



### REQUEST FOR QUOTATION

Contact person/Telephone  
Larry Waxman/201-395-3451

Collective# 0000035712  
Bid Due Date 12/17/2013  
Bids must be received no later than 11:00 AM on the above Bid Due Date.

Deliver Goods/Services To:  
Newark Liberty International Airport  
Building 11 - Stockroom  
Newark NJ 07114

Quantity	Description	Unit Price	Total
	<p>RUNWAY ISOLATION TRANSFORMERS AND CONNECTOR KITS. FOR NEWARK LIBERTY INTERNATIONAL AIRPORT FURNISH AND DELIVER</p> <p>QUOTE FOB DELIVERED PRICES.</p> <p>ALL ITEMS OFFERED MUST HAVE MET FAA ADVISORY CIRCULAR 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM DATED 09/26/12. "NO EQUALS - NO SUBSTITUTES"</p> <p>ALL BIDDERS ARE TO SUBMIT WITH YOUR BID RESPONSE TWO (2) COPIES OF CATALOG CUTS/SPECIFICATIONS/DRAWINGS FOR PORT AUTHORITY REVIEW AND APPROVAL.</p> <p>SEE ATTACHMENTS: PRICING SHEET, DRAWINGS / DELIVERY REQUIREMENTS AND DIVISION 16, SECTION 16000, 16129 AND 16542.</p> <p>IN THE EVENT OF AN ORDER: DELIVER TO: Newark Liberty International Airport Brewster Road - Bldg. 80</p>		
	<b>PLEASE QUOTE FULLY DELIVERED PRICES</b>	<b>PAYMENT TERMS</b>	<b>Total Delivered Price</b>

This Quotation is subject to the terms and conditions set forth on the back page hereof. Bidder is advised to read these before signing.

We have read the instructions and, if favored with an order, we agree to furnish the items enumerated herein at the prices and under the conditions indicated.

Signed \_\_\_\_\_  
Firm Name \_\_\_\_\_  
Telephone number \_\_\_\_\_ Date \_\_\_\_\_  
Fax Number \_\_\_\_\_  
Federal Taxpayer ID \_\_\_\_\_

Bidder  
Must  
Sign  
In  
Two  
Places

NOTICE TO BIDDERS: Unless the following term of assurance that the above offer is irrevocable is signed, the offer submitted herein shall not be deemed to be complete.

The foregoing offer shall be irrevocable for 90 days after the date on which the Port Authority of New York and New Jersey opens this proposal.

Signed \_\_\_\_\_ Date \_\_\_\_\_  
Firm Name \_\_\_\_\_



# REQUEST FOR QUOTATION

Bid Due Date  
12/17/2013

Quantity	Description	Unit Price	Total
	<p>Newark, NJ 07114</p> <p>ATTENTION: Catherine Nigro 973-961-6109</p> <p>PLEASE FOLLOW RETURN TO BID INSTRUCTIONS. REPLY IF POSSIBLE ONLY ON PATH/PA REQUEST FOR QUOTATION FORM AS ATTACHING YOUR COMPANY'S TERMS &amp; CONDITIONS MAY CAUSE YOUR BID TO BE DEEMED NON RESPONSIVE AND OR DELAY AN AWARD ISSUED.</p> <p>INCLUDE WITH YOUR BID RESPONSE TWO COPIES OF CATALOG CUTS/SPECIFICATIONS/DRAWINGS FOR PORT AUTHORITY REVIEW AND APPROVAL.</p> <p>=====</p> <p>===</p> <p>A price preference of 10 % is available for NY/NJ Minority and Women Business Enterprises (M/WBE) or 5% for NY/NJ Small Business Enterprises (SBE) certified by the Port Authority (PA) by the day before bid opening for awards not exceeding \$1,000,000. My firm was certified as a _____ on _____.</p> <p>=====</p> <p>====</p> <p>QUESTIONS ONLY CONTACT: LARRY WAXMAN</p>		
	<p><b>PLEASE QUOTE FULLY DELIVERED PRICES</b></p>	<p><b>PAYMENT TERMS</b></p>	<p><b>Total Delivered Price</b></p>

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Signed \_\_\_\_\_

Firm Name \_\_\_\_\_

Telephone number \_\_\_\_\_ Date \_\_\_\_\_

Fax Number \_\_\_\_\_

Federal Taxpayer ID \_\_\_\_\_

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Firm Name \_\_\_\_\_



## REQUEST FOR QUOTATION

Bid Due Date  
 12/17/2013

Quantity	Description	Unit Price	Total
	TEL: 201 395 3451 OR EMAIL: Lwaxman@panynj.gov		
	<b>PLEASE QUOTE FULLY DELIVERED PRICES</b>		
	<b>PAYMENT TERMS</b>		
		<b>Total Delivered Price</b>	

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 Fax Number \_\_\_\_\_  
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 Firm Name \_\_\_\_\_



