

**Public Works and Government
Services Canada (PWGSC)**

**Schefferville Airport
Replacement of Visual Aids**

Client Ref.: R.096390.001

**TECHNICAL SPECIFICATIONS
Electrical**

SR4 ISSUED - Addendum No. 1



Prepared for:
PWGSC

Prepared by:
Stantec

October 4, 2019

O/Ref.: 157102418-400-EL-S-0002-01

Public Works and Government Services Canada (PWGSC)
Schefferville Airport
Replacement of Visual Aids
Client Ref.: R.096390.001

TECHNICAL SPECIFICATIONS
Electrical

Prepared by:

Prepared by:

Electrical

Airport Engineering

SR4 Issued - Addendum No. 1 (2019-10-04)
"This document shall not be used for Construction"

PWGSC

Schefferville Airport Replacement of Visual Aids Client Ref.: R.096390.001

Addendum No. 1 Electrical/Airport Engineering

This addendum completes, modifies, or eliminates certain elements of the tender documents, which the addendum refers to. It is an integral part of the tender documents.

1. CLARIFICATIONS

1.1 ELECTRICAL

- Concerning the air side assembly components, the number of threads exceeding a nut must not be greater than four (4).
- When flexible ducts are used to route secondary cables from an isolation transformer to the visual aid equipment, these flexible ducts can be buried without passing through a PVC conduit. Use suitable mechanical connectors for flexible conduits at the connection points.

2. SPECIFICATIONS

The following Sections from the specifications are issued with the current addendum:

| <u>Sections</u> | <u>Pages issued</u> |
|-----------------|---------------------|
| 01 11 01 | 2 to 5 |
| 01 78 00 | All |
| 34 43 05 | All |
| 34 43 13.13 | 4 |
| 34 43 13.15 | 4 and 5 |
| 34 43 23.16 | 2, 3 and 4 |
| 33 43 26.13 | 4 to 6 |

Addendum No. 1

3. DRAWINGS

3.1 ELECTRICAL

The following drawings are modified, but not issued with the current addendum:

Drawings modified

P015, Rev. 01 (drawing not issued)
P014, Rev. 01 (drawing not issued)
P018, Rev. 01 (drawing not issued)
P019, Rev. 01 (drawing not issued)
P020, Rev. 01 (drawing not issued)

3.1.1 Drawing No. P012, Rev. 1

- The following general note is added:
 - "At the end of the work, the contractor must provide accurate as-built plans true to reality for all work performed. The Contractor must also provide a location survey of all new components, ducts and cables, performed by a qualified surveyor. All electronic data of the surveys must be forwarded to Transport Canada before the end of the mandate."
- On the plan view, the existing camera to be reinstalled is referring to detail 02/P020. This detail reference is modified to point to detail 02/P012.

3.1.2 Drawing No. P014, Rev. 1

- In section B, the text "TECK Cable to Air Inuit Panel for Terminal #1 and #2" is replaced by:
 - "Cables to Air Inuit Panel for Terminal #1 and #2".

3.1.3 Drawing No. P015, Rev. 1

- In plan view "Electrical Room – Final Setup", the junction box installed between the RTIL CCR and existing heater near axis J is to be identified with item reference 17.

Addendum No. 1

- Note 2 is completed by the following text:
 - "The operation of annunciator panel RSA III must be clearly indicated on a Lamicoïd plate place on the panel."

3.1.4 Drawing No. P018, Rev. 1

- Detail 01 – Pull Pit W/O Isolation Transformer:
 - In reference note 8, text "and cap with Duxseal" is removed.
- Detail 03 – Installation of a Runway, Taxiway or Threshold/End Light:
 - Counterpoise conductor is not connected to the ground lug of isolation transformer.
- Detail 07-A – Pull Pit with Isolation Transformer:
 - Counterpoise conductor is not connected to the ground lug of isolation transformer.
 - Pull pit height is 450 mm rather than 600 mm.

3.1.5 Drawing No. P019, Rev. 1

- Detail 02 – Installation of a Runway Threshold Identification Light (RTIL):
 - In elevation view, counterpoise conductor is not connected to the ground lug of isolation transformer.

3.1.6 Drawing No. P020, Rev. 1

- Detail 01 – Installation of a Wind Sock:
 - Counterpoise conductor is not connected to the ground lug of isolation transformer.
- Detail 03:
 - Counterpoise conductor is not connected to the ground lug of isolation transformer.

Addendum No. 1

- Ground level is to be elevated to the top of transition plate. The frangible point is to be at a maximum of 50 mm from ground level.
- Detail 4:
 - Counterpoise conductor is not connected to the ground lug of isolation transformer.
 - Ground level is to be elevated to the top of transition plate. The frangible point is to be at a maximum of 50 mm from ground level.
- Detail 5 – Remote Controlled Airfield Lighting - ARCAL:
 - The note is replaced by: "All exterior wall drillings must be sealed. No drilling through the roof will be accepted."

3.2 AIRPORT ENGINEERING

The following drawings are issued with the current addendum:

Drawings issued

P023, Rev. 01

3.2.1 Drawing No. P023, Rev. 1

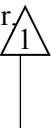
- Enlargement of embankment for PAPI at threshold 35.

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Sections of Division 01 - General Requirements.
- .2 Sections of Division 26 - Electrical.
- .3 Sections of Division 33 - Utilities.
- .4 Sections of Division 34 - Transportation.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises replacement of visual aids and other works as indicated, located at Schefferville airport. Not limited to, works include:
 - .1 Replacement of the following items of equipment:
 - .1 Runway edge lighting;
 - .2 Threshold runway lighting;
 - .3 Taxiway "Alpha" lighting;
 - .4 Apron lighting;
 - .5 Wind cones for runway thresholds 17 and 35;
 - .6 PAPIs for runway thresholds 17 and 35;
 - .7 REILs for runway thresholds 17 and 35;
 - .8 Mandatory instruction signs;
 - .9 Current regulator at FEC and addition of a spare regulator;
 - .10 Heating system for PAPIs;
 - .11 ARCAL receptor;
 - .12 Rotating beacon control.
 - .2 Addition of the following equipment:
 - .1 Indicator signs;
 - .2 Dedicated electrical panel for all airfield lighting;
 - .3 Obstruction lighting;
 - .4 Remote monitoring of emergency generator in the garage;
 - .5 Two force flow heaters to serve as resistive loads;
 - .6 Unfused safety switches.
 - .3 Relocation of the following equipment:
 - .1 Camera system and RF communication.
 - .4 Conduit network construction;
 - .5 Excavation, backfill, and finishing of surfaces;
 - .6 Electrical cabling;
 - .7 New hold line marking and removal of existing marking;

