring or employ a competent Engineer to do so. Figures, full size and detail drawings shall take precedence over scaled measurements off drawings. No plea as to the actions and directions of other than the Consultant will be accepted in justification of any error in construction where a departure is made from the drawings, specifications or contract; it shall remain the duty of the Contractor to take his own measurements of the work.
- .3 Correct all work completed contrary to the intent of the drawings and specifications and bear all costs for same. Where the intent of the drawings and specifications is not clear, obtain clarification from the Consultant before proceeding with the work
- .4 Prior to commencing work, check the drawings and specifications of other trades for conflicts with the electrical work. Any such conflicts shall be reported to the Consultant and a written ruling obtained before proceeding with this work. Failure to report such conflicts will result in the Contractor's responsibility to make whatever adjustments are required.
- .5 All anchors, sleeves, inserts, etc. required for the electrical portion of the contract shall be installed at the proper time and when required to co-ordinate job progress with other trades.

#### **1.18 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, lubrication, 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.

**1.19 GUARANTEE**

- .1 Furnish a written guarantee/warranty countersigned and guaranteed by the Trade Contractor stating:
  - .1 That all work executed under this contract will be free from defects of workmanship and materials for a period of one (1) year from the date of final acceptance of this work, except for incandescent lamps, which shall be for a period of six (6) months.
  - .2 The above parties further agree that they will, at their own expense, repair and replace all such defective work and other work damaged thereby, which fails or becomes defective during the term of the guarantee/warranty provided that such failure is not due to improper usage.
  - .3 The period of the guarantee specified shall in no way supplant any other guarantee of a longer period but shall be binding on work not otherwise covered.

**1.20 FINAL**

- .1 Specifically note that the Civil drawings shall be checked for device locations before junction boxes and conduits are roughed-in. If this is not done and that conflict occurs, the outlets and/or conduits shall be moved and any repairs made at the expense of the Trade Contractor.
- .2 Points not specifically mentioned shall be in strict accordance with the Canadian Electrical Code and regulations of the Electrical Inspection Department from which the permit was obtained. The latest revisions and/or amendments to this code with applicable date restrictions shall also govern work on this contract.
- .3 It is the intent that these drawings and specifications provide for an electrical installation complete and in operating condition and the contractor shall be responsible for supplying and installing all material and work necessary to accomplish this, except where specifically noted that such work or material is not included.

- .4 These drawings and specifications are to be read in conjunction with the civil drawings and specifications and what may be called for in another shall be binding on this contract.
- .5 Leave the work complete to the approval of the Owner.

### **1.21 SCOPE OF WORK**

- .1 The scope of work shall include, but not be limited to, the following:
  - .1 Supply and installation of new Medium Intensity Taxiway Edge Lighting.
  - .2 Supply and installation of illuminated signage.
  - .3 Supply and installation of cables/conduit in trench as indicated on drawings.
  - .4 Supply and installation of series isolating transformers, primary/secondary cabling, connector kits, and all other associated equipment and work.
  - .5 Supply and installation of pullpits.
  - .6 Modifications to the existing Airfield Lighting Control System (ALCS) graphical outputs to show the New Taxi C and Taxi C edge lighting.
  - .7 Modifications to existing CCR Cell #6 (existing 7.5kW rated, Taxiway/Apron CCT) to upgrade rating to 10kW.
  - .8 Removal of existing obsolete electrical equipment, and return to owner or disposal off-site as directed by owner / engineer.

## **Part 2 Products**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from local inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

### **2.2 WARNING SIGNS**

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction / inspection authorities.
- .2 Decal signs, minimum size 175 x 250 mm.

### **2.3 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors. Penatrox to be used on aluminum connections.

## 2.4 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
  - .1 Nameplates: lamicoïd 3 mm thick plastic engraving sheet, white face, black 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 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by owner/engineer prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.

## 2.5 WIRING IDENTIFICATION

- .1 For indoor wiring, identify wiring with permanent lamicoïd indelible identifying markings, numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. (See further instruction in section, below).
- .2 For airfield wiring, identify wiring with lamicoïd cable tags as follows:
  - .1 lamicoïd 3 mm thick plastic engraving sheet, white face, black core, 20mm x 50mm, with 8mm high lettering
  - .2 tag to be punched with a 6mm diameter hole for connection to cables with two (2) black tie-wraps
  - .3 Identification to include circuit numbering, and include “(R)” for return leg of circuits, eg. “CCT#5 (R)”. Designations to be confirmed with owner/engineer, prior to manufacture of tags.
  - .4 Label cables in all pulpits, and pull boxes. Labelling requirements include any straight through cable.
  - .5 Where there are 2 or more transformers in a pulpit, each secondary conductor to fixtures are to be clearly identified with markers to clearly denote which plug is associated with which transformer.

- .3 Maintain phase sequence and colour coding throughout.
- .4 Colour coding: to CSA C22.1.
- .5 Use colour coded wires in communication cables, matched throughout system.

**2.6 CONDUIT AND CABLE (NON-AIRFIELD LIGHTING) IDENTIFICATION**

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

- .4 Underground cables: Provide lamicoïd tags, black face with white core, fastened to cables with black nylon ties, for all cables in pulpits to indicate the function/purpose of each cable, including the following:
  - .1 Each cable entering and leaving pulpit at every primary connector.
  - .2 All straight-through cable in pulpits.

