

SECTION 26 65 00: AIRFIELD LIGHTING AND SIGNS

READ THIS FIRST

Notice to the Design Engineer, this document is part of Facilities and Infrastructure standards for Electrical Systems. Designers are advised to NOT use this template (*.doc) document as part of any project contract documents. Designers shall use the Port of Seattle MasterSpec specifications from the following link:

<https://www.portseattle.org/page/guide-specifications>.

Designers shall edit the corresponding Port's MasterSpec specification to meet the F&I Electrical Standard outlined in this specification. Note that Port's MasterSpec specifications contain specifications and languages for both Aviation and Maritime Divisions. F&I Standards are strictly for Aviation Division, and any Maritime related specs or languages should be removed from the project specifications.

PART 1 - GENERAL

1.1 SUMMARY OF WORK

- A. This Section includes the requirements for the temporary provisions, modification, and installation of fully operational airfield lighting and airfield sign systems.
- B. All airfield lighting system and airfield sign systems shall be powered from a Constant Current Regulator (CCR). All airfield lighting and sign CCR shall be controlled by existing Programmable Logic Controller (PLC) Airport Lighting Control and Monitoring System (ALCMS) located at the Ports owned/operated Field Lighting Vault (FLV).
- C. All airfield lighting systems and airfield sign systems on the airfield shall use light-emitting diode (LED) lights, with the exception as shown on the Contract Documents that shall use incandescent.
- D. Airfield lighting systems include light fixtures and microwave:
 - 1. Runway Lights
 - a. L-862(L) - Elevated Runway edge lights, high intensity (LED)
 - b. L-862E(L) - Elevated Runway threshold/end lights, high intensity (LED)
 - c. L-850A(L) – In-pavement Runway centerline lights (LED)
 - d. L-850B(L) – In-pavement Touch down zone lights (LED)
 - 2. Taxiway Lights
 - a. L-861T(L) – Elevated Taxiway edge lights (LED)
 - b. L-852C(L) – In-pavement Taxiway centerline lights [straight sections](LED)
 - c. L-852D(L) – In-pavement Taxiway centerline lights [curve sections] (LED)
 - 3. Guard Lights and Stop Bar Lights
 - a. L-804(L) – Elevated Runway guard lights (LED)
 - b. L-862S(L) – Elevated stop bar light (LED)
 - c. L-852G(L) – In-pavement Runway guard lights (LED)
 - d. L-852S(L) – In-pavement stop bar light (LED)
 - e. L-852GS(L) – In-pavement Runway guard/stop-bar lights (LED)
- E. Airfield sign systems includes

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1. General Airfield Signage
 - a. L-858L(L) – Location (LED)
 - b. L-858Y(L) – Direction/Information (LED)
 - c. L-858R(L) – Mandatory (LED)
 2. Runway Distance Remaining
 - a. L-8585B(L) – Runway Distance Remaining (LED)
- F. Isolation Transformers
1. Series to Series Isolation Transformer operating at 60Hz with a Primary Amps of 6.6A and Secondary of 6.6A sized per manufacturer recommendation of airfield light or airfield sign.
 2. Series to Series Isolation Transformer operating at 60Hz with a Primary Amps of 20A and Secondary of 6.6A sized per manufacturer recommendation of airfield light or airfield sign.
- G. Airfield lighting Light Bases and Junction Cans
1. L-867 – Non-Aircraft Rated
 2. L-868 – Aircraft Rated.
- H. Mounting plates for elevated edge light co-located with the Foreign Object Debris (FOD) detection system field devices.
- I. Mounting plates for the Independent FOD detection system field devices that are located separately from the elevated edge lights.

[Note to designer/project determine who will be responsible for furnishing fixtures]

- J. Elevated and in-pavement LED runway edge and threshold/end lights and in-pavement LED runway guard lights.

1.2 REFERENCES

The most current version of Federal Aviation Administration's (FAA) Advisory Circulars (A/C) shall be used. The most current version of ICAO Annex 14 shall be used.