- .8 Cold mix paving for electrical trenches.
- .9 Temporary works required for proper execution including:
 - .1 Relocation of existing equipment from FEC to the electrical room in order to free up space for new equipment;
 - .2 Required temporary wiring to maintain service continuity;
 - .3 Retaining or dismantling and reinstalling existing elements conflicting with excavation works including electrical poles, fences, and protection bollards.
- .10 Demolition works, including removal of equipment and associated wiring up to feed point;
- .11 Grounding of all installed systems;
- .12 Commissioning of all equipment;
- .13 Training of operation and maintenance personnel on site;
- .14 Supply of spare materials;
- .15 All other work shown on drawings or as noted in specifications.
- .2 The supply, transportation, and installation of a container to store materials on-site to avoid shipping delays for 2020 installation.
- .3 The complete survey of the location of equipment on the air side by a qualified surveyor including marking and visual aids equipment, ducts, cables and pull pits, as well as producing "As-Built" drawings true to reality for all facilities. All electronic statement data must be submitted to Transport Canada before the end of the term. 
- .4 Works include temporary measures required on site to provide complete project, including temporary fences and construction barriers, as well as vehicle and pedestrian accesses.

1.3 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Departmental Representative's continued use of premises during construction.
- .2 Co-ordinate Progress Schedule with Departmental Representative.
- .3 Required stages:
 - .1 Before February 15, 2020:
 - .1 Purchase, transportation, and storage in on-site container of all equipment and materials required for work execution. Supply required container with side mounted doors. Refer to Section 01 21 00 - Allowances for payment conditions for the supply of equipment and materials.
 - .2 Between March 31, 2020 and August 31, 2020:
 - .1 Equipment replacement on runways and inside terminal.
 - .2 Replacement of cabling including trenching, conduits, cables, grounding, etc.

- .3 Commissioning.
- .4 All other Work on drawings and in specifications.

1.4 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work to allow:
 - .1 Departmental Representative's occupancy.
 - .2 Work by other contractors.
 - .3 Public usage.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .6 Ensure that operations conditions of existing work at completion are still the same, equal to or better than that which existed before new work started.
- .7 Maintain fire access and provide means to combat fire.

1.5 DEPARTMENTAL REPRESENTATIVE'S OCCUPANCY

- .1 Departmental Representative will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate his usage.

1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public, and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Use only existing access points and circulations in building for moving workers and material.
 - .1 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.7 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical

- service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to vehicular traffic and site operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
 - .4 Submit schedule for approval by Departmental Representative for any shutdown or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
 - .5 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant services.
 - .6 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
 - .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
 - .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
 - .9 Record locations of maintained, re-routed and abandoned service lines.
 - .10 Construct barriers, as required, in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.8 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy of each document as follows:
 - .1 Contract Drawings;
 - .2 Specifications;
 - .3 Addenda;
 - .4 Reviewed Shop Drawings;
 - .5 List of Outstanding Shop Drawings;
 - .6 Change Orders;
 - .7 Other Modifications to Contract;
 - .8 Field Test Reports;
 - .9 Copy of Approved Work Schedule;
 - .10 Health and Safety Plan and Other Safety Related Documents;
 - .11 Other documents as specified.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION


Part 1 General**1.1 REFERENCE STANDARDS**

- .1 Canadian Environmental Protection Act (CEPA).
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements manufacturer's installation instructions.
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Provide name, telephone number, and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, one (1) final paper copies and one (1) electronic copy of final Operating and Maintenance (O&M) Manuals in French and English. 
- .3 Provide spare parts, maintenance materials, and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source, and quality of products supplied.

1.4 FORMAT


- .1 Organize data as instructional manual.
- .2 Binders: Vinyl, hard covered, 3 "D" ring, loose leaf, 219 x 279 mm, with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.

- .4 Cover: Identify each binder with type or printed title "Project Record Documents"; list title of project and identify subject matter of contents.
- .5 Arrange content by process flow, systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files, in dwg format, on CD.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: Provide title of project.
 - .1 Date of submission; names.
 - .2 Addresses, name, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: Mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: As required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: Refer to Section 01 79 00 - Demonstration and Training.

1.6 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative, one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, exploitation sheets, and samples. 
 - .6 Field test records.

- .7 Inspection certificates.
- .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry, and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: Mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: Mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: Maintain field test records, inspection certifications, manufacturer's certifications, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.8 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics, and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel Board Circuit Directories: Provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shutdown, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
 - .3 Instructions presented must meet the requirements of CSA Z 463-18 Standard.
- .5 Maintenance Requirements: Include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions, in compliance with CSA Z463-18 Standard.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Sections 01 45 00 - Quality Control and 01 91 13 - General Commissioning Requirements.
- .15 Aboveground storage tank inspection documentation, registration, forms, decommissioning, and removal in accordance with CEPA SOR/2008-197.
- .16 Additional Requirements: As specified in individual Specification.



1.9 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: As specified in individual Specification.

1.10 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual Specification.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual Specification.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual Specification.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE, AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paint and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.12 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit Warranty Management Plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain enough detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing;
 - .2 List of subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible designated by each one;
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 9-month warranty inspection, measured from time of acceptance, with Departmental Representative.