**2.7 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint outdoor electrical equipment “international orange” to EEMAC Y1-1 unless otherwise specified.
  - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1 unless otherwise specified.

**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 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: Rigid PVC, size as indicated and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation and fire stop opening.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

**3.4 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
  - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

**3.5 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles:
    - .1 General: 300 mm.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1400 mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Telephone and interphone outlets: 300 mm.
  - .5 Wall mounted telephone and interphone outlets: 1500 mm.

- .6 Fire alarm stations: 1500 mm.
- .7 Fire alarm bells: 2100 mm.
- .8 Television outlets: 300 mm.
- .9 Wall mounted speakers: 2100 mm.
- .10 Clocks: 2100 mm.
- .11 Door bell pushbuttons: 1500 mm.

### **3.6 CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

### **3.7 FIELD QUALITY CONTROL**

- .1 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
  - .1 Power distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .5 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Megger 5kV circuits, feeder and equipment with a 5kV instrument.
    - .4 Reference Section 34 43 10 for detailed Megger Test Procedures to be utilized.
  - .6 Calibrate and adjust the settings of regulators as per manufacturer's recommendations. Ensure the supply voltage corresponds to the input tap. Check that the open circuit protector de-energizes the circuit within 2 or 3 seconds when load is disconnected.
- .3 Carry out tests in presence of owner/engineer.



- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**3.8 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 SECTION INCLUDES**

- .1 Materials and installation for wire and box connectors.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, latest version.
  - .2 CSA C22.2No.65, Wire Connectors, latest version.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

**Part 2 Products****2.1 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts sized to fit conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of sized to fit conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
  - .1 Connector body and stud clamp for stranded, round copper conductors.
  - .2 Clamp for stranded, round copper conductors.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper conductors.
  - .5 Bolts for aluminum conductors.
  - .6 Sized for conductors as indicated.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.



- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
- .3 Install fixture type connectors and tighten. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

**END OF SECTION**



**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 26 05 20 – Wire and Box Connectors 0-1000 V
- .2 Section 26 05 34 – Conduit Fastenings and Conduit Fittings
- .3 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts

**1.2 REFERENCES**

- .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations (latest version).

**1.3 MEASUREMENT FOR PAYMENT**

- .1 No separate payment for work is included under this section. Include costs in the appropriate lump sum or unit price item indicated in Section 26 05 00 – Common Work Results for Electrical.

**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 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V.

**2.2 TECK 90 CABLE**

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
  - .1 Grounding conductor: copper.
  - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
  - .1 Cross-linked polyethylene XLPE.
  - .2 Rating: 1000 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.



- .6 Overall covering: thermoplastic polyvinyl chloride.
- .7 Connectors:
  - .1 Watertight approved for TECK cable.

**Part 3 Execution**

**3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

**3.2 GENERAL CABLE INSTALLATION**

- .1 Install cable in trenches in accordance with all sections.
- .2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

**3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

**3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)**

- .1 Install cable securely.

**END OF SECTION**

**Part 1 General****1.1 SECTION INCLUDES**

- .1 Materials and installation for connectors and terminations.

**1.2 RELATED SECTIONS**

- .1 Section 26 05 21 – Wires and Cables (0-1000 V)

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.158-10, Terminal Blocks.
  - .2 CSA C22.2 No.41-M1987(R1999), Grounding and Bonding Equipment.

**1.4 MEASUREMENT FOR PAYMENT**

- .1 No separate payment for work is included under this section. Include costs in the appropriate lump sum or unit price item indicated in Section 26 05 00 – Common Work Results for Electrical.

**Part 2 Products****2.1 CONNECTORS AND TERMINATIONS**

- .1 Copper short barrel compression connectors as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2No.41.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results – Electrical
- .2 Section 34 43 10 – Airfield Lighting – General

**1.2 REFERENCES**

- .1 Canadian Standards Association, (CSA International)

**1.3 MEASUREMENT FOR PAYMENT**

- .1 Except for Ground Counterpoise (and only as broken out on the Schedule of Quantities), for which measurement for payment will be per section 26 05 43.01, no other separate pay items shall be applicable for grounding – secondary. Payment for all grounding work shall be included in the respective pay items for electrical equipment.

**Part 2 Products****2.1 EQUIPMENT**

- .1 Rod electrodes: Ground Rods / Electrodes:
  - .1 Copper clad steel, 19mm diameter x 3m long, or
  - .2 Plate electrodes: 300mm x 300mm x 15mm copper plate. (Only use where it is not possible to install rod type electrode, and only with the acceptance of the engineer / owner.)
- .2 Grounding conductors: bare stranded copper, soft annealed, #8 AWG, or as otherwise indicated.
- .3 Insulated grounding conductors: green, type TW, #8 AWG.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermite welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.
  - .7 Ground Bus (in all electrical manholes / vaults).

**Part 3 Execution****3.1 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous grounding system including electrodes, conductors, connectors, and accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermite process, permanent mechanical connectors, or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .11 Ground secondary service pedestals.
- .12 Install ground counterpoise 75mm above all cables / ducts in trench.