# REQUEST FOR QUOTATION

Bid Due Date  
12/17/2013

Quantity	Description	Unit Price		Total	
	<p>This is a Formal Bid Invitation Mail Sealed Bids to:</p> <p>The Port Authority of NY &amp; NJ Attn: Bid Custodian Procurement Department 2 Montgomery Street, 3rd Floor Jersey City, NJ 07302</p> <p>by the date and time listed above, where it will be publicly opened and read.</p> <p>Bids are only accepted Monday through Friday, excluding Port Authority holidays, between the hours of 8 A.M. &amp; 5 P.M., via regular mail, express delivery service or hand delivery.</p> <p>If you do not use or have an envelope provided, you must clearly mark the outside envelope/package with 'BID ENCLOSED' and show the company name, address, as well as Bid number and Due date as stated on this bid document.</p> <p>A valid photo id is required to gain access into the building, to attend the bid opening or hand deliver a bid.</p>				
	<p>Transformer, Connector, et.c</p>				
	<p><b>PLEASE QUOTE FULLY DELIVERED PRICES</b></p>			<p><b>Total Delivered Price</b></p>	

**PAYMENT TERMS**

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 Firm Name \_\_\_\_\_



## REQUEST FOR QUOTATION

Bid Due Date  
 12/17/2013

Quantity	Description	Unit Price		Total
1.00	<p><b>The item covers the following services:</b>            FAA- Transformer, Connector</p>			
	<b>PLEASE QUOTE FULLY DELIVERED PRICES</b>	<b>PAYMENT TERMS</b>		
		<b>Total Delivered Price</b>		

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 Fax Number \_\_\_\_\_  
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Signed \_\_\_\_\_ Date \_\_\_\_\_  
 Firm Name \_\_\_\_\_

## TERMS AND CONDITIONS

1. The Port Authority (PA) reserves the right to request information relating to seller's responsibility, experience and capability to perform the work.
2. Unless otherwise provided, complete shipment of all items must be in one delivery FOB delivery point. Payment will not be made on partial deliveries unless authorized in advance by the party to be charged and the discount, if any, will be taken on the total order.
3. PA payment terms are net 30 days. Cash discounts for prompt payment of invoices may be taken but will not be considered in determining award, except in the case of tie bids.
4. Separate unit and total FOB delivered prices must be shown.
5. Sales to the PA and to PATH are currently exempt from New York and New Jersey State and local taxes and generally from federal taxation. The seller certifies that there are no federal, state, municipal or any other taxes included in the prices shown hereon.
6. The PA shall have the absolute right to reject any or all proposals or to accept any proposal in whole or part and to waive defects in proposals.
7. Unless the phrase "no substitute" is indicated, bidder may offer alternate manufacturer / brands, which shall be subject to Port Authority approval. Please indicate details of product being offered with bid.
8. Acceptance of seller's offer will be only by Purchase Order Form signed by the PA. No change shall be made in the agreement except in writing.
9. If the seller fails to perform in accordance with the terms of this purchase order, the PA may obtain the goods or services from another contractor and charge the seller the difference in price, if any, a reletting cost of \$100, plus any other damages to the PA.
10. Upon request, sellers are encouraged to extend the terms and conditions of any terms agreement with the PA to other government and quasi-government entities by separate agreement.
11. By signing this quotation or bid, the seller certifies to all statements on Form PA 3764A regarding non-collusive bidding; compliance with the PA Code of Ethics; and the existence of investigations, indictments, convictions, suspensions, terminations, debarments and other stated occurrences to assist the PA in determining whether there are integrity issues which would prevent award of the contract to the seller. The PA has adopted a policy set forth in full on PA 3764A, that it will honor a determination by an agency of the State of New York or New Jersey that a bidder is not eligible to bid on or be awarded public contracts because the bidder has been determined to have engaged in illegal or dishonest conduct or to have violated prevailing wage legislation. The Terms and Conditions of PA 3764A apply to this order. A copy can be obtained by calling (201) 395-3405 or at <http://www.panynj.gov/business-opportunities/become-vendor.html>
12. The vendor may subcontract the services or use a supplier for the furnishing of materials required hereunder to such persons or entities as the Manager, Purchasing Services may from time to time expressly approve in writing. All further subcontracting shall also be subject to such approval.
13. The successful bidder (vendor) shall not issue nor permit to be issued any press release, advertisement, or literature of any kind, which refers to the Port Authority or that goods will be, are being or have been provided to it and/or that services will be, are being or have been performed for it in connection with this Agreement, unless the vendor first obtains the written approval of the Port Authority. Such approval may be withheld if for any reason the Port Authority believes that the publication of such information would be harmful to the public interest or is in any way undesirable.
14. Neither the Commissioners of the Port Authority, nor Directors of PATH, nor any of them, nor any officer, agent or employee thereof, shall be charged personally by the Contractor with any liability, or held personally liable to the Contractor under any term or provision of this Agreement, or because of its execution or attempted execution, or because of any breach, or attempted or alleged breach, thereof.

DRAWINGS/DELIVERY REQUIREMENTS

BID # 35712

**Vendor Requirements**

- The vendor shall submit all required shop drawings and/or catalog cuts within 3 business days after receipt of award.

**Delivery Requirements**

DELIVERY: WITHIN SIX (6) WEEKS OF APPROVED SHOP DRAWINGS AND/OR CATALOG CUTS.