- A. Reference Standards
1. FAA A/C 150/5340-30J - Design and Installation Details for Airport Visual Aids
 2. FAA A/C 150/5345-10H - Specification for Constant Current Regulators and Regulator Monitors
 3. FAA A/C 150/5345-42J - Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
 4. FAA A/C 150/5345-44K – Specification for Runway and Taxiway Signs

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5. FAA A/C 150/5345-46E - Specification for Runway and Taxiway Light Fixtures
6. FAA A/C 150/5345-47C – Specification for Series to Series Isolation Transformers for Airport Lighting Systems
7. FAA A/C 150/5345-53D – Airport Lighting Equipment Certification Program
8. ICAO Annex 14 – Volume 1 Aerodromes Design and Operation - Ninth Edition, July 2022

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Lighting System Activation. Through the Resident Engineer, the Contractor shall coordinate the activation of the lighting systems with the Port's consultant for the airport lighting control and monitoring system (ALCMS) and shall account for the amount of time needed for the coordination in the schedule.

1.4 SUBMITTALS

- A. Submit product data for the following in accordance with Section 01330 – Submittals:
 1. Constant Current Regulators
 2. Airfield Light Fixtures
 3. Light Bases, Mounting Hardware, and accessories
 4. Light Base Covers
 5. Airfield Guidance Signs
 6. Illuminated Distance Runway Marker Signs
 7. Isolating Transformers
 8. Light fixture lock washers
 9. Non-metallic liquid tight flexible conduit
 10. Special Warranty from manufacturer

1.5 QUALITY ASSURANCE

- A. Testing for compliance with the Contract provisions shall be in accordance with Section 01451 – Quality Control; Testing Laboratory Services and as outlined in this section.
- B. Contractor shall develop and implement an inspection and testing program to assure contract compliance with the following items, at a minimum:
 1. Light Bases and cover plates

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2. Light Fixtures
3. Guidance Signs
4. Marker Signs
5. Isolation Transformers
6. Constant Current Regulators

C. Contractor shall submit all test results to the Engineer for review and approval.

1.6 ACCEPTANCE TESTING

- A. All acceptance testing necessary to determine conformance with the requirements specified in this section shall be performed by the Contractor. The Contractor shall provide copies of the test results to the Engineer.
- B. Contractor shall develop and implement an acceptance testing program to include the following items, at a minimum:
 1. Lighting and Signs – Photometric Testing
 2. Airfield Lighting Circuits – System Meggering
 3. Airport Lighting Control and Monitoring System Modifications
- C. Contractor shall submit all test results to the Engineer for review and approval. See paragraph 3.9B for additional test requirements.

1.7 SPECIAL WARRANTY

- A. Provide a minimum 5-year warranty from the Manufacturer for the LED fixtures and signs installed in the Airfield Lighting System and Airfield Guidance Sign System.
 1. Warranty shall cover the following:
 - a. Housing, wiring, and connections for fixtures and signs (excludes cables providing power and communication to the light cans and signs).
 - b. LED light source(s).
 - 1) Light output/intensity shall be no less than 90% of the manufacturer-rated luminance. Light source failing to meet the 90% threshold of the rated luminance shall be considered as a luminaire failure.
 - c. LED driver(s) or power supplies.
 2. Warranty period for the Runway Lighting System and the Airfield Guidance Sign System shall begin when the Acceptance Testing is completed, accepted by the Port, and all airfield lighting systems are operational.
 3. To address the isolated failure of LED fixtures and to ensure that airfield lighting remains fully operational, the Manufacturer shall provide the Port with a sufficient number of LED

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fixtures so that the Port can immediately replace the failed LED fixtures. The Port will ship the failed fixtures to the Manufacturer. The Manufacturer shall resupply the Port with repaired or new fixtures so there is a sufficient supply of fixtures on hand. The replacement unit shall be of the same type, model, and configuration as the installed product, unless otherwise agreed to by the Port. Replacement units shall be recorded and documented; include, at a minimum, fixture's type, wattage, style, serial number, and manufacturer. At the conclusion of the warranty period, any LED fixtures in possession of the Port will be returned to the Manufacturer or purchased by the Port, at the Port's option.

4. Should there be a significant product failure to the same type of LED lighting fixtures (i.e. edge fixtures, centerline fixtures, touch down zone fixtures, etc.) within the warranty period, the Manufacturer shall replace all fixtures within that system. The replacement of fixtures for a significant product failure shall include installation in the airfield. Significant product failure shall be defined as failures of more than 10% of the installed type of fixture failing within a 12-month period.
 5. Manufacturer shall agree to repair or replace LED sign unit, including but not limited to LED lamps, electronic boards, accessories, and factory-installed interconnection wiring, that fail in materials or workmanship within the warranty period.
- B. CCR Manufacturer shall provide a minimum of 2-year warranty from Manufacturer. Warranty period shall begin at Acceptance Testing completion and acceptance by the Port.
1. Warranty shall cover all internal connection, system components, power components, displays, and control components.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All equipment and materials specified in this section shall meet the requirements of the applicable and most current FAA Advisory circulars regulating the particular equipment.
- B. Manufacturer of all airfield signage system for runways and taxiways shall be from a single manufacturer.