**3.2 ELECTRODES**

- .1 Install rod electrodes and make grounding connections. Ground rods to be installed every 4<sup>th</sup> edge lighting pullpit (in all pullpits for signs, pavement duct bank crossings).
- .2 Bond separate, multiple electrodes together.
- .3 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

**3.3 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service Equipment, Transformer, Airfield Lighting Fixtures, Pullpit Lids.



**3.4 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of engineer and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1, Canadian Electrical Code, Part 1, latest edition.

**1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide shop drawings.

**1.4 MEASUREMENT FOR PAYMENT**

- .1 No separate payment for work is included under this section. Include costs in the appropriate lump sum or unit price item indicated in Section 26 05 00 – Common Work Results for Electrical.

**Part 2 Products****2.1 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

**2.2 CABINETS**

- .1 Construction: welded sheet steel hinged door, handle, lock 2 keys, and catch.
- .2 Type E Empty: surface return flange mounting.

**Part 3 Execution****3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.

- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

**3.2 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, voltage, and phase, or as indicated.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

**1.3 SUBMITTALS**

- .1 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Submit cable manufacturing data.
- .2 Quality assurance submittals:
  - .1 Test reports: submit certified test reports.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Instructions: submit manufacturer's installation instructions.

**1.4 MEASUREMENT FOR PAYMENT**

- .1 No separate payment for work is included under this section. Include costs in the appropriate lump sum or unit price item indicated in Section 26 05 00 – Common Work Results for Electrical.

**Part 2 Products****2.1 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

## **2.2 CONDUIT FASTENINGS**

- .1 One (1) galvanized hole straps to secure surface conduits 50 mm and smaller.
- .2 Two (2) hole steel straps for conduits larger than 50 mm.
- .3 Beam clamps to secure conduits to exposed steel work.

## **2.3 CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.  
Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

## **2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

## **2.5 FISH CORD**

- .1 Polypropylene 6 mm DIA.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

- .3 Surface mount conduits.
- .4 Use rigid galvanized steel, PVC, and EMT threaded conduit where specified.
- .5 Use rigid PVC conduit underground.
- .6 Minimum conduit size for lighting and power circuits: 19 mm.
- .7 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 19 mm diameter.
- .9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .10 Install fish cord in empty conduits.
- .11 Dry conduits out before installing wire.

### **3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

### **3.5 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel.
  - .1 Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

- .1 Use cold mastic between sleeve and conduit.
  - .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
  - .6 Encase conduits completely in concrete per details on the drawings.
  - .7 Organize conduits in slab to minimize cross-overs.
- 3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE**
- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.
    - .1 Provide 50 mm of sand over concrete envelope below floor slab.
- 3.7 CONDUITS UNDERGROUND**
- .1 Slope conduits to provide drainage.
  - .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.
- 3.8 CLEANING**
- .1 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
- .2 Section 26 05 21 – Wires and Cables (0-1000 V)
- .3 Section 31 23 33.01 – Excavating, Trenching and Backfilling
- .4 Section 33 65 76 – Direct Buried Underground Cable Ducts
- .5 Section 34 43 10 – Airfield Lighting – General

**1.2 REFERENCES**

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

**1.3 MEASUREMENT FOR PAYMENT**

- .1 Supply & Installation of Cables
  - .1 Payment for installation of cables in existing/new ducts shall include:
    - .1 Supply and installation of cables of type specified. The Contractor shall note that cable supply shall include any extra cable necessary for cable loops, connections, fittings, splices, offsets, as well as all surplus cables brought above ground.
    - .2 Transition to/from polytube/duct.
    - .3 All other accessories necessary to complete the installation to the satisfaction of the engineer.
  - .2 Payment for these items shall be on the basis of lineal metre of installed cables measured horizontally along trenches and ducts from the cable source to the end use device. This cable length payment will be approximately equal to the length of trenching for the same device. It shall be this contractor's responsibility to factor the cost of all surplus cable, loops, and accessories required to make a complete system into his tendered price.

**Part 2 Products****2.1 NOT USED.****Part 3 Execution****3.1 SITE PREPARATION AND STOCKPILING**

- .1 Remove obstructions from surfaces to be excavated.
- .2 Stockpile granular materials in areas designated by Engineer.
- .3 Protect granular materials from contamination.

**3.2 TRENCHING**

- .1 Advise Engineer in advance of excavation operations.
- .2 Excavate to depth indicated.
- .3 Wall of trench to be vertical as much as possible so that a minimum of shoulder surface is disturbed.
- .4 Dispose of surplus and unsuitable excavated material and rocks on site at an area approved by the Engineer.
- .5 Bottom of trench to be level and free from loose, soft, or coarse aggregate and organic matter.
- .6 When a boulder or rock is encountered, remove to a depth of at least 80 mm below the required cable depth and replace with granular bedding material.
- .7 Trenches shall be excavated only to the extent that cables can be installed and the trench backfilled as per Item 3.3 in the same working day.

**3.3 BACKFILLING**

- .1 Do not proceed with backfilling operations until the Engineer has inspected and given approval.
- .2 Areas to be backfilled are to be free from debris.
- .3 Place and compact granular and native backfill materials in continuous horizontal layers as indicated on drawings.
- .4 At locations 200 mm above counterpoise, provide underground protective hazard tape as outlined in Item 2.3.1.