- .9 Include information contained in Warranty Management Plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers, or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, motors, pumps, HVAC balancing, transformers, sprinkler systems, lightning protection systems, alarm systems, commissioned systems fire protection.
 - .3 Provide list for each warranted equipment, item, feature of construction or system, indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses, and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: Include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 4- and 9-month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected items of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material;
 - .2 Model number;
 - .3 Serial number;
 - .4 Contract number;
 - .5 Warranty period;
 - .6 Inspector's signature;
 - .7 Contractor's signature.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

September 11, 2019

Part 1 General**1.1 RELATED REQUIREMENTS**

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

1.2 REFERENCE STANDARDS

- .1 CSA Group.
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.179-09 (R2014), Airport Series Lighting Cables.
 - .3 CSA C22.2 No.180-13, Series Isolating Transformers for Airport Lighting.
 - .4 CSA C22.2 No.198.2-M1986 - Underground Cable Splicing Kits.
- .2 Federal Aviation Administration.
 - .1 FAA AC 150 5345 26 L823 for Primary/Secondary - Plug/Receptacle Cable Connectors.
- .3 Transport Canada/Air Navigation System Requirements Branch.
 - .1 TP 312-2015, Airfield Standards and Recommended Practices, 5th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide written confirmation of compliance with CSA C22.2 No.180, CSA C22.2 No.179, and CSA C22.2 No.198.2 Standards.
- .3 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets, for aeronautical ground lighting (AGL), including product functional and performance characteristics, physical size, finish, and limitations.
 - .2 Submit evidence of conformation to TP-312 requirements for airfield lighting products.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for airfield lighting for incorporation into manual.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit extra stock materials in accordance with Section 01 78 00 - Closeout Submittals.

September 11, 2019

- .2 Supply extra material as follows:
 - .1 Runway edge lighting, white: Quantity: 10.
 - .2 Runway edge lighting, white/yellow: Quantity: 4.
 - .3 Threshold runway lighting, green/red: Quantity: 4.
 - .4 Taxiway lighting, blue: Quantity: 5.
 - .5 Apron lighting, yellow: Quantity: 2.
 - .6 Hazard, obstruction and unserviceable areas marker lights, red: Quantity: 1.
 - .7 Breakable couplings for runway lights: Quantity: 20.
 - .8 PAPI lamps: Quantity: 8.
 - .9 PAPI breakable couplings: Quantity: 3.
 - .10 Master unit RTIL: Quantity: 1.
 - .11 Slave unit RTIL: Quantity: 1.
 - .12 RTIL breakable couplings: Quantity: 2.
 - .13 Isolating transformer for runway lighting: Quantity: 10.
 - .14 Isolating transformer for RTIL: Quantity: 2.
 - .15 Isolating transformer for PAPI: Quantity: 2.
 - .16 Isolating transformer for signs: Quantity: 2.
 - .17 PAPI adjustment system: Quantity: 1
 - .18 Sock for wind sock tower: Quantity: 2.



1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors, off ground, in clean, dry, and well-ventilated area, and in accordance with manufacturer's recommendations.
 - .2 Store and protect airfield lighting from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.7 OPERATION INSTRUCTION

- .1 Provide operation instructions for each main system and each equipment prescribed in relevant Sections of this specification, for operation and maintenance personnel.
- .2 Operation instructions include, if applicable:
 - .1 Cabling diagram, control diagram, control sequence for each main system and each equipment.
 - .2 Start-up, setup, adjustment, lubrication, operation, and shutdown procedures.
 - .3 Security measures.
 - .4 Procedures to be followed in case of breakdown.

September 11, 2019

- .5 Exposed views of equipment identifying name and part numbers.
- .6 Methods and periods of maintenance.
- .7 Other instructions, as recommended by manufacturer of each system or equipment, in compliance with CSA Z463-18 Standard. △
1
- .3 Provide printed or engraved instructions, glass-enclosed or laminated, in an approved manner
- .4 Affix instructions at approved locations.
- .5 Operating instructions exposed to severe weather are made of durable material or placed in a weathertight envelope.
- .6 Ensure that operating instruction will not fade if exposed to sunlight.

Part 2 Products

2.1 GENERAL

- .1 Waterproof and weatherproof – withstand exposure to sunlight, oil gasoline, water deicing fluids, and acid/alkaline soils.
- .2 Complete electrical and mechanical isolation of the primary to secondary windings and ground for a 5-KV insulation rating.
- .3 Operate indefinitely with short- or open circuit loads place on the secondary with the rated current and frequency input applied to the primary winding while immersed in water and or buried in ground.

2.2 SYSTEMS

- .1 Systems: To TP 312, 5th Edition.
- .2 Description:
 - .1 Medium-intensity edge lighting on:
 - .1 Runways 17 and 35.
 - .2 "Alpha" taxiways.
 - .3 Runway thresholds.
 - .4 Aprons.
 - .2 Runway threshold identification lights (RTIL) at limits of runways 17 and 35.
 - .3 Wind Direction Indicators (Wind cones) at ends of runways 17 and 35.
 - .4 PAPI: Precision Approach Path Indicator at ends of runways 17 and 35.
 - .5 Illuminated airport guidance signs on runways 17 and 35 and taxiway “Alpha”.
 - .6 Hazard, obstruction, and unserviceable areas marker lights and beacons:
 - .1 Medium intensity red flashing obstruction light.
 - .7 Unserviceability/closed lights.

September 11, 2019

2.3 PRIMARY CABLES

- .1 Single conductor concentric stranded soft drawn copper, #8 AWG, 90°C, 5,000 V, type ASLC, combined cross linked polyethylene insulation and jacket: To CSA C22.2 No.179.
- .2 Principal length of primary cables, 600 m minimum, to reduce splices and ensure highest level of insulation possible.

2.4 BREAKABLE COUPLING, TYPE 1

- .1 For mounting of elevated runway, taxiway, and apron edge lighting fixtures in accordance with international Standards.
- .2 Integral breakable coupling of the manufacturer's design, complying with international standards, for frangibility requirements for elevated LED type edge light fixtures.

2.5 BREAKABLE COUPLING, TYPE 2

- .1 Integral breakable coupling of the manufacturer's design, complying with international standards, for frangibility requirements for PAPIs and RTILs.

2.6 BREAKABLE COUPLING, TYPE 3

- .1 Integral breakable coupling of the manufacturer's design, complying with international standards, for frangibility requirements for illuminated airport guidance signs.

2.7 PRIMARY PLUG RECEPTACLE CONNECTORS

- .1 Primary plug and receptacle connector kit, straight type, one male plug and one female plug, for use with isolating transformer or use for separable straight splice of #8 AWG, style 3/10, as per FAA L823, type I, Class B primary cable.
- .2 Three (3) layers of vinyl tape, "Super 88" from 3M, to apply on junction.
- .3 Contractor to ensure that all employees executing connectors have received appropriate training. A certificate for each electrician will be remitted to Departmental Representative.
 - .1 Tools: Strapping sealer for connectors to comply with manufacturer's requirements.
 - .2 Cable stripper: AMP 606700-1.
 - .3 Submit tool information to Departmental Representative for approval.
- .4 Acceptable Products: Amerace (T&B - ABB), 54 Super Kit D4-D4.