**Deliver to Address:**

Newark Liberty International Airport

Building 80, Brewster Road

Newark, NJ 07114

Delivery Contact: Catherine Nigro (973) 961-6109

Supplement to Terms and Conditions

A) If the vendor fails to perform in accordance with the terms (including timeliness of delivery) of this purchase order, the Authority may obtain the goods or services from another source and change the vendor the difference in price, if any, plus a reletting cost of \$100, plus any other damages to the Authority.

B.) The Vendor's obligations for the delivery of the material within the time (or times) as quoted & provided for in this Purchase Order are of the essence of this Purchase Order. The Vendor guarantees that he can and will complete the delivery of the material within the time hereinbefore stipulated. Inasmuch as the damage and loss to the Authority which will result from delay in delivery of the material within the time herein stipulated will include items of loss whose amount will be incapable or very difficult or accurate estimation, the damages to the Authority for each calendar day or other time interval by which the Vendor does not complete the delivery of the material within the time or times above stipulated, shall be liquidated in the sum of the following amounts: Two percent (2%) of the Vendor's itemized bid price for each calendar week (or prorated portion thereof) by which the Vendor fails to deliver the material as scheduled.



ITEM NO.	BID ITEM	DESCRIPTION	PA SPEC No.	QUANTITY EACH	Manufact. Offered	Manufact. Part No.	UNIT COST (\$)	LINE SUB-TOTAL (\$)
1	L-830 Isolation Transformers - 25W	6.6A Primary/6.6A Secondary	16000, 16129, 16542	812				
2	L-830 Isolation Transformers - 45W	6.6A Primary/6.6A Secondary	16000, 16129, 16542	237				
3	L-830 Isolation Transformers - 65W	6.6A Primary/6.6A Secondary	16000, 16129, 16542	47				
4	L-830 Isolation Transformers - 100W	6.6A Primary/6.6A Secondary	16000, 16129, 16542	168				
5	L-830 Isolation Transformers - 150W	6.6A Primary/6.6A Secondary	16000, 16129, 16542	411				
6	L-830 Isolation Transformers - 200W	6.6A Primary/6.6A Secondary	16000, 16129, 16542	113				
7	L-823 Connector Kits - Single Pole		16000, 16129, 16542	5830				

TOTAL FOB DELIVERED PRICE: ITEMS 1 - 7 (\$)
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BID # 35712 ✓

A REVISED 7/20/00

## DIVISION 16

### SECTION 16000

#### ELECTRICAL GENERAL REQUIREMENTS

##### PART 1. GENERAL

###### 1.01 SUMMARY

Unless otherwise shown on the Contract Drawings, or unless otherwise specified in other Sections of these Specifications, the general requirements specified in this Section are applicable to all electrical work of this Contract. Additional requirements applicable to individual Sections of these Specifications are specified in those Sections, or are shown on the Contract Drawings.

###### 1.02 REFERENCES

The following is a listing of publications referenced in this Section:

	<u>American National Standards Institute (ANSI)</u>
ANSI C 2	National Electrical Safety Code.
	<u>American Society of Testing and Materials (ASTM)</u>
ASTM D 178	Standard Specification for Rubber Insulation Matting.
	<u>National Fire Protection Association (NFPA)</u>
NFPA 70	National Electrical Code.
	<u>Occupational Safety and Health Administration (OSHA)</u>

###### 1.03 QUALITY ASSURANCE

- A. Any entity performing Work shall have had experience on at least two projects involving quantities and complexities at least equal to those required under this Division or the applicable Section thereof.
- B. All workmen performing under this Division shall be skilled workers of the trade involved. Where specialty work, such as splicing or welding are required, submit proof of training, experience and work history for each workman, for review by the Engineer. Only approved workmen shall perform specialty work.
- C. All electrical work shall be performed under the supervision of an electrical contractor, licensed in the state (and the city as required) in which the work is to be performed. Submit a copy of the qualifying license for review by the Engineer.
- D. All calculations required by this and other various Sections of these Specifications, or as shown on the Contract Drawings, shall be certified and sealed by a Professional Engineer licensed in the state in which the Work is to be performed, and shall be submitted to the Engineer for review.

- E. Various Sections of these Specifications contain the requirement for the specific material or equipment to be furnished with an experience statement "satisfactorily used for purposes similar to those intended herein" or words of similar intent and a statement that specifies the required experience time. These statements shall mean that the manufacturer of the material or equipment being furnished for the Work specified in this Contract shall have manufactured similar material or equipment to that specified, for at least the time specified.
- F. In various Sections of this Division there is a statement that refers to the length of required experience that must be satisfied.
- G. Polyvinyl Chloride (PVC): PVC conduits, PVC-insulated power wiring, or items containing PVC, except PVC-insulated wiring for communications systems, remote control, signaling, and power limited circuits, shall not be installed in any indoor area. PVC-insulated wiring for communications systems, remote control, signaling, and power-limited circuits shall be furnished and installed in accordance with NFPA 70.
- H. Asbestos  
Asbestos or items containing asbestos shall not be furnished or installed.
- I. Conformance Labels  
All electrical materials and equipment for which there is a nationally recognized standard shall bear the conformance labeling of the third party inspection authority, such as Underwriters Laboratories Inc., Factory Mutual, ETL, or approved equal. Where the phrase "where there are established UL standards, shall bear the UL label", or words of similar intent appear in other Sections, the instructions for the conformance label above shall apply.