- .5 If, during progress of work, granular materials do not meet approval, replace and retest at no extra cost to the Owner.
- .6 Backfill and compact, level with adjacent finished surface.

### **3.4 DIRECT BURIAL OF CABLES**

- .1 After granular bedding is in place, lay cables, maintaining a minimum of 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 at least 1000 mm of surplus cable in each direction.
  - .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.
  - .2 All splices and terminations shall be in a pull pit.
- .4 Minimum permitted radius at cable bends for rubber- or plastic-covered cables is 8 times diameter of cable, or in accordance with manufacturer's instructions.

### **3.5 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 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .6 After installation of cables, seal duct ends with duct sealing compound.
- .7 All cables shall go through to pull pits, and all terminations shall be at pull pits.
- .8 The bare copper counterpoise shall be laid outside and above the duct, as shown on the drawings.
- .9 Primary cable piping to enter through bottom of pullpit.
- .10 Pre-drill pull pits to accept installation of secondary cable duct.

**3.6 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 5 gig-ohms.
- .5 Pre-acceptance tests.
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 5000 V megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
  - .3 The above megger testing is to be undertaken non-destructively at 5000V. Circuits to be tested in a non-energized, fully functional configuration (with transformers connected, etc.).
- .6 Provide owner/engineer 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                RELATED REQUIREMENTS**

- .1            Section 26 05 00 – Common Work Results – Electrical
- .2            Section 34 43 10 – Airfield Lighting – General

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Product Data:
  - .1            Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3                QUALITY ASSURANCE**

- .1            Quality assurance submittals: submit following:
  - .1            Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
  - .2            Manufacturer's Instructions: for installation and special handling criteria, installation sequence, and cleaning procedures.

**1.4                MEASUREMENT FOR PAYMENT**

- .1            Trenching & Ducts
  - .1            The Contractor shall provide all trenching, backfilling, compaction and restoration as outlined in the drawings and specifications. Where multiple circuits/ducts are installed along the same route, a common “joint-use” trench shall be provided.
  - .2            Payment for the installation of trenching of required depth, including backfill and compaction, shall be on the basis of lineal metre of trench measured in the field. Such unit prices shall include all excavation of trenching, fill (if required), supply and installation of all materials, duct, pull strings, removal and disposal of excess excavated material, and reconditioning of disturbed surface.
  - .3            Earth excavation includes removal of rock and/or boulders up to 0.5 m<sup>3</sup>.
  - .4            Native material shall be used for backfill except no rocks or stones greater than 50mm diameter are to be used.
  - .5            A 75 mm bedding of sand is to be provided at the bottom of all trenches, under the new electrical duct(s). A 75mm cover of sand is to be provided above all direct buried counterpoise cables, extending vertically to bedding sand.
  - .6            1 - #8 bare ground counterpoise wire shall be installed direct buried in trenches, and shall be included in the unit rate for the trenching. It shall be this contractor's responsibility to factor in all costs for all grounding connections and extra counterpoise wire needed for zig-zagging.



- .7 Pump excavation free of standing water and remove soft or foreign materials prior to placing bedding. Place bedding material to the full trench width and compact to minimum 95% Standard Proctor Maximum Dry Density.
  - .8 Provide the size and number of ducts specified on the drawings, and layout as detailed.
  - .9 Maintain 300mm separation between POWER and COMM ducts.
- .2 Trenching & Ducts (Concrete Encased)
- .1 The Contractor shall provide all trenching, compaction and restoration as outlined in the drawings and Specifications. Where multiple circuits/ducts are installed along the same route, a common “joint-use” trench shall be provided.
  - .2 Payment for the installation of concrete encased duct bank of required depth shall be on the basis of lineal metre of concrete encased trench measured in the field. Such unit prices shall include excavation of trenching, granular subbase fill compacted and graded to underside of granular base material, RPVC & fittings to CSA C22.2 No. 211.2 Rigid PVC (unplasticized) Conduit, pull strings, forming, duct cradles, removal and disposal of excess excavated material at on-site disposal site. Care shall be taken to avoid creating square corners in bottom of excavated trench. Duct to be placed and weighted / secured in trench to ensure consistent slope of duct to allow drainage and avoid floatation. Concrete formwork and concrete placement shall be done by experienced concrete personnel as accepted by the Engineer.
  - .3 Earth excavation includes removal of rock and/or boulders up to 0.5 m<sup>3</sup>.
  - .4 Concrete encase ducts as detailed in the drawings and specifications, to the full width of the trench.
  - .5 1 - #8 insulated green ground counterpoise wire shall be installed in concrete encased duct banks, and shall be included in the concrete encased duct unit price. It shall be this contractor’s responsibility to factor in all costs for all grounding connections.
  - .6 Pump excavation free of standing water and remove soft or foreign materials prior to placing concrete.
  - .7 Provide the size and number of ducts specified on the drawings, and layout as detailed.
  - .8 Where detailed, price shall include saw-cutting of existing pavement, to allow duct installation, concrete encasement, backfill, compaction, and reinstatement of surface to match pre-existing condition.