2.2 AIRFIELD LIGHTING CABLE

[Note to designer] Add standard FAA specification for Airport Underground Cables under Section 260519 (in FAA format). Discuss with F&I as needed.

- A. All airfield lighting and airfield signage cables shall be L-824 #6 AWG unless otherwise stated. Additional requirement shall be in accordance with in Section 260519 – Low-Voltage Electrical Power Conductors and Cables.

2.3 AIRFIELD LIGHT FIXTURES

All new fixtures shall be in accordance with the reference standards per this specification and as follows:

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- A. In-pavement Fixtures – All shall be rated for Class 2 (base mounted), Mode 1 (constant current), and Style 3 (Total height above finished grade $\leq 1/4$ inches) .
 - 1. Runway Centerline
 - 2. Runway Touchdown Zone
 - 3. Runway Stop Bar
 - 4. Taxiway Centerline
- B. Elevated Fixtures – All shall be rated for Class 2 (base mounted) and Mode 1 (constant current).
 - 1. Runway edge – Elevated height 14 inches
 - 2. Runway threshold/end - Elevated height 14 inches
 - 3. Taxiway edge – Elevated height 14 inches
 - 4. Runway guard light – Elevated height 14 inches
 - 5. Stop bar – Elevated height 14 inches

2.4 LIGHT BASES/JUNCTION CAN AND MOUNTING HARDWARE

All required light bases and mounting hardware shall be of steel construction, and shall be in accordance with reference standards per this specification. All light bases will be either L-867 or L-868 with integral 2" threaded hubs. All 2" threaded hubs shall be oriented and configured as required to limits bends in the conduit system. All bases shall be provided with internal and external ground lugs. All base cans shall be provided with shims and gaskets. All L-868 base cans shall be provide with 3/8" thick flange ring and pavement dam.

Junction cans shall be provided with galvanized steel blank covers, L-868 shall be 3/4" thick and L-867 shall be 3/8" thick.

Typical depth of base cans installed in concrete shall be 24". Typical complete depth of a base can installed in pavement shall be 24" which includes a 6" riser for facilitating a mill and overlay.

All Light fixtures shall be bolted down light base and each bolt shall have a two-piece cam type lock washers made of stainless steel.

- A. L-867 Non-Aircraft Rated, Class IB (corrosion tested)
 - 1. Size B (12" dia.)
 - a. Elevated Fixtures.
 - b. Sign Junction Cans.
 - c. Junction cans located in the grass or asphalt shoulders.
- B. L-868 Aircraft Rated, Class IB (corrosion tested)

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1. Size B (12" dia.)
 - a. In-Pavement.
 - b. Junction cans, located within 9 feet of taxiway and runway full-strength pavement.

Existing in-pavement base cans that are to be abandoned per Contract Documents shall be provided with a load-bearing steel cover plate. The bolts on the cover plate shall be welded, and the plate shall be labeled "ABANDONED" via bead weld or other approved method.

2.5 AIRFIELD GUIDANCE SIGNS

All new signs shall be in accordance with reference standards per this specification and as follows:

- A. Manufacturers: Subject to compliance with requirements, provide airfield signage products by one of the following:
 1. Crouse-Hinds
 2. ADB Safegate.
 3. OCEM
 4. Lumacurve
 5. Or Approved Equal
- B. Unless otherwise noted, signs shall be Class 1 (operation from -4 degrees Fahrenheit – 131 degrees Fahrenheit), Mode 3 (withstand wind loads of 300mph) with LED lamps.
- C. Erosion Control Pad
 1. Size and dimension as shown on the Contract Documents.
 2. Crushed aggregate base shall meet the requirements of Section 02724 – Crushed Aggregate Base Course (FAA).
 3. Asphalt concrete shall meet the requirements of Section 02743 – Asphalt Concrete Pavement.

2.6 ISOLATION TRANSFORMERS

- A. All new isolation transformers shall be in accordance with reference standards per this specification. Transformer primary amperage shall be coordinate with upstream CCR (20A or 6.6A) and secondary amperage shall be 6.6A. Final size of isolation transformer for each fixture shall be per manufacturer requirement.