#### 1.04 CODES AND STANDARDS

- A. The electrical installation shall conform to all requirements of ANSI C2, NFPA 70, and the codes and standards specified in other Sections, all local codes and the requirements of OSHA, which would be applicable if the Authority were a private corporation.
- B. Standards publications of technical organizations and regulatory agencies are referenced in other Sections, and unless stricter requirements are indicated, materials and equipment so specified shall be manufactured, tested and installed to conform, as a minimum, to the requirements of such reference standards and publications.
- C. Installations for aeronautical markers, lighting, guidance signs, and other work as shown on the Contract Drawings, shall comply with the standards of the Federal Aviation Administration (FAA), where applicable.
- D. In case of conflict between provisions of codes, laws and ordinances, the more stringent requirement shall apply.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in manufacturers' original unopened protective packaging.
- B. Store materials in original packaging in a manner to prevent soiling, physical damage, wetting or corrosion prior to installation.

- C. Handle in a manner to prevent damage to finished surfaces.
- D. Where possible maintain protective coverings until installation is complete and remove such covers as part of final cleanup.
- E. Touch up any damage to finishes to match adjacent surfaces to the satisfaction of the Engineer.

#### 1.06 SUBMITTALS

See Appendix "A" for submittal requirements.

#### 1.07 SPECIAL TERMS

Throughout this and other Sections of this Division the term "Authority" is used. In PATH contracts, substitute the term "PATH" is deemed substituted for the term "Authority".

### **PART 2. PRODUCTS**

#### 2.01 MATERIAL AND EQUIPMENT TO BE FURNISHED

Equipment and materials furnished shall be new and unused, prior to this installation, first grade commercial quality and shall be essentially the standard cataloged products of a manufacturer regularly engaged in the manufacture of the products. Only those items specifically shown on the Contract Drawings as existing, relocated or Authority furnished shall be reused in this installation. Rebuilt or remanufactured equipment will not be permitted.

#### 2.02 IDENTIFICATION

- A. All parts of equipment, such as switchboards, panel boards, safety switches, motor starters, circuit breakers, time clocks, contactors and similar items shall be identified by name, function or control with laminated plastic nameplates consisting of two black sheets with one white sheet bonded to and between the two outer sheets and having letters machine engraved in the face sheet to the depth of the white plastic. Nameplates shall not be smaller than 1 inch by 3 inches with characters not less than one-quarter inch. Where letter sizes are not specified, use one-inch high letters for panel boards, switchboards and motor control centers and one quarter inch high elsewhere. Nomenclature shall be according to a schedule approved by the Engineer.
- B. All device plates other than lighting switch plates, telephone and 120 volt, single phase, 15 or 20 ampere receptacles, shall have black or white (as directed) silk-screened lettering Helvetica Medium type face (or other type face as directed by the Engineer) designating:
  - 1. System.
  - 2. Voltage (where applicable).
  - 3. Number of phases (where applicable).
  - 4. Current rating (where applicable).
  - 5. Frequency (where applicable).

- C. Before placing orders for nameplates or silk-screened device plates, submit a typewritten list to the Engineer for review.
- D. The outside of the covers of all junction or pull boxes located above hung ceilings and the inside of the covers of all junction or pull boxes exposed shall be labeled with an indelible marker indicating the operating voltage and the system contained therein.
- E. All device plates of receptacles connected to a standby or emergency power distribution system shall be labeled with an orange plastic nameplate, engraved with the panel board and circuit number to which the receptacle is connected. Nameplate character engraved shall be not less than one-quarter inch in height.
- F. Unless otherwise shown on the Contract Drawings, all panel boards, switchboards, switchgear, circuit breakers, switches and transformers connected to a standby or emergency power distribution system shall be finished Federal Safety Orange in color.

### 2.03 RUBBER MATTING

- A. Provide continuous insulated rubber matting not less than 36 inches wide and not less than one quarter inch thick in one piece in front of:
  - 1. Substation transformers.
  - 2. Switchgear.
  - 3. Switchboards.
  - 4. Motor control centers.
  - 5. Panel boards.
  - 6. On each side and end of a standby or emergency generator set.
  - 7. Other locations as shown on the Contract Drawings.
- B. Matting shall conform to ASTM D 178, Type 2.

## PART 3. EXECUTION

### 3.01 GENERAL

- A. Work of this Division shall include all labor, material and apparatus necessary for the completion of all electrical work as shown on the Contract Drawings and as hereinafter specified, left ready for satisfactory operation.
- B. Coordinate with Authority operations and construction by other trades.
  - 1. Coordinate with the Work of all trades as necessary to facilitate timely completion, avoid unnecessary cutting and patching and to ensure proper installation and operation of all equipment.
  - 2. Coordinate all components and aspects of the Work, in order to minimize power shutdowns to the power distribution systems. Should any part of the Work require an "off-hours" shutdown in excess of 8 hours, supply temporary services or feeders as required to maintain operation of the existing systems and equipment.