**Part 2**

**Products**

**2.1 PVC DUCTS AND FITTINGS**

- .1 Rigid PVC duct: CSA C22.2 No. 211.2, with moulded fittings, for direct burial, sizes as indicated.
- .2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, and adaptors same product material as duct, to make a complete installation.
- .3 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

**2.2 OTHER DUCTS**

- .1 Polytube: 50mm, or size as indicated.

**2.3 SOLVENT WELD COMPOUND**

- .1 Solvent cement for PVC duct joints.

**2.4 CABLE PULLING EQUIPMENT**

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

**2.5 WARNING TAPE**

- .1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

**Part 3**

**Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION**

- .1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support, every 1.5m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 Ensure all duct joints are solvent welded.
- .6 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.



- .7 Pull through each duct a wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.
  - .1 Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .8 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .9 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.
- .10 Install markers as required.
- .11 Install bell ends on all ducts in all pull boxes.
- .12 Notify the owner/engineer for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

### **3.3 DUCT DRAINAGE**

- .1 Where possible, drain ducts into pull boxes. Otherwise make five 3/8" drill holes in a row at the bottom of each duct whenever duct turns upwards to enter a pull box. Cover holes with a plastic or galvanized steel mesh to prevent soil entering ducts.

### **3.4 CLEANING**

- .1 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
- .2        Section 34 43 10.01 – Illuminated Airport Guidance Signs
- .3        Section 34 43 13.19 – Elevated Edge Lighting

**1.2            REFERENCES**

- .1        Canadian Standards Association (CSA)
  - .1        CSA C22.2 No.179-09, Airport Series Lighting Cables.
  - .2        CSA C22.2 No.180-FM1983(R2008), Series Isolating Transformers for Airport Lighting.
  - .3        CSA C22.1, Canadian Electrical Code, Part 1, latest edition
- .2        Transport Canada
  - .1        Aerodrome Standards and Recommended Practices, TP312E, 5<sup>th</sup> Edition

**1.3            SYSTEM DESCRIPTION**

- .1        Supply and installation of new Medium Intensity Taxiway Edge Lighting.
- .2        Supply and installation of illuminated signage.
- .3        Supply and installation of cables/conduit in trench as indicated on drawings.
- .4        Supply and installation of series isolating transformers, primary/secondary cabling, connector kits, and all other associated equipment and work.
- .5        Supply and installation of pullpits.
- .6        Modifications to the existing Airfield Lighting Control System (ALCS) graphical outputs to show the New Taxi C and Taxi C edge lighting.
- .7        Modifications to existing CCR Cell #6 (existing 7.5kW rated, Taxiway/Apron CCT) to upgrade rating to 10kW.
- .8        Removal of existing obsolete electrical equipment, and return to owner or disposal off-site as directed by owner / engineer.

**1.4            SUBMITTALS**

- .1        Provide written confirmation of compliance with CSA standards. Where CSA certified equipment/material is not available, equipment/material to be submitted to local inspection authority for special approval, before delivery to site, and copy of CSA special approval acceptance documentation is to be provided as a submittal.
- .2        Provide written confirmation of compliance with TP312, 5<sup>th</sup> Edition requirements, from a third party Independent Testing Agency (ITA).

**1.5            MAINTENANCE MATERIALS**

- .1        Provide all maintenance materials (manuals) and any special tools required.

**1.6 MEASUREMENT FOR PAYMENT****.1 New Pull Pit**

.1 Payment at the tendered price shall be full compensation to complete the work including excavation, granular bedding, backfill, compaction, cable/duct entries, intercepting on existing cable/duct (where applicable), galvanized steel checker plate lid (with hub for fixture installation where used for fixture mounting, solid for pullpits not used for fixture mounting), bell ends, ground rods, supply and installation using the pullpits as shown on the drawings and described in the specifications.

**.2 Testing and Commissioning**

.1 Payment at the tendered price shall be full compensation for all testing and commissioning activities required for all of the various new/modified systems and equipment, and shall include the following:

.2 Megger testing of all new/modified airfield series circuits in the presence of the owner/engineer, and indicating that the circuits meet all requirements of the drawings and specifications. Existing circuits shall be tested before any alterations to the system are made, and after completion of works on the system.

.3 Functional testing of all airfield lighting equipment in the presence of the owner/engineer, and indicating that the new/modified equipment meets all operational requirements for brightness levels, start-up, proper operation, aiming/sequence, and are controllable by manual/remote control.

.4 Submittal of megger test and functional test check sheets, documenting the tests undertaken, and the test results.

**.3 Removals of Obsolete Electrical Equipment**

.1 Payment at the tendered price shall be full compensation for removals of electrical equipment made obsolete under this project, and shall include the following:

.2 Existing obsolete cables in ducts to be removed and disposed of off site.

.3 Existing direct buried obsolete cables to be abandoned in place. Cut and remove all portions of cable above ground.

.4 Existing obsolete pullpits to be removed and disposed of off site, with voids backfilled and compacted.

.5 Existing obsolete lighting fixtures and transformers to be removed and returned to owner.

**.4 Underground Locates**

.1 Payment for this item shall be on a lump sum basis and shall include all work and coordination to locate all existing underground utilities and facilities that are within the project limits, whether indicated on the project documents, or not. The contractor

is advised that the project drawings may not be complete with respect to underground utilities and facilities.