2.7 CONCRETE

- A. Concrete for light base installations and sign base footing shall use P-610, portland cement concrete as specified in Section 03300 – Cast-in-Place Concrete.

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2.8 LIGHT BASE SEALANT

- A. Sealant shall be as specified in Section 02763 – Joint Sealing Filler (FAA).

2.10 CONDUIT

- A. Rigid Nonmetallic Conduit (RNC): Rigid nonmetallic conduit shall be as specified in Section 260543 –Underground Duct and raceways for electrical systems.
- B. Non-metallic Liquid Tight Flexible Conduit: Conduit shall be rated for direct burial, waterproof, oil proof, crush proof, and approved for outdoor use. Conduit shall be sized per the Contractor Documents.
 - 1. Conduit shall be as manufactured by:
 - a. Thomas & Betts
 - b. Liquid-tight
 - c. Or approval equal
- C. Flexible Conduit Connectors – Watertight: Connectors shall be water-tight, oil-tight and grease-tight and shall be specifically designed for use with liquid-tight flexible conduit. Connectors shall be sized to mate with the conduit. Aluminum fittings shall not be used.
 - 1. Connectors shall be manufactured by:
 - a. Appleton
 - b. Thomas & Betts
 - c. Or approved equal

2.11 UNDERGROUND STRUCTURES

- A. Underground Structures shall be as specified in Section 260543 – Underground Ducts and Raceways for Electrical Systems.

2.12 SPLICES

- A. Primary (up to 5,000v) shall be FAA certified L-823 splice kits per Port standard detail.
- B. Secondary (less than 600v) shall be FAA certified L-823 splice kit per Port standard detail

2.13 ELECTRICAL TAPE

- A. Primary (up to 5,000v) shall utilize two layers of wrapped electrical tape.
 - 1. First Wrap – medium voltage linerless half lapped.
 - a. 3M – 130C
 - b. Plymouth - L969
 - c. Shurtap – LR117
 - d. Or approved equal
 - 2. Second Wrap – low voltage 8.5 mil, vinyl half lapped.
 - a. 3M – Super 88
 - b. NSI – WW832
 - c. Plymouth – Slipknot R85

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d. Or approved equal

B. Secondary (less than 600v) shall utilize two layers of wrapped electrical tape.

1. First Wrap – low voltage 8.5 mil, vinyl half lapped.
 - a. 3M – Super 88
 - b. NSI – WW832
 - c. Plymouth – Slipknot R85
 - d. Or approved equal
2. Second Wrap – low voltage 8.5 mil, vinyl half lapped.
 - a. 3M – Super 88
 - b. NSI – WW832
 - c. Plymouth – Slipknot R85
 - d. Or approved equal

2.14 FIBER-OPTIC CABLE

A. Fiber-optic cable shall be as specified in Division 27.

2.15 CONSTANT CURRENT REGULATORS

All new constant current regulators (CCR) shall be in accordance with the reference standards per this specification and as follows.

New CCR shall integrated into the existing Programmable Logic Controller (PLC) based Airport Lighting Control and Monitoring System (ALCMS).

New CCR shall have integrated insulation resistance monitoring system (Megger) that integrates into existing megger resistance tracking system.

New CCR shall be configured as indicated below:

1. L-829 – Regulator with Monitor
2. Input Voltage: 480V
3. Frequency: 60 Hz
4. Ferroresonant
5. Class: 1 or 2
 - a. 1 – 6.6 A (amp) Output current
 - b. 2 – 20 A Output Current
6. Style: 1 or 2
 - a. 1 – Three (3) brightness step
 - b. 2 – Five (5) brightness step
7. Size – As required for electrical load
8. Integrated Series Cutout

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2.16 CONTROLLABLE STOP BAR SYSTEM