3. Furnish to appropriate trades, shop drawings, catalog cuts and instructions necessary for construction of concrete bases, concrete encasement, anchor bolts, and other construction required to accommodate installations under other Sections.
  4. Obtain all wiring diagrams and other instructions required for proper electrical connection of equipment installed or furnished under other Divisions of these Specifications and coordinate the installation, wiring and connections for equipment furnished under this Division, or other various Divisions.
- C. The arrangement of electrical equipment and conduit runs as shown on the Contract Drawings and described in the Specifications is schematic. Locate and install electrical work in coordination with other trades so that all electrical equipment and material is installed with working clearances in accordance with NFPA 70. Route conduit to avoid interference with existing installation and with work to be performed by other trades.
  - D. The location of equipment and motors shown on the Contract Drawings shall be subject to minor revisions due to field conditions or coordination with other trades without any increase in Contractor's compensation. Prior to roughing-in, verify the exact location of all electrical connections to equipment and motors from reviewed shop drawings and field verification.
  - E. Maintain records of all inspections, testing, overload and overcurrent settings throughout the construction and any corrective actions taken, and submit records to the Engineer for review.
  - F. All electrical work shall be subject to inspection by the Engineer. Correct any deficient work, as required for the approval of the Engineer.
  - G. Any equipment, materials, wiring or labor that are a necessary part of the electrical work and to its proper performance, although not specifically mentioned herein or shown on the Contract Drawings, shall be furnished and installed as if called for in detail, without additional cost to the Authority.

### 3.02 REMOVALS, RELOCATIONS, RECONNECTIONS, RESTORATIONS

- A. Relocate existing equipment and materials as shown on the Contract Drawings.
- B. Unless otherwise shown on the Contract Drawings, existing equipment and materials that are to be removed and not required to be relocated under this Contract, will become the property of the Contractor and shall be removed from the property of the Authority, and shall be properly disposed of. Disposal of equipment and materials shall comply with all local, state and Federal laws and regulations as if the Authority was a private corporation.
- C. Unless specifically shown on the Contract Drawings, salvaged equipment and materials shall not be reused in the installation.
- D. If existing electrical feeders, wiring, conduit, lighting fixtures or equipment interfere with the installation of new construction of any trade, the existing electrical feeder, wiring and conduit shall be rerouted or the equipment relocated in a manner approved by the Engineer to permit installation of the new construction. Where existing circuits or devices, or portions of the existing wiring system are to remain in service, but are interrupted by the construction, continue the existing wiring to maintain the remainder of the wiring system in operation.

- E. Notify the Engineer immediately of any damage caused by the Contractor to existing wiring, services or feeders that are to remain in service. Repair the damage in a workmanlike manner to restore to service, at no cost to the Authority.
- F. Before shutdown or discontinuation of service on any circuit, system or feeder, coordinate such activities with the Engineer in order to minimize shutdown periods. Provide a minimum of two weeks notice in writing to the Engineer before performing any shutdowns. The minimum period may be reduced with the express written permission of the Engineer.

### 3.03 LOCATION OF EQUIPMENT

- A. Unless otherwise shown on the Contract Drawings, the location of outlets or devices, from finished floor to center of plate or device, shall be as follows:
  - 1. Lighting switches: 48 inches.
  - 2. Thermal switches: 48 inches.
  - 3. Receptacles: 16 inches.
  - 4. Telephone outlets: 16 inches.
  - 5. Fire alarm stations: 48 inches.
  - 6. Fire alarm horn/light signals: 7 feet 6 inches.
  - 7. Clocks: 7 feet 8 inches.
- B. Unless otherwise shown on the Contract Drawings, the location of equipment, from finished floor to top of enclosures shall not exceed 6 feet, 6 inches, and shall not protrude more than 4 inches if higher than 27 inches.
  - 1. In exposed or public locations, panel boards and cabinets shall generally be flush mounted and all covers shall be identical in layout and size, and shall be installed to maintain a level and straight top and bottom alignment.
  - 2. In concealed locations, or in closets or electrical or mechanical rooms, or non-public locations, panel boards and cabinets shall generally be surface mounted and shall be installed to maintain a level and straight top alignment.

### 3.04 DISSIMILAR METALS

- A. Dissimilar metals shall mean those metals that are incompatible with one another in the presence of moisture, as determined from their relative positions in the Electrochemical Series, or from test data. Where dissimilar metals come in contact, paint the joint both inside and out with approved coating so as to exclude moisture from the joint, or provide a suitable insulating barrier separating the metals.
- B. Transitions in raceways, from one metal to a dissimilar metal shall only be made at boxes or other enclosures, except where shown on the Contract Drawings.

### 3.05 NAMEPLATES

Secure nameplates on equipment or walls with stainless steel or brass screws.

### 3.06 RUBBER MATS

- A. Install rubber mats in front of each panelboard, switchboard, motor control center, switchgear and substation transformers, and along each side and the end of each generator set, or as shown on the Contract Drawings.
- B. Rubber mats, when installed, shall lay flat without curling.

### 3.07 CUTTING AND PATCHING

- A. Perform all cutting and patching of existing construction required for installation of all materials and equipment as specified in this Division.
- B. Perform all patching to match existing adjacent construction to the satisfaction of the Engineer and using the best possible workmanship of the various trades involved.