- .2 Work under this item shall include providing all locate sketches and information to the airport, for reference and updates to the base plans.

.5 Spare Parts

- .1 Spare Parts will be accounted for under a cash allowance. After award of project, a list of spare parts to be priced will be supplied to the contractor. After list of parts pricing is received, the owner will select the spare parts to be supplied under the contract, and this will be accounted for under the cash allowance.

.6 Modifications to Existing Airfield Lighting Control System

- .1 Payment for this item shall include the retention of an airfield lighting vendor qualified to modify the existing Airfield Lighting Control System (ALCS) graphics/programming to show the new Taxi C and Taxi C edge lighting. The existing ALCS system was supplied by Liberty Airport Systems.
- .2 Work shall include all remote based and/or on-site work by the qualified ALCS vendor, to complete the necessary changes.
- .3 Payment for this item shall be on a lump sum basis.

.7 Modifications to Existing CCR Cell #6 (Existing 7.5kW CCR, Taxiway/Apron)

- .1 Payment for this item shall include the retention of an airfield lighting vendor qualified to modify the existing CCR Cell#6 (Existing 7.5kW Rating) to 10kW Rating. The existing CCR was supplied by Liberty Airport Systems.
- .2 Work shall include all work by a qualified CCR vendor, to complete the necessary changes.
- .3 Payment for this item shall be on a lump sum basis.

**1.7 QUALIFICATIONS**

- .1 Airfield Lighting Systems are specialized high voltage electrical systems and work on these systems are to be undertaken by only those individuals with appropriate experience and qualifications in dealing with these systems.
- .2 The airfield electrical contractor/sub-contractor and assigned electrical site superintendent shall have a minimum 3 projects within last 5 years working on airport electrical system projects (construction, minimum electrical project values of \$100,000 each) and with the following airport lighting equipment / systems: constant current regulators, series circuit installation, elevated edge lighting, airfield signage.
- .3 The electrical contractor/sub-contractor shall submit a detailed airport experience project listing, outlining how all of the above requirements are met by their company/staff, along with the tender documents.

**Part 2****Products****2.1 PRIMARY CABLE**

- .1 Single conductor stranded soft drawn copper, #8 AWG, 5000 volt, combined cross linked polyethylene insulation and jacket: CSA C22.2 No.179.

**2.2 PRIMARY PLUG RECEPTACLE CONNECTORS**

- .1 Primary plug and receptacle connector kit, straight type, one male plug, one female plug, for use with isolating transformer or use for separable straight splice of #8 AWG primary cable. Splice only in pulpits.
- .2 Acceptable Product: Amerace Ltd. Model 54 Super Kit. (No Exceptions)

**2.3 SECONDARY PLUG AND RECEPTACLE CONNECTORS**

- .1 Secondary male plug connector kit; factory assembled secondary using 2 - #10 or 2 - #12 AWG type SOW secondary cable.
  - .1 Acceptable Product: Amerace Ltd. 95MPR8-G
- .2 Secondary female receptacle connector kit; factory assembled secondary using 2 - #10 or 2 - #12 AWG type SOW secondary cable.
  - .1 Acceptable Product: Amerace Ltd. 95MPR8-G
- .3 Factory assembled secondary extension, minimum 1.2 m long, #12 AWG Type SOW, one - two conductor cable terminated with male connector on one end and female connector on other end, for long secondary runs between transformers and fixtures. Exact length to suit distance between light fixtures and transformer.

**2.4 ISOLATING TRANSFORMER**

- .1 CSA C22.2 No180, rating as required for applicable fixture. Use for 5000 volt series circuits.
- .2 Transformers and all connections to be completely waterproof and suitable for mounting in any type of pull pit.
- .3 Transformers must be designed to allow continuous operation with the secondary open circuited, short circuited, or with a lamp in place.
- .4 Transformers to be rubber encapsulated complete with factory-installed primary and secondary leads and shall conform to CSA C22.2 180-M. Ensure secondary lead is equipped with a Style 8 receptacle.
- .5 Connections shall conform to Transport Canada K-255 and shall be suitable for 5 kV non-screened cable and shall match the transformer manufacturer.
- .6 Transformer rating: as indicated, 6.6 A primary, 6.6 A secondary, sized to suit connected loads and as per below, 60 Hz.
- .7 Manufacturer: Amerace CTAG Series, sized to suit (or approved alternate).



## **2.5 TRANSFORMER PULLPIT**

- .1 Rigid polyethylene or PVC to Transport Canada specification K-303.
  - .1 Approved Products: West Coast Engineering, Nova Pole (Large Round)

## **2.6 GROUND COUNTERPOISE WIRE**

- .1 Single conductor #8 AWG, soft drawn copper wire:
  - .1 Solid bare for direct burial as counterpoise for airfield lighting circuits in new trench.
  - .2 Stranded with green TW insulation for placing in duct or polytube as counterpoise for airfield lighting circuits buried beneath hard surfaces (or above ground), and for power circuit insulated bonding conductors.

## **2.7 GROUND ROD**

- .1 Copper clad steel 19 mm x 3000 mm long complete with ground connector.