- A. The controllable stop bar system as shown in the Contract Documents and described herein shall consist of four above ground cabinets: two Stop Bar Relay Cabinets and two Stop Bar Programmable Logic Controller (PLC) Cabinets. Stop bar cabinets shall be NEMA 4X with dual access doors. The junction box adjacent to the stop bar cabinets shall be NEMA 4X junction box. See Contract Documents for cabinets and junction boxes dimensions.
- B. Procure the following items for each stop bar cabinets. Port's maintenance to assemble hardware and wire connections for all items inside stop bar cabinets. Contractor shall be responsible for installing cabinets and conduit connections from adjacent handholes and between cabinets. Contractor shall route all wirings from isolation transformers and lighting fixtures to each cabinet per Contract Documents. Contractor shall identify each conductor with the connected lighting fixture.
 - 1. Back Panel: plywood, sized for each cabinet.
 - 2. Terminal Blocks
 - a. Minimum 600-volt rating for 480-volt circuits.
 - b. Clamp or screw terminals sized for maximum conductor size.
 - c. Separate connection point for each conductor.
 - d. Individual identification for each terminal block.
 - e. Phenolic block separators or barriers to isolate low-voltage and control terminations from analog and DC circuits.
 - f. Terminal Blocks: NEMA ICS 4.
 - g. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts. Provide power terminal blocks for 300 circuits.
 - h. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts. Provide control and signal terminal blocks for 300 control/signal circuits.
 - i. Provide ground bus terminal block, with each connector bonded to enclosure.
 - 3. Nonmetallic Wireways
 - a. Comply with TIA-569-B.
 - b. PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

PART 3 - EXECUTION

3.1 LIGHT BASE INSTALLATION

- A. All light bases shall be installed as detailed on the Contract Documents and set at the coordinate, line, and grade as staked by the Surveyor. Install light bases with fixture's orientation as shown on the Contract Documents and fixture schedules. All light bases shall be level and aligned using manufacturer's recommended tools.
- B. The conduit shall be connected to the base can 2" threaded welded hub with a threaded fitting as required for completion of the Contract Documents.

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- C. Prior to placement of concrete onto the light base footing (anchor), the installation shall be inspected and approved by the Engineer.
- D. The in-pavement light base shall be installed with shims, as required, and manufacturer-provided plywood mud plate.
- E. Base can finishing for in-pavement light fixture shall be per the following:
 - 1. The top of the pavement dam shall be installed flush with the lowest pavement elevation around the base can.
 - 2. Shims may be used, as required, to adjust the pavement dam to the correct elevation, during installation of the can. A maximum of 2 shims shall be used in final configuration.
 - 3. Minimum size shims allowed for installation shall be 1/8" thickness. Maximum size shims allowed for installation shall be 3/4" thickness.
 - 4. Prior to placement of the sealant around the pavement dam, the area shall be thoroughly cleaned by wire brushing and compressed air. The sealant shall be installed in accordance with Section 02763 – Joint Sealing Filler (FAA).
- F. Base can finishing for elevated light fixture shall be per the following
 - 1. The top of the fixture baseplate shall be set plumb and flush with the lowest projected finish pavement elevation around the base.
 - 2. Shims may be used, as required, to adjust the pavement dam to the correct elevation, during installation of the can. A maximum of 3 shims shall be used in final configuration.
 - 3. Minimum size shims allowed for installation shall be 1/8" thickness. Maximum size shims allowed for installation shall be 3/4" thickness.

3.2 CONDUCTOR INSTALLATION

- A. Prior to the installation of conductors in the light base/conduit system, thoroughly clean the base cans of debris and residual concrete slurry. Mandrel connecting conduits in accordance with Section 260543 – Underground Ducts and Raceways for Electrical Systems.
- B. Install conductors as detailed on the Contract Documents and in accordance with Section 260519 – Low-Voltage Electrical Power Conductors and Cables. Place conductors for sign circuits at the bottom of the base can.
- C. In all light bases and junction cans, the Contractor shall install 18" of slack for L-824 conductors, measured from the top of the finished pavement.

[Note to designer] Add standard FAA specification for Airport Underground Cables under Section 260519 (in FAA format). Discuss with F&I as needed.

- D. Cable splices and connections at the isolating transformers shall be in accordance with this specification.

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- E. All conductors and isolating transformers in each light base, handhole, and manhole shall be tagged and labeled with the airfield lighting circuit, name, supply, return and light designation in accordance with Section 260553 – Identification for Electrical Systems.

[Note to designer] Add standard FAA specification for Airport Underground Cables under Section 260519 (in FAA format). Discuss with F&I as needed.

- F. Testing of new cables and circuits, as well as testing for extensions or modification to existing circuits shall be in accordance with Section 260519 – Low-Voltage Electrical Power Conductors and Cables.
- G. Labeling shall occur at the time of installation of the conductors and prior to the activation of the circuit.