2.8 SECONDARY PLUG AND RECEPTACLE CONNECTORS


- .1 Two (2) core cable secondary plug connector kit to field assemble secondary extension or terminate fixture lead, using two (2) conductors, 12 AWG, type SOW secondary cable, style 5, to FAA L823, Type II, Class B. Factory assemble cables.
 - .1 Acceptable Products: Amerace (T&B - ABB), 91 P.

- .2 Two (2) core cable secondary receptacle connector kit to field assemble extension or repair transformer lead, using two (2) conductors, 12 AWG, type SOW secondary cable, style 12, to FAA L823, Type II, Class B.
 - .1 Acceptable Products: Amerace (T&B - ABB), 91 R.
- .3 Secondary cable extensions, factory assembled, 1.5 m in length: Two (2) conductors, 12 AWG cable with plug connector on one end and receptacle connector on other end, for long secondary runs between transformers and fixtures, style 5, to FAA L823, Type II, Class A.

2.9 AGL SERIES ISOLATING TRANSFORMER

- .1 To CSA C22.2 No.180.
 - .1 Use for 5,000 V, 60 Hz, 6.6 A/6.6 A, AGL Series circuits.
 - .2 Completed with #8 AWG ground wire from manufacturer.
 - .3 Compatible with light monitoring systems.
 - .4 Power rating: In accordance with manufacturer recommendations.

2.10 TRANSFORMER HOUSING

- .1 Plastic construction, with tabs to centre and prevent side movement, galvanized metal cover, locking type.
 - .1 450 mm diameter, 400 mm depth. 

2.11 LIGHT UNIT GROUND ANCHOR

- .1 Conduit anchor 50.8 mm diameter conduit, 1.5 m long, galvanized steel, threaded one end, with conduit coupling and ground connector.

2.12 GROUND COUNTERPOISE WIRE

- .1 Single conductor #8 AWG, soft annealed copper wire.
 - .1 Solid bare for direct burial as counterpoise for airfield lighting circuits.
 - .2 Stranded with green TW insulation for placing in duct or conduit, as counterpoise for airfield lighting circuits buried beneath hard surfaces, and for power circuit insulated bonding conductors.

2.13 GROUND ROD

- .1 Copper clad steel 19 mm x 3,000 mm long, complete with ground connector.

2.14 OTHER MATERIAL

- .1 Secondary Cable:
 - .1 Two (2) conductors, #12, copper, type SOW, Cab Tire.
 - .2 Coordinate exterior dimensions of sheath with secondary connector opening.
- .2 Three conductors #10, copper, type NMWU.
- .3 Cable Ties: Black nylon, appropriate length.

September 11, 2019

- .4 Number identification tags for light units.
- .5 Conductor Markers: Galvanized steel tags, 20 mm diameter, with sufficient width for 15 mm high letters, from T&B.
- .6 Conduit, Rigid:
 - .1 Schedule 40 PVC: 53 mm diameter.
- .7 Planking, Cable Protection: 50 x 152 mm timber free from checks, shakes, waness and loose knots, treated with pentachlorophenol wood preservative (not required for buried cables installed in accordance with Electrical Code).
- .8 Splicing sleeves.
- .9 Tape: PVC type.
- .10 Stranded, 6 mm diameter nylon pull cord, with 5 kN resistance.
- .11 Splices.
 - .1 Compression joints per Amerace models for primary cables.
 - .2 Rubber isolating tape: 130 C Scotch, 50 mm, de 3M.
 - .3 Vinyl isolating tape: Super 88 Scotch, 38 mm, de 3M.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation, in accordance with manufacturer's written instructions prior to airport lighting installation.
 - .1 Visually inspect substrate with Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 GENERAL

- .1 Install airport lighting underground circuitry in accordance with Canadian Electrical Code, Part I, and CSA C22.1 Standard.



3.3 INSTALLATION OF LIGHT UNIT ANCHORS

- .1 Install 50 mm diameter, light unit anchors, at locations indicated. Set plumb and vertical with top of conduit coupling at same elevation as adjacent ground surface:
 - .1 In common soil:
 - .1 Drive in conduit.
 - .2 Screw coupling on.
 - .2 In solid rock:
 - .1 Remove surface dirt.

September 11, 2019

- .2 Drill holes 60 cm deep.
- .3 Cut conduit to proper length.
- .4 Cement grout in position.
- .5 Screw coupling on.
- .6 Backfill and compact to same level and density as adjacent ground.

3.4 INSTALLATION ISOLATING TRANSFORMERS

- .1 Install isolating transformers adjacent to primary cable trench, at locations indicated:
 - .1 In common ground:
 - .1 Excavate holes to proper depth.
 - .2 Install bedding material.
 - .3 Make connections to:
 - .1 Primary cable.
 - .2 Edge light secondary cable.
 - ~~.3 Ground counterpoise.~~ 
 - .4 Backfill with sand and compact to same level and density as adjacent ground.
 - .2 In transformer pullpits:
 - .1 Place suitable transformers in pullpits.
 - .2 Make connections to:
 - .1 Primary cable.
 - .2 Edge light secondary cable.
 - ~~.3 Ground counterpoise.~~ 
 - .3 Place back cover and lock.

3.5 INSTALLATION OF TRANSFORMER HOUSINGS

- .1 Install transformer in transformer housings at locations indicated.
 - .1 Excavate to size and depth indicated.
 - .2 Cover bottom of excavation with layer of bedding material.
 - .3 Place transformer housing so that cover is 100 mm minimum below adjacent ground surface.
 - .4 Make holes in transformer housing wall suitable for tubing used.
 - .5 Install incoming and outgoing tubing and/or conduit. Conduits must not protrude more than 50 mm inside of housings. Ream conduit ends to avoid damage to cables.
 - .6 Backfill with sand washed stone and common backfill material around transformer housing and compact to same level and density as adjacent ground as indicated.
 - .7 Place cover on housing and lock, turning cover in clockwise rotation. Bolts must not protrude above cover.
 - .8 Connect the #8 green ground counterpoise wire to cover.