## **2.8 OTHER MATERIAL**

- .1 Cable ties: nylon black, length as required.
- .2 Conductor markers: as detailed on drawings.
- .3 Conduit, rigid:
  - .1 PVC: size as indicated.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 Install Airport Lighting underground circuitry in accordance with Canadian Electrical Code.
- .2 Install new pull pits and polytube as shown on the drawings.
- .3 Install the appropriate size isolating transformer(s) in each pull pit. Maximum 3 transformers per pull pit.
- .4 Where there is more than one transformer in a pullpit, provide new engraved lamicoïd cable tags secured with nylon cable ties for the secondary circuits. Label all cables as they enter and exit pull boxes.
- .5 Provide engraved lamicoïd cable tags secured with nylon cables ties on each isolating transformer secondary lead to indicate which light the transformer serves.

### **3.2 INSTALLATION ISOLATING TRANSFORMERS**

- .1 Install isolating transformers in pullpits, at locations indicated:
  - .1 In transformer pulpits or enclosures:



- .1 Place suitable transformer(s) in pullpits / enclosures.
- .2 Make connections to:
  - .1 Primary cable.
  - .2 Airfield lighting secondary cable.
  - .3 Ground counterpoise.
- .3 Place back cover.

### **3.3 INSTALLATION OF TRANSFORMER PULLPITS**

- .1 Install transformer pullpits at locations indicated.
  - .1 Excavate to size and depth indicated.
  - .2 Cover bottom of excavation with layer of bedding material.
  - .3 Place pullpit so that cover is 50 mm below adjacent ground surface.
  - .4 Make holes in pullpit wall suitable for secondary tubing used (primary cable tubing shall enter through the bottom of the pullpit).
  - .5 Install incoming and outgoing tubing and/or conduit.
  - .6 Install drain conduit, where directed by engineer in the field, for connection to nearby drainage swale or ditch.
  - .7 Backfill with sand (bottom of pulpit) and common backfill material around pullpit and compact to same level and density as adjacent ground.
  - .8 Place cover on pullpit and lock, insert bolt.

### **3.4 INSTALLATION OF AIRPORT LIGHTING PRIMARY U/G CABLES**

- .1 Install airport lighting primary underground cables, as indicated on drawings.
  - .1 Pull in ducts.
  - .2 Run in conduits.
- .2 Make connections using approved connectors as indicated.
  - .1 Leave 1000 mm loop of loose cable at each connection, avoid mechanical tension on connector.
  - .2 Install connector in accordance with manufacturer's instructions.
- .3 Install markers on cable identifying circuit numbers in each pullpit.

### **3.5 INSTALLATION OF GROUND COUNTERPOISE**

- .1 Install with runs of series lighting primary cables, in trench, duct and/or tubing at locations as indicated:
  - .1 Use 1 conductor #8 SDBC wire with cables directly buried in trench or in protective tubing:
    - .1 Place counterpoise wire on top of additional 75 mm layer of bedding material above cables or tubing.
    - .2 Run counterpoise wire in straight line or in zig-zag pattern as indicated.
- .2 Use 1 conductor #8 stranded with TW green insulation, with cables pulled in ducts and/or tubing under pavement.



- .3 Use appropriate ground connector and connect counterpoise wire to:
  - .1 Power supply system common ground.
  - .2 Each light unit anchor and isolating transformer.
  - .3 Each ground rod.
  - .4 Other ground wires in same trench.
  - .5 Pullpit covers (if metal).

### **3.6 INSTALLATION OF SECONDARY CABLES**

- .1 Install as indicated:
  - .1 Run in conduits.
- .2 Make connections using approved connectors as indicated.
  - .1 In series lighting circuits, connect to isolating transformer secondary outlet.
  - .2 Leave 60 cm loop of loose cable at connection to transformer.
  - .3 Run loose cable end above ground to light unit location.
  - .4 Backfill as indicated and compact to same level and density as adjacent ground.

### **3.7 TESTING**

- .1 Testing requirements:
  - .1 Assign tests to qualified personnel only.
  - .2 Provide necessary instruments and equipment to demonstrate that:
    - .1 Circuits are continuous, free of short circuits and unspecified grounds.
    - .2 Circuits are connected according to applicable wiring diagrams.
    - .3 Circuits perform designated functions in sequence and manner intended.
    - .4 Resistance to ground of leg of a new circuit, measured with 5 kV Megger is not less than 5 gig-ohms. Megger test using the following procedure:
      - .1 For each circuit, disconnect from source and separate the A + B legs.
      - .2 Discharge capacitance in the cabling both before and after testing.
      - .3 Megger each of the A + B legs of the circuit independently. Take reading after test voltage has been applied for a period of 1 minute.
    - .5 For work where new cabling is to be spliced into existing circuitry, the existing circuit(s) are to be tested BEFORE and AFTER modifications to the circuit take place. The readings AFTER modifications shall not be below the pre-construction reading. Megger test using the following procedure:
      - .1 For each circuit, disconnect from source and separate the A + B legs.
      - .2 Discharge capacitance in the cabling both before and after testing.