3.3 LIGHT FIXTURE AND TRANSFORMER INSTALLATION

- A. Prior to setting the fixture the light base shall be inspected and approved by the Engineer.
- B. Materials inside base can shall be stack in the order listed below. Where the first items is on the bottom of the base can
 - 1. Fixture with FOD sensor
 - a. Circuits passing through can if present
 - b. Transformer for edge light
 - c. Transformer for FOD sensor
 - d. Power supply for FOD sensor
 - e. Fusion splice box for FOD sensor
 - f. Baseplate with light and FOD sensor
 - 2. Fixture with Individual Light Controller (ILC)
 - a. Circuits passing through can if present
 - b. Transformer for light
 - c. Individual Light Controller
 - d. Baseplate Light or in-pavement light.
 - 3. Fixture
 - a. Circuits passing through can if present
 - b. Transformer for light
 - c. Baseplate Light or in-pavement light.
- C. Install the light fixture with the bolts and washers as specified. Bolts shall be set with a torque wrench to the manufacturers specified torque settings.
- D. Light fixtures and transformers shall be installed as described in the fixture schedule, as detailed on the Contract Documents, and per manufacturer's recommendations.

3.4 AIRFIELD GUIDANCE SIGNS

- A. Airfield guidance signs shall be installed as shown on the Contract Documents. The signs shall be installed at the coordinate, orientation, and elevation shown on the Contract Documents and as staked by the Surveyor.

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- B. Sign Base Footing: The footing shall be constructed as detailed on the Contract Documents.
- C. Erosion Control Pad: The asphalt erosion control pad shall be constructed to the dimensions and grade as detailed on the Contract Documents.
- D. Conductors shall be installed in accordance with paragraph 3.2 of this Section.
- E. The sign installation shall be in accordance the reference standards per this specification.
- F. All signs shall be labeled with the sign number, as shown on the Contract Documents and in accordance with Section 260553 – Identification for Electrical Systems.

3.5 STOP BAR SYSTEM

- A. Controllable stop bar cabinets shall be installed as detailed on the Contract Documents. Cabinets shall be installed and anchored to existing concrete slabs. Contractor shall not use existing anchor slot for new anchors.
- B. Installed new underground conduits and duct banks as required for connecting cabinets to adjacent handholes and equipment.

3.6 MODIFICATIONS OF EXISTING AIRFIELD GUIDANCE SIGNS

- A. Existing signs to be modified are indicated on the Contract Documents. The work shall include the reconnection of the sign with new conduit, replaced primary conductors and the replacement of the existing isolation transformer in each sign as shown and detailed on the Contract Documents.

3.7 AIRFIELD LIGHTING CIRCUIT MODIFICATION

- A. The circuit modifications are as detailed on the Contract Documents.
- B. The shutdown of existing circuits, the removal and relocation of conductors shown on the Contract Documents shall be done in accordance with the operational phasing Contract Documents.
- C. Any temporary conductors, or connections required to maintain circuits operational, as specified shall be considered part of the circuit modifications work.

3.8 REINSTALLATION OF EXISTING EQUIPMENT

- A. Material and equipment required to be removed and stored for reinstallation are shown on the Contract Documents. Contractor shall field inspect the operating and functioning conditions of the existing equipment prior to removal of existing equipment. Contractor shall submit to the Engineer a list of failed equipment based on Contractor's inspection. Contractor shall take responsibility for all functioning equipment being removed and stored for reinstallation. Contractor shall replace existing equipment if damaged during storage and reinstallation. The existing equipment shall be installed in the locations in accordance with the details shown on the Contract Documents.