September 11, 2019

3.6 INSTALLATION OF AIRPORT LIGHTING PRIMARY U/G CABLES

- .1 Install airport lighting primary underground cables.
 - .1 Run cable in conduits.
- .2 Make connections using approved connectors as indicated.
 - .1 Leave 600 mm loop of loose cable at each connection, avoid mechanical tension on connector.
 - .2 Install connector in accordance with manufacturer's instructions.
- .3 In each pull pit and at each lamp, each primary cable shall be marked with the circuit number.



3.7 INSTALLATION OF PRIMARY MOLDED PLUG/RECEPTACLE CONNECTORS

- .1 Plug and receptacle connector kit: Plug housing with conductor size wire pin contact and receptacle housing with conductor size wire socket contact. Contact must lock permanently into the housing upon completion on the assembly so that the contact does not dislodge when pulling onto the housing.

3.8 INSTALLATION OF PRIMARY CABLE KIT

- .1 Airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 V.
- .2 Connections of cable conductors shall be made using crimp connectors with a crimping tool designed to make a complete crimp before the tool can be removed.

3.9 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 one (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 anchor device.
 - .3 Each ground rod.
 - ~~.4 Other ground wires in same trench.~~ 
 - .5 Transformer housing cover.

September 11, 2019

3.10 INSTALLATION OF SECONDARY CABLES

- .1 Install as indicated:
 - .1 Run cable in conduits.
- .2 Make connections using approved connectors as indicated.
 - .1 In series lighting circuits, connect to isolating transformer secondary outlet.
 - .2 Leave 600 mm 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.

3.11 FIELD QUALITY CONTROL

- .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 circuits, measured with 5 kV megger is not less than 1,000 meg-ohms for existing cables.
 - .5 Circuits are operable by:
 - .1 Energizing and operating each circuit at each brightness not less than 10 times.
 - .2 Energizing and operating each circuit at full load for continuous period of not less than eight (8) hours.
 - .3 Redo measurements after.
- .2 Provide Departmental Representative 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.

3.12 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: Separate waste materials for recycling reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

September 11, 2019

3.13 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by airfield lighting system installation.

END OF SECTION

September 11, 2019

Part 1 General**1.1 RELATED REQUIREMENTS**

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

1.2 REFERENCE STANDARDS

- .1 CSA Group.
 - .1 CSA C22.2 No. 131-14, Type TECK 90 Cable.
 - .2 CAN/CSA C22.2 No. 38-14, Thermoset-Insulated Wires and Cables.
 - .3 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - .4 CSA C22.2 No.179-09 (R2014), Airport Series Lighting Cables.
 - .5 CSA C22.2 No.180-13, Series Isolating Transformers for Airport Lighting.
 - .6 CSA C22.2 No.198.2-M1986 - Underground Cable Splicing Kits.
- .2 Transport Canada.
 - .1 TP 312-2015, Airfield Standards and Recommended Practices, 5th Edition.
- .3 Federal Aviation Administration.
 - .1 Engineering Brief No.67D, Light Sources Other Than Incandescent and Xenon.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature and data sheets for airfield runway identification lights, and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Test Reports: Submit certified test reports from established third-party testing laboratories attesting compliance with specifications for specified performance characteristics and physical properties.
- .4 Field Test Reports: Submit test reports relative to work of this Section.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for airfield runway identification lights for incorporation into manual.

September 11, 2019

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors, off ground, in clean, dry, well-ventilated area, and in accordance with manufacturer's recommendations.
 - .2 Store and protect airfield runway identification lights.
 - .3 Replace defective or damaged materials with new.

Part 2 Products**2.1 MATERIALS**

- .1 Runway identification lighting (RIL) system to TP 312F, 5th Edition.
- .2 RIL system, consisting of: Two (2) flasher heads with integrated control unit.
- .3 DEL fixture.
 - .1 LED master unit, capable of operating in 6.6 A Series operation, from current regulator with three (3) brightness levels.
 - .1 The master unit starts the flash sequence at a rate of 1 flash every 0.5 sec and verifies that the slave unit is synchronized to the master unit.
 - .2 LED slave unit, capable of operating in 6.6 A series operation, from current regulator with three (3) brightness levels.
 - .1 Triggering of flash of the slave unit must be synchronized to the master clock of the master unit.
 - .3 Mounted on 2 legs.
 - .4 Equipped with one-level current detection option to automatically adjust brightness levels from controller current.
 - .5 Beam opening:
 - .1 15° horizontal.
 - .2 10° vertical.
 - .6 High-intensity operation/one level.
 - .7 Fault detection:
 - .1 A fault will be generated on loss of supply.
 - .2 A fault will be generated if more than 25% of LEDs are in fault.
 - .3 A fault will be generated if the number of misfires per 100 consecutive flashes exceeds a pre-defined value. A value between zero (0) and seven (7) may be chosen using a selector mounted in the master controller.

September 11, 2019

- .8 The locking mechanism cuts out primary power when the master or slave control unit is open.
- .4 Cable for connection of flasher heads to auxiliary transformer units to manufacturer's requirements.
- .5 Multi-Conductor Cable #14 AWG TECK 90 (-40°C): To CSA C22.2 No.131.
 - .1 Galvanized steel interlocking armour.
 - .2 Outer jacket: PVC.
- .6 For 6.6A Current Powered Units.
 - .1 CSA C22.2 No.179, Airport Series Lighting Cables.
 - .2 CSA C22.2 No.180, Series Isolating Transformers for Airport Lighting.
 - .3 CSA C22.2 No.198.2, Underground Cable Splicing Kits.
- .7 Concrete base as indicated.
- .8 Ground rods, in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .9 Ground counterpoise wire, bare copper, #8 AWG, in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .10 Conduit, flexible liquid-tight type.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for airfield runway identification lights installation, in accordance with manufacturer's instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PRIMARY AND SECONDARY FEEDER CABLES FOR RIL

- .1 Install primary feeder cable in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts and Section 34 43 05 - Common Work Results for Airfield Lighting.
- .2 Install 2/C #14 AWG TECK 90, (-40°C) cable between RIL along routes indicated on site drawing.
 - .1 Bury cable in ground, as indicated on drawings.
- .3 Isolating transformer, rating as per manufacturer's requirements.