### 3.08 FINAL FIELD TESTS

- A. The entire electrical installation shall be inspected prior to final acceptance testing, thoroughly cleaned, and damaged finishes touched up after final completion and prior to final acceptance testing being performed. Not less than 30 days prior to the testing, furnish a test plan, to the Engineer for review, outlining all aspects of the testing, including tests to be performed and the expected results.
- B. Perform the following field test in the presence of the Engineer to demonstrate the reliability of the electrical installation. Give the Engineer a minimum of one-week advance notice of such tests.
  - 1. Operate all electrical systems and equipment for a period of 24 hours, unless in the opinion of the Engineer, a different test period is required, to prove the operation and performance of a system and its equipment.
  - 2. Should the foregoing test reveal any defects, promptly correct such defects and re-run the tests until the entire installation conforms to the requirements of these Specifications and the Contract Drawings.
- C. Tests requiring certified reports and those requiring factory or field inspection shall be conducted and reported to the Engineer in conformance with standards herein specified.
- D. In addition to the tests outlined above, after completion of the electrical system and prior to occupancy:
  - 1. The following equipment and devices, as a minimum, shall be thermographically inspected utilizing a Hughes Aircraft Probeye infrared detector, or approved equal, with videotaping attachment.
    - a. High voltage cable splices and connections.
    - b. Switchboard.
    - c. Transformer.
    - d. Switchgear.
    - e. Panelboards.
    - f. Motor control centers.

- g. Automatic transfer switch and emergency power system connections.
  - h. Chiller motor and starter connections.
  - i. All 600 volt (nominal) cable connections rated 100 amperes (#3 AWG) or greater.
  - j. Other equipment as shown on the Contract Drawings.
2. The inspection shall be made by an independent inspection company such as Infrared Services, Inc, Montville, N.J., General Electric Apparatus Service Division, or approved equal. The inspection shall be made with all equipment, motors, lighting fixtures, and miscellaneous loads operating and with all equipment covers removed. Inspection reports complete with color photographs of the infrared scan and control photographs indicating the ambient temperature and any hot spots of each item inspected shall be submitted to the Engineer for approval. Any equipment, connections or devices indicated to be operating improperly performing equipment shall be replaced or repaired by the Contractor at no cost to the Authority. The cost of the inspections and necessary repairs shall be included in the Contract.
- E. Demonstrate to the Engineer equipment or systems installed or modified in this Contract.
- 1. After completion of all testing, and prior to placing equipment or systems in operation, demonstrate the features and operation of the equipment or systems to the Engineer, and all other staff or interested parties, as designed by the Engineer, so that operational and maintenance personnel are familiarized with the equipment and systems, as follows:
    - a. Switchboards and panelboards.
    - b. Transformer.
    - c. Switchgear.
    - d. Motor control centers.
    - e. Fire alarm and smoke detection systems.
    - f. Automatic transfer switches.
    - g. Standby/Emergency generator sets.
    - h. Other equipment as shown on the Contract Drawings.
  - 2. Provide the necessary accessories, test equipment, and personnel, for each demonstration.
  - 3. Complete all arrangements for the demonstrations through the Engineer.
  - 4. Upon the completion of each demonstration or instructional session, obtain "sign-off" from the Engineer. The "sign-off" shall state that the demonstration or instructions for use were provided, that they were complete and were given to the designated personnel.

END OF SECTION

## SECTION 16000

### ELECTRICAL GENERAL REQUIREMENTS

#### APPENDIX "A"

#### SUBMITTALS

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Division 1 - GENERAL PROVISIONS:

- A. Shop Drawings
  - 1. Substation and high-voltage transformers.
  - 2. Switchgear.
  - 3. Switchboards.
  - 4. Motor control centers.
  - 5. Emergency lighting battery systems.
  - 6. Working drawings for the installation sequence of medium voltage cables, and other systems where shown on the Contract Drawings, including the reel designations for each leg of the installation. Drawings shall include the calculations for pulling tensions and sidewall pressure of all cable pulls, including identification of manhole locations with splices and manholes that will be "pulled-through" without splicing. Calculations shall be certified and sealed by a Professional Engineer licensed in the State in which the Work is to be performed.
- B. Catalog Cuts
  - 1. Conduit, and fittings.
  - 2. Wire and cable.
  - 3. Wiring devices.
  - 4. Multi-outlet assemblies.
  - 5. "Standard" outlet and junction boxes.
  - 6. Medium voltage cable, splicing and termination kits.
  - 7. Lightning arresters.
  - 8. Capacitors.
  - 9. Panel boards and cabinets.
  - 10. General purpose transformers.
  - 11. Circuit breakers.
  - 12. Lighting fixtures.
  - 13. Pulling devices and end seals.
  - 14. Special pull and junction boxes.