3.9 FIELD QUALITY CONTROL

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- A. QC Inspections and Testing: The Contractor shall be required to inspect and/or test the installed equipment to ensure that it conforms to the requirements of the Contract Documents. The Contractor shall furnish all necessary equipment and appliances, and shall demonstrate to the satisfaction of the Engineer the following:
1. Airfield Light Fixtures
 - a. Confirm that light is installed per lighting fixture schedule and as shown in Contract Documents.
 - b. Confirm that all bolts are tightened to manufacturer's recommended torquing strength.
 - c. Confirm that angle and elevation of fixture are per Contract Documents.
 2. Isolation Transformers
 - a. Confirm that insulation resistance of all isolation transformers, prior to installation is not less than infinity.
 3. Runway Guard Light Pulsing Units
 - a. Confirm that runway guard light pulsing unit installation meets the requirements of reference standards per this specification.
- B. Acceptance Testing: The Contractor shall be responsible for submitting a test plan and procedure, including all required test forms, for compliance with all acceptance testing. The Contractor shall furnish all necessary equipment and appliances. The Contractor shall be required to modify existing installation, as required, in order to comply with all testing parameters and resubmit results.
1. Airfield Circuits: Provide insulation resistance (Megger) testing for each new and existing circuit. All megger test reports shall have date, time, people present, weather conditions, rain fall within the past 48 hours, circuit being tested, test voltage, time duration of test, megger's manufacturer/model number, and megger calibration date. Megger shall be calibrated within 12 months of test.
 - a. Whenever the scope of work requires connection to or modifying an existing circuit, the circuit's insulation resistance test shall be tested, in the presence of the Engineer. The test shall be performed prior to any activity affecting the respective circuit. The test result shall be recorded and submitted to the Engineer. When the work affecting the circuit is completed, the circuit's insulation resistance shall be retested in the presence of the Engineer. The second test reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs, including a complete replacement of the L-823 connectors, L-830 transformers, and L-824 cables, if necessary, shall be borne by the Contractor.
 - b. For new circuit, the circuit's insulation resistance test shall be tested, in the presence of the Engineer. The test reading shall be at least 1 GigaOhms, and submitted to the Engineer.
 2. Airfield Light Fixtures: Perform photometric testing in the field on all new airfield light fixtures, as required by reference standards per this specification. Provide the following test system requirements and reports:
 - a. For each fixture, take measurements of candela outputs at multiple points within the main beam area with data presented on the 1 degree. Measurements shall be

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- taken at minimum of 13 feet from each fixture to determine the photometric performance for runway and taxiway lightings. Plot measurement results on graph.
- b. Provide test report to include the following, at a minimum:
- 1) Fixture ID
 - 2) GPS coordinates
 - 3) FAA light fixture type
 - 4) Required candela output
 - 5) Maximum candela output
 - 6) Average candela output
 - 7) Lens color
 - 8) Angle of fixture off centerline
 - 9) Constant current regulator amperage
 - 10) Pass/fail photometric testing, with anticipated reason for failure if applicable.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Measurement for “Runway Lighting System” and “Airfield Guidance Signs Systems” shall be as a unit.

4.2 PAYMENT

- A. Payment for “Airfield Lighting System” will be made at the contract lump sum price as stated in the Schedule of Unit Prices, and shall be full compensation for all labor, materials, tools, and equipment, to furnish and install all runway and taxiway lighting. This includes, but is not limited to, new light can bases, conduits, concrete, conductors, isolation transformers, constant current regulators, connectors, connections, grounding, excavation, backfill, dewatering, conductor racking and labeling, testing, sealing, and all incidentals for complete light systems as detailed on the Contract Documents and specified herein. The cost of providing blank plates on existing bases for the runway lighting system shall be incidental to and included under this payment item. This payment item shall exclude the installation of FOD field devices such as FOD sensors and splice boxes, but shall include isolation base can foundation for FOD sensors. This payment item shall exclude all items defined under payment item “Airfield Electrical Infrastructure” in Section 26000 Electrical Work General.
- B. Payment for “Airfield Guidance Sign System” will be made at the contract lump sum price as stated in the Schedule of Unit Prices, and shall be full compensation for all labor, materials, tools, and equipment, to furnish and install the new airfield guidance signs and modify the existing airfield signs as shown on the Contract Documents. The lump sum shall include furnishing and installing all signs as specified, constant current regulators, sign base footings, conductors, conduits, connections, connectors, isolation transformers, base cans, concrete, crushed aggregate base, asphalt concrete erosion pad, grounding, excavation, backfill, modifications and connections to the existing airfield signs including the new conduit connections, conductors, new isolation transformer, conductor racking and labeling, testing and all incidentals as specified herein and detailed on the Contract Documents. The cost of providing blank plates on existing bases for the signage system shall be incidental to and included under this payment item. This payment item shall exclude all items defined under payment item “Airfield Electrical Infrastructure” in Section 26000 Electrical Work.

SECTION 26 65 00: AIRFIELD LIGHTING AND SIGNS

Payment will be made under:

Airfield Lighting System	Lump Sum
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Airfield Guidance Sign System	Lump Sum
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END OF SECTION 266000

F&I STANDARD