September 11, 2019

**3.3 INSTALLATION OF RUNWAY THRESHOLD IDENTIFICATION LIGHTS,
FLASHER HEADS**

- .1 Install RTIL units at runway threshold on new concrete bases.
- .2 Mount RIL units on conduit supports, set to proper elevation and fasten rigidly.
- .3 Install multi-conductor TECK 90, (-40°C), cable between power supply units to suit manufacturers requirements.
- .4 Make electrical connections in accordance with manufacturer's written instructions.
- .5 When flexible ducts are used to route secondary cables from an isolation transformer to the visual aid equipment, these flexible ducts can be buried without passing through a PVC duct. Use suitable mechanical connectors for flexible ducts at connection points.

**3.4 GROUNDING**

- .1 Install one ground rod at each RTIL unit location.
- .2 Make connections to ground rods and equipment housing, using 1/C #8 AWG soft drawn bare copper wire and suitable ground connectors.
- .3 Fasten wire to mounting leg of each unit, using black nylon cable ties.

3.5 ALIGNMENT

- .1 Align units to ensure their locations and elevations are as indicated.
- .2 Set units in horizontal plane.
- .3 Assist in angular setting of units, made by Departmental Representative.

3.6 FIELD QUALITY CONTROL

- .1 Perform tests as required in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting and as indicated.

3.7 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: Separate waste materials for reuse recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by airfield runway identification light installation.

END OF SECTION

September 11, 2019

Part 1 General**1.1 RELATED REQUIREMENTS**

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

1.2 REFERENCE STANDARDS

- .1 Transport Canada.
 - .1 TP 312-2015, Aerodrome Standards and Recommended Practices, 5th Edition.
- .2 CSA Group.
 - .1 CSA G40.20/G40.21.
- .3 Federal Aviation Administration.
 - .1 Engineering Brief No. 67D Light Sources Other Than Incandescent and Xenon.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, and data sheets for illuminated guidance signs, and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Test Reports: Submit certified test reports from established third-party testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit operation and maintenance data for incorporation into manual.
- .3 Operation and Maintenance Data: Submit operation and maintenance data for materials relative to work for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in clean, dry, well-ventilated area, and in accordance with manufacturer's recommendations.

September 11, 2019

- .2 Store and protect illuminated airport guidance signs from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 INTERNALLY ILLUMINATED SIGNS

- .1 Products to meet TP 312F, 5th Edition.
- .2 Airside guidance signs, types and colours, size, quantity, mounting arrangements, as indicated on drawings. Signs to have following characteristics:
 - .1 Lighting type: DEL;
 - .2 Minimum height: 600 mm;
 - .3 Lettering minimum height: 400 mm;
 - .4 Total mounting height including legs: 1500 mm;
 - .5 Indications on sign: single sided, as indicated on drawings;
 - .6 "ON/OFF" switch;
 - .7 Supply via a three (3) brightness level regulator from 4.8 to 6.6 A;
 - .8 Transformer to maintain a constant lighting level when connected on a variable intensity circuit;
 - .9 Detection system to shut off power if more than 25% of LEDs are malfunctioning;
 - .10 Removable side panel to remove panel front;
 - .11 Window for observation of LED strip condition from exterior on runway side;
 - .12 Manufacturers: Eaton Crouse-Hinds; ADB Safegate; AGM.
- .3 Mounting assembly frangible couplings with base mounting flanges for mounting on concrete pad, via transition plate.
- .4 Secondary lead assembly from sign, external SOW 2/C #12 cab tire and secondary male plug.

2.2 OTHER MATERIALS

- .1 Primary cable, single conductor #8 AWG, in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .2 Primary connector in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .3 Secondary cable in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .4 Ground rod in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.

September 11, 2019

- .5 Ground counterpoise wire, bare copper, #8 AWG in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .6 Breakable coupling in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .7 Isolating power transformer compatible with the dimension of the panel, in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .8 Transformer housing/pullpit in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.
- .9 Screw anchor, galvanized, 152 mm diameter, single helix, 1.8 m length.
- .10 Transition plate, 12 mm flat 6 mm with 38 mm formed lip, CSA G40.20/G40.21 44W steel, hot galvanized after fabrication, supplied c/w 12 mm HDG hardware for sign flange mounting.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for illuminated guidance signs installation in accordance with manufacturer's written instructions.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION PRIMARY CABLE

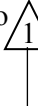
- .1 Install airport lighting primary cable in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting as loop circuit for power supply to isolating transformers, as indicated.
- .2 Install the counterpoise wire as indicated.

3.3 INSTALLATION OF AIRPORT LIGHTING ISOLATING TRANSFORMERS

- .1 Install suitable approved isolating transformer, sized in accordance with manufacturer's written instructions sized as indicated, 6.6A/6.6A, in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting, at locations indicated. Place in transformer housing as indicated.
- .2 Number of isolating transformers per sign in accordance with manufacturer's written instructions.
- .3 Connect grounding cable to isolating transformer and to ground terminal of panel.

September 11, 2019

3.4 INSTALLATION OF SIGNS

- .1 Mounting of signs, mount with flanges on concrete pad mount, as indicated, ensure that the frangibility point do not protrude more than 50 mm above finished grade.
- .2 Ensure sign leg dimensions are not altered to affect or withstand frangibility characteristics of sign.
- .3 Properly align and level signs to approval of Departmental Representative.
- .4 Install 2C #12 AWG SOW cable and 1C #6 AWG ground with green TW insulation in 32-mm poly tubing from transformer housing to sign location. The cable must be protected by passing under the plate and in a support. The connection will be made at ground level to ensure frangibility. Connect ground wire to ground conductor at isolating transformer and to sign grounding lug.
- .5 When flexible ducts are used to route secondary cables from an isolation transformer to the visual aid equipment, these flexible ducts can be buried without passing through a PVC duct. Use suitable mechanical connectors for flexible ducts at connection points 
- .6 Install restraining cables to secure signs.

3.5 INSTALLATION OF CONCRETE PAD

- .1 Install at locations, as indicated.
- .2 Cover bottom of excavation with layer of crushed stone, as indicated.
- .3 Install tubing or conduit for secondary feeder cables as indicated.
- .4 Obtain authorization of Departmental Representative before starting erection of sign fixtures.