15. Supporting devices.
- C. Certifications  
Training, experience and work history for certified splicers and welders.
  - D. Design Calculations  
Calculations where required by the Specifications or the Contract Drawings.
  - E. Maintenance Manuals  
Operation and maintenance manuals, where required by the Specifications or the Contract Drawings.
  - F. Schedules  
Nameplate designations.
  - G. Record Documents  
One set of Shop Drawings revised, completed and brought up to date showing the permanent construction as actually made, in accordance with "Shop Drawings, Catalog Cuts and Samples" of Division 1, and showing the exact location of all equipment and conduit runs, as actually installed.
  - H. Site Inspection Reports  
A final copy of the records and certified test reports for all tests, to the Engineer for review, for not less than the following:
    - 1. Primary cable and terminators insulation testing.
    - 2. Insulation testing of 600V (nominal) cables rated 100 amperes (#3 AWG) and above.
    - 3. Ground resistance test of each service ground.
    - 4. Ground fault circuit breaker and receptacle testing.
    - 5. Setting of all adjustable overcurrent devices.
    - 6. Setting or size of all overload elements installed, indicating the following:
      - a. Motor designation.
      - b. Nameplate horsepower, full load current, voltage and phases.
      - c. Operating current and voltage.
      - d. Overload element size or setting.
    - 7. Emergency power distribution equipment and system test results.

END OF APPENDIX "A"

**DIVISION 16****SECTION 16129****TAXIWAY/RUNWAY WIRES AND CABLES****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for wires, cables, splices, terminations and accessories, for airfield construction.

**1.02 REFERENCES**

The following is a listing of the publications referenced in this Section:

American Society for Testing and Materials (ASTM)

ASTM B 1	Specification for Hard-Drawn Copper Wire
ASTM B 2	Specification for Medium-Hard-Drawn Copper Wire
ASTM B 3	Specification for Soft or Annealed Copper Wire
ASTM B 8	Specification for Concentric-Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B 33	Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
ASTM D 2802	Standard Specification for Ozone-Resistant Ethylene-Propylene-Rubber-Insulation for Wire and Cable

Federal Aviation Administration, Advisory Circular (FAA-AC)

150/5345-7	Underground Electrical Cables for Airport Lighting Circuits (FAA Specification L-824B)
150/5340-19	Taxiway Centerline Lighting System
150/5345-26	Specification for Plug and Receptacle Cable Connectors (FAA Specification L-823)

Federal Specifications (FS)

SS-S-1401	Sealing Compound, Hot Applied For Concrete and Asphalt Pavements
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Insulated Cable Engineers Association (ICEA)

S-68-516	Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
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Institute of Electrical and Electronics Engineers (IEEE)

IEEE 383	Type Test of Class 1E Electric Cables, Field Splices and Connections for Nuclear Power Generating Stations
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Underwriters Laboratories, Inc. (UL)

UL 44	Rubber Insulated Wires and Cables
UL 83	Thermoplastic-Insulated Wires and Cables

1.03 QUALITY ASSURANCE

- A. Tests requiring certified reports and those requiring factory witness or field inspection shall be conducted and reported to the Engineer in conformance with those standards specified in this Section.
- B. Installations shall comply with the standards of the Federal Aviation Administration (FAA) where applicable.
- C. Wires and cables that have been manufactured more than two years prior to installation shall not be used in the work of this Section.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Where multi-conductors are to be installed as one cable, single conductor cables shall be paralleled by cable manufacturer prior to shipment. Cable assembly overall diameter shall be kept to a minimum.
- B. Store material in a clean, dry space and protect from weather.

1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

**PART 2. PRODUCTS**

2.01 MATERIALS

- A. General
  - 1. Locations, types, sizes and numbers of wires and cables are shown on the Contract Drawings.
  - 2. Unless otherwise shown on the Contract Drawings, solid conductors shall be soft or annealed copper, conforming to ASTM B 33 (tinned), ASTM B 189 (lead-coated or lead-alloy coated), or ASTM B 3 (uncoated).
  - 3. All electrical materials and equipment for which there are established UL standards, shall bear the UL label.

B. 600 volt Insulated Wires and Cables

1. Power Wires and Cables

Type THWN - Secondary Series Lighting wire and cable shall be single conductor, Class C stranded, double rated THHN-THWN, thermoplastic insulated and nylon jacketed, gasoline and resistant and conform to UL 83.

2. Grounding Wires and Cables

Unless otherwise shown on the Contract Drawings, grounding conductors shall be as follows:

a. Insulated

- (1) Solid for sizes #8 AWG and smaller, Class B Stranded for sizes #6 AWG and larger, 600 volt rated.
- (2) Insulation shall be a continuous green color, double rated THHN-THWN thermoplastic insulated and nylon jacketed, gasoline and oil resistant and conform to UL 83.

b. Uninsulated

- (1) Solid for sizes #8 AWG and smaller, Class B stranded for sizes #6 AWG and larger.
- (2) In raceways

Soft-drawn and conforming to ASTM B 3

- (3) Direct buried or encased in concrete

Soft-drawn, medium-hard-drawn or hard-drawn and conforming to ASTM B 1, B 2, or B 3, respectively.

C. 5000 volt Insulated Wires and Cables

Primary Series Lighting Cable shall be Non-Shielded 5000 Volt Rated, Type 'B', Single Conductor, Coated Copper, Class C, 19 Strands, Ethylene-Propylene-Rubber Insulated (ASTM D-2802 and ICEA S-68-516) and Chlorinated Polyethylene Jacket. The cable shall comply with FAA-AC 150/5345-7 and shall be approved under FAA Specification No. L-824B. Where indicated on the contract drawings, two cables shall be paralleled. (Identify one of the two cables with a yellow stripe.)