- .3 Megger each of the A + B legs of the circuit independently. Take reading after test voltage has been applied for a period of 1 minute.
- .6 Circuits are operable by:
  - .1 Energizing and operating each circuit at each brightness not less than 10times.
  - .2 Energizing and operating each circuit at full load for continuous period of not less than eight hours.
- .2 Provide owner/engineer with list of test results indicating:
  - .1 Location at which test was made.
  - .2 Circuit number or designator of circuit tested.
  - .3 Individual test results.
  - .4 Submit at no cost to the Engineer, 2 copies of factory production test data as requested, with each shipment of material.
    - .1 Test reports shall show manufacturer's stock number, serial number, rating, quantity, manufacturer order number, date of manufacture, type of test, and duration.

**END OF SECTION**

**Part 1 General****1.1 RELATED WORK**

- .1 Electrical-General Provisions: Section 26 05 00 – Electrical - General Requirements
- .2 Airport lighting (General): Section 34 43 10 – Airport Lighting - General

**1.2 WORK TO BE PERFORMED ON MATERIAL SUPPLIED BY OTHERS**

- .1 Not applicable.

**1.3 MEASUREMENT FOR PAYMENT**

- .1 Installation of New Airfield Sign
  - .1 Payment for this item shall include the installation of the sign as detailed on the drawings including the supply and installation of sign, installation of mounting plate and foundation, secondary conduit and cable, grounding, all levelling / alignment / testing, and all other required accessories and work.
  - .2 Payment for associated pullpit shall be covered under a separate unit price item for pullpits.
  - .3 Payment for this item shall be on a per unit basis.

**Part 2 Products****2.1 INTERNALLY ILLUMINATED SIGNS**

- .1 Airside Guidance signs, meeting all requirements of TP312 – 5<sup>th</sup> Edition, types and colours, size, quantity, mounting arrangements, as indicated on the drawings. Number of lamps and wattage as indicated or per manufacturer's requirements.
- .2 Mounting assembly: frangible couplings with base mounting flanges for mounting on concrete pad.
- .3 Back-lit illuminated from interior LED light sources.
- .4 Secondary lead assembly from the sign, external SOW 2/C #12 cab-tire and secondary male plug.
- .5 Signs shall be suitable for operation in temperatures of -40 to +55 degrees C.
- .6 Acceptable products: ADB Safegate, Eaton Crouse-Hinds, Empower Airport Systems.
- .7 Sign shall come complete with an external weatherproof disconnect switch.

**2.2 OTHER MATERIALS**

- .1 Primary cable, single conductor #8 AWG, to section 34 43 10 - Airfield Lighting - General.

- .2 Secondary cable to Section 34 43 10 - Airfield Lighting - General.
- .3 Ground rod to Section 34 43 10 - Airfield Lighting - General.
- .4 Ground counterpoise wire, bare copper, #8 AWG to Section 34 43 10 - Airfield Lighting - General.
- .5 Breakable coupling to Section 34 43 10 - Airfield Lighting - General.
- .6 Isolating transformer to Section 34 43 10 - Airfield Lighting - General.
- .7 Transformer pullpit to Section 34 43 10 - Airfield Lighting - General.

### **Part 3 Execution**

#### **3.1 INSTALLATION PRIMARY CABLE**

- .1 Install airport lighting primary cable to Section 34 43 10 - Airfield Lighting - General as a loop circuit for power supply to isolating transformers as indicated.
  - .1 Place in duct, as indicated.

#### **3.2 INSTALLATION OF AIRPORT LIGHTING ISOLATING TRANSFORMERS**

- .1 Install suitable approved isolating transformer, sized per manufacturer's instructions, 6.6A/6.6A, per Section 34 43 10 - Airfield Lighting - General, at locations indicated, place in transformer housing as indicated.
- .2 Number of isolating transformers per sign per manufacturer's instructions.

#### **3.3 INSTALLATION OF SIGNS**

- .1 Mounting of signs, mount with flanges on concrete pad as indicated, ensure that the edges of the concrete pad are flush with finished grade.
- .2 Anti-seize compound to be used for all threaded connections.
- .3 Sign leg dimensions shall not be altered in order not to affect the withstand or frangibility characteristics of the sign.
- .4 Properly align and level signs to the satisfaction of the owner/engineer.
- .5 Install 2C #12 SOW cable and 1C #6 ground with green TW insulation in duct from transformer housing to sign location. Connect ground wire to ground conductor at the isolating transformer and to the sign grounding lug.

#### **3.4 CONTROL OF SIGNS**

- .1 Lighted signs shall be energized from respective runway or taxiway series lighting circuits as indicated.

**3.5 CLEANING**

- .1 Clean and trim areas disturbed by operations.
- .2 Touch up any damaged finishes.

**3.6 FIELD CONTROL**

- .1 Perform all tests as required to Section 34 43 10.

**3.7 TEST RESULTS**

- .1 Provide test results to section 34 43 10.

**END OF SECTION**





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**Part 3            Execution**

**3.1                LIGHT UNIT INSTALLATION**

- .1            Install at locations indicated or as directed by owner/engineer.
- .2            Install to Section 34 43 10 - Airfield Lighting - General and as indicated:
  - .1            Pullpit lid or stake mounted, as indicated on drawings.
- .3            Assemble in accordance with manufacturer's installation instructions. Connect isolating transformer secondary lead to light unit cord assembly by means of disconnecting plug and receptacle. Do not tape this connection.
- .4            Level as recommended by manufacturer.
- .5            Align fixture as directed by manufacturer instructions.

**END OF SECTION**