3.6 CONTROL OF SIGNS

- .1 Ensure lighted signs are energized from respective runway or taxiway light circuits, as indicated.

3.7 FIELD QUALITY CONTROL

- .1 Perform tests as required in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.

3.8 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

September 11, 2019

- .3 Waste Management: Separate waste materials for recycling reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by illuminated guidance sign installation.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

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

1.2 REFERENCE STANDARDS

- .1 Transport Canada.
 - .1 TP 312-2015, Airfield Standards and Recommended Practices, 5th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, and data sheets for airfield wind cones, and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance duplicate 150 x 150 mm minimum samples of wind direction indicator fabric.
- .4 Field Test Reports: Submit test reports relative to work of this Section.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for airfield wind cones for incorporation into manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors, off ground, in accordance with manufacturer's recommendations, and in clean, dry, well-ventilated area.
 - .2 Store and protect wind cone from tears.
 - .3 Replace defective or damaged materials with new.

Part 2**Products****2.1 DESIGN CRITERIA**

- .1 Wind direction indicator products in accordance with TP 312, 5th Edition.

2.2 WIND DIRECTION INDICATOR FABRIC

- .1 Wind direction indicator fabric as indicated, 927 mm diameter, 3,750 mm length, international aviation orange and white colour coding.
 - .1 Nylon fabric: Rot, mildew, and water-resistant.

2.3 WIND DIRECTION INDICATOR

- .1 Wind direction indicator fabric, with hinged aluminum mast.

2.4 ISOLATING TRANSFORMER

- .1 Compatible with installed system and supplied by a three (3) brightness circuit 4.8 A to 6.6 A.
- .2 6.6 A/6.6 A, 200-W isolating transformer, with secondary grounding device.
- .3 A supply box to maintain constant illumination when connected to a variable brightness runway or taxiway circuit.

2.5 INTERRUPTOR

- .1 Interruptor: 15 A, single-pole, rainproof, in CSA type 3R enclosure.

2.6 CONCRETE FOOTING

- .1 Concrete footing as indicated.

2.7 GROUND WIRE

- .1 Bare stranded copper, #8 AWG.

**2.8 LAMPS**

- .1 Unit shall be backlit with an internal lamp having the following characteristics:
 - .1 LED, 2.8 A to 6.6 A, current powered.
 - .2 50,000 service life.

2.9 GROUND ROD

- .1 19 mm diameter x 3,000 mm long, with ground connector.

2.10 ANCHOR BOLTS

- .1 Frangible anchor bolts or fuse bolts for mounting when the wind direction indicator is located within the designated runway strip.

- .2 Standard anchor bolts when the wind direction indicator is located outside the designated runway strip.

2.11 TUBING

- .1 Polyethylene, 53 mm diameter, 34.5 kPa.

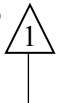
Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to wind direction indicator equipment installation.
 - .1 Visually inspect substrate.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION OF WIND DIRECTION INDICATOR

- .1 Install concrete base at location indicated. Ensure correct installation of bolts frangible mounting bolts/fuse bolts as per manufacturer's directions to ensure a maximum 50 mm projection of the yield point above grade.
- .2 Mount hinged steel aluminum mast, complete with wind cone frame and accessories, as indicated.
- .3 Install primary feeder cable to Sections 26 05 43.01 - Installation of Cables in Trenches and in Ducts, along route indicated.
- .4 Run cable in existing duct.
- .5 Connect to transformer primary.
- .6 Install two (2) #12 conductors, type SOW, cab tire cable, connect to transformer secondary lug and to wind cone lighting fixture.
- .7 When flexible ducts are used to route secondary cables from an isolation transformer to the visual aid equipment, these flexible ducts can be buried without passing through a PVC duct. Use suitable mechanical connectors for flexible ducts at connection points.
- .8 Make adjustment.



3.3 FIELD QUALITY CONTROL

- .1 Perform field tests in accordance with Section 34 43 05 - Common Work Results for Airfield Lighting.

3.4 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment, in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: Separate waste materials for reuse recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by airfield wind direction indicator installation.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, and data sheets for airport lighting control system, including product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Quebec, Canada.
 - .2 Indicate configuration and dimensions of individual control units.
 - .3 Indicate control panel construction, dimensions, materials and finishes.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data for airport lighting control system for incorporation into manual.
 - .1 Indicate: description of relay interface panels.
 - .2 For control panels: Indicate manufacturer's name, type, year, number of units, and capacity.
 - .3 Supply one (1) hard copy and one (1) soft copy of wiring diagram with each panel. Wiring diagram to show colour code or number identification of each wire and proper connections.
 - .4 Supply component parts list and installation instructions with each control panel along with enough drawings or illustrations to indicate method of installation.

1.4 QUALITY ASSURANCE

- .1 Ensure products are from one manufacturer.

1.5 AIRFIELD LIGHTING CONTROL SYSTEM DESCRIPTION

- .1 The airfield lighting control system must include the following components:
 - .1 Roof-mounted antenna;
 - .2 Type K ARCAL radio receptor;

- .3 Cavity filter as per ARCAL frequency receiver;
- .4 Relay interface panel.
- .2 Description of System Operation:
 - .1 The ARCAL system is activated upon receiving, via the roof antenna, a series of energy pulses (3, 5, or 7) at the programmed radio frequency within a five-second period from an aircraft.
 - .2 Exit relays are configured for incremental operation: At the third pulse, the first relay closes, at the fifth pulse, the second relay closes, at the seventh pulse, the third relay closes.
 - .3 The relay interface receives signals from the ARCAL receptor and activates relays to set the lighting intensity of each constant current regulator at the required intensity.
 - .1 The relay interface panel must include a command relay for each intensity of each constant current regulator:
 - .1 One 3 steps constant current regulator for the runway lighting circuit. 3 pulses = intensity 1 (10%), 5 pulses = intensity 2 (30%), 7 pulses = intensity 3 (100%);
 - .2 One 3 steps constant current regulator for the Runway threshold identification lights (RTIL) circuit. 3 pulses = stop, 5 impulses = stop, 7 pulses = intensity 3 (100%);
 - .3 One 5 steps constant current regulator for PAPI circuit:
 - .1 The first step must be use for heating the PAPI units.
 - .1 A switch must be installed on the face of the airfield lighting control panel to activate of deactivate the Heating function. Indicate « Été » and « Hiver » on the switch.
 - .2 If activated, the first step (regulator adjusted to 2A) will be used to heat the PAPI units.
 - .3 Upon reception of an ARCAL signal, the relay interface will deactivate temporarily the heating function and command the regulator to the required intensity.
 - .2 Second step is unused.
 - .3 Step 3 (3 pulses), 4 (5 pulses) and 5 (7 pulses) will command the lighting intensity of the PAPI circuit. Step 3 must be adjusted to 4,8 A.
 - .4 One 3 steps spare constant current regulator.
 - .2 The relay interface panel must include a relay to be interfaced with the existing rotary beacon contactor:
 - .1 This relay must be interconnected with the contactor so that a set of 3, 5, and 7 impulses received by the ARCAL system will activate the rotary beacon.

- .3 A remote « OFF – ON » 2 positions selector, identified « déneigement à distance » must be interfaced with the relay interface panel. This selector will allow the airfield lighting circuits to be manually activated at medium intensity (2, 30%).

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors, off ground, and in accordance with manufacturer's recommendations, in clean, dry, well-ventilated area.
 - .2 Store and protect airfield lighting control equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.7 MATERIAL IDENTIFICATION

- .1 No "P-touch" identification will be accepted.
- .2 Provide Lamicoïd identification plates for all new components to be installed in FEC.

Part 2 Products

2.1 ARCAL RECEIVER

- .1 Produced according to the requirements of TP-312, 5th Edition.
- .2 Complying with L-854 AC 150/5345-16, Edition in force, ETL certified.
- .3 Input Voltage: 120 VAC, $\pm 10\%$, 60 Hz.
- .4 Contacts of output relays are calibrated at 3A.
- .5 Operation Temperature: -55 to + 55 °C.
- .6 Operation Frequencies: 118.0 at 136.0 MHz VHF, programmable by user. Control electronics allow user to easily change the programmed frequency.
 - .1 The basic programmed frequency is channel 122.2 MHz.
 - .2 The frequency of the programmed channel shall be coordinated with the airport representative.
- .7 Antenna: Remote.
- .8 Configured in ARCAL type K units via DIP switch.
- .9 Must have a memory to maintain the intensity selected by the pilot during a momentary power failure, ensuring a return to operating conditions prior to the failure.


2.2 ARCAL CAVITY FILTER

- .1 Aviation type VHF cavity filter, with the following characteristics:
 - .1 Aluminum with internal copper and brass coaxial conductor;
 - .2 Silver and chromate coating limiting corrosion and improving filter performance;
 - .3 Temperature compensated for very low frequency variation;
 - .4 Frequency range: 108 to 138 MHz:
 - .1 Cavity frequency must be calibrated at the factory;
 - .2 Cavity frequency must be coordinated with the ARCAL receptor's operating frequency;
 - .3 Provide a performance certificate with the new cavity filter.
 - .5 Impedance: 50 ohms;
 - .6 Average power: 350 W;
 - .7 Operation temperature: -40 to +60 °C.
- .2 Recognized Manufacturer: Sinclair, same model as existing filter.


2.3 COAXIAL CABLE FOR ARCAL RECEIVER

- .1 "Héliax" type coaxial cable at low loss.
- .2 Frequency Range: Must match the frequency range of the ARCAL receiver.
- .3 Connectors suitable for connection to ARCAL receiver, ARCAL filter, and antenna.

2.4 ROOF-MOUNTED REMOTE ANTENNA FOR ARCAL RECEIVER

- .1 Aviation type VHF antenna, omnidirectional.
- .2 Frequency Range: Must match the frequency range of the ARCAL receiver.
- .3 Model and recognized manufacturer: Equivalent or superior to existing model, Sinclair "Hevi Duty" type, model SG238-SF1SNM. 

2.5 RELAY INTERFACE PANELS

- .1 Control panels consisting of switches devices/changeover switches and relays, in NEMA 1 Enclosure, as indicated, to control airfield system as described above.
 - .1 Relays must be of pluggable and non-programmable type, except for timed or specific relays. 
 - .2 Position switches/selectors must be equipped with a LED pilot light;
 - .3 The relay interface panel must be equipped with LED pilot lights to indicate:
 - .1 Relay interface is live.
 - .2 The different state of operation "Manual, Automatic, Local, Distant", as per configuration.
 - .4 Wall-mounted.

- .2 Control panel to select control source for airfield lighting control equipment.
 - .1 Airfield lighting can be activated from a 2-position selector installed outside the electrical room. This selector is identified as "Déneigement".
- .3 Relay panel to interface control of existing rotary aeronautical beacon, as indicated.
- .4 Supply: 120 V.

2.6 ACCESSOIRES

- .1 Screw terminal type connector blocks designed for rated current and voltage of not less than 10 A and 120 V, respectively.
- .2 Spare parts:
 - .1 Provide a set of spare fuses identical to those in the relay interface panel.
 - .2 Provide a spare relay for each type of relays in the relay interface panel.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: Verify conditions of substrates and surfaces to receive airfield lighting control equipment previously installed under other Sections or Contracts are acceptable for airport lighting control system installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Manufacturer's Instructions: Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 The Contractor shall supply all equipment, cabling, conduits, enclosures, supports, anchors, and accessories required for a functional and complete installation of the airfield lighting control system.

3.3 INSTALLATION OF RELAY INTERFACE PANEL

- .1 Install control panel in FEC, as indicated.
- .2 Make wiring connections as indicated.
- .3 Identify terminal block points or wires with permanent markers, as indicated.
- .4 Adjust the intensity of the regulator according to levels indicated in the airfield control.

3.4 INSTALLATION OF REMOTE-CONTROL CABLES

- .1 Run cable and make connections as indicated.
- .2 For "Heliax" coaxial cables, supply and install the required connectors.

3.5 ADJUSTING

- .1 Adjust system to operate as designed.

3.6 FIELD QUALITY CONTROL

- .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product.
- .2 Manufacturer must submit recommendations as to the use of product(s).

3.7 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by airfield lighting control system installation.

END OF SECTION