## 2.02 SPLICING AND TERMINATING MATERIALS

### A. General

All materials for making splices and terminations shall be specifically designed for use with the type of wire or cable, insulation and installation and operating conditions of the specific application.

### B. Power Wire and Cable Splices

1. Connector shall be insulated compression (indenter) type as specified on the contract drawings.
2. Silicone Sealant shall be as specified on the contract drawings.
3. Heat Shrinkable Tubing shall be either irradiated modified polyvinyl-chloride or irradiated polyolefin as specified on the contract drawings.

### C. Secondary Series Lighting Cable Connectors

Double Pole plug and receptacle connectors for the secondary series lighting system shall comply with FAA-AC 150/5345-26 and shall be approved under FAA Specification No. L-823 in accordance with Figure No. 15. Plug and receptacles shall be as specified on the contract drawings.

### D. Series Lighting Cable Connectors

Single Pole plug and receptacle connectors for the primary series lighting cable system shall comply with FAA-AC 150/5345-26 and shall be approved under FAA Specification No. L-823 in accordance with Figure No. 6. Plug and receptacles shall be as specified on the contract drawings. Coordinate the connector size for use with the cable.

### E. Cable Tags

Stainless steel metal tags, No. 25 gauge, and 3/4 inch wide, embossed with letters and numerals 5/16 inch high fastened to the cable at both ends of tags with nominal 1/16-inch diameter monel metal wire or stainless steel cable ties.

- F. Hot Rubberized Asphalt Sealer shall be the hot poured type conforming to Federal Specification SS-S-1401 Sealer.

## 2.03 SHOP TESTS

### A. General

1. Factory or in-plant and independent laboratory tests shall be in conformance with the applicable standards and as specified in this Section. All testing, and the results thereof shall be certified, in writing, to the Engineer.

### B. Factory or In-Plant Tests

1. Factory inspection and witnessing of tests by the Engineer shall be required for all wires and cables furnished under this contract. The Engineer reserves the right to require additional factory tests as required, or to waive factory inspection or witnessing of tests.
2. The Contractor shall notify the Engineer 14 days in advance of such factory tests.
3. 600 Volt Insulated Wires and Cables
  - a. For quantities as shown on the Contract Drawings, regular dielectric-withstand and insulation-resistance in water tests for wires and cables shall be performed in accordance with UL 44.
  - b. Flame tests for wires and cables shall be performed in accordance with IEEE 383.
4. 5000 Volt Insulated Wires and Cables
  - a. Tests for wires and cables shall be in accordance with FAA-AC 150/5345-7 and ICEA S-68-516.

### C. Independent Laboratory Tests

1. The following tests shall be performed by an independent test laboratory:
  - a. Specific Surface Resistivity

The specific surface resistivity of the cable jacket shall have a value greater than 200,000 Megohms under all of the following conditions:

    - (1) As manufactured.
    - (2) After immersion in tap water at 30 Degrees Celsius for 28 days with measurements performed after the first day and then every week.
    - (3) After immersion in a 50/50 solution of potassium acetate (KAc) deicer and tap water at 30 Degrees Celsius for 28 days with measurements performed after the first day and then every week.
  - b. The values of specific surface resistivity obtained in 2.03 C.1.a shall be plotted to demonstrate stability over time.

c. Drip Track Resistance

Using apparatus described in ASTM Standard D2303, the cable jacket shall pass the following test;

- (1) No. of Samples: 6 - after immersion for 28 days in KAc/H<sub>2</sub>O solution
- (2) Wetting Solution: 50/50 KAc/water
- (3) Wetting Rate: 0.2 cm<sup>3</sup>/minute
- (4) Applied Voltage Steps: 100 Volts/30 minutes
- (5) Initial Tracking Voltage: >1000 Volts (Median Value)

Airport lighting cables that satisfy the above requirements should bear the following jacket printing;

"Cable Manufacturer" FAA-L-824 Type B MOD A

- d. Certification and test required under Section 2.03 C shall be performed by an independent test laboratory. Submit qualifications and the test procedure of the test lab for approval prior to testing.
- e. Testing shall not be required for a previously certified cable if successful testing has been performed by the same manufacturer for the identical cable using identical materials. The certified test data shall be submitted for approval.

### **PART 3. EXECUTION**

#### **3.01 PREPARATION**

- A. Inspect the raceways and conduits prior to installation of wires and cables and notify the Engineer in writing in the event of finding conditions that would prevent the proper installation of materials using the methods specified in this Section.
- B. Prior to pulling wires and cables, clean the raceway systems of all foreign matter and perform all operations necessary so as not to cause damage to wires and cables while pulling.
- C. Prior to pulling wires and cables into underground conduit systems, place a feeding tube approved by the Engineer at the entrance end of such systems.

#### **3.02 INSTALLATION**

- A. Wire and Cable
  1. General
    - a. Keep wires and cables dry at all times.
    - b. Seal wire and cable ends with watertight end seals if splicing or terminating does not follow at once.
    - c. Before splicing or terminating wires and cables, make a thorough inspection to determine that water has not entered the wires and cables or that the wires and cables have not been damaged.

2. General Purpose Wires and Cables

- a. For the connection of taxiway and runway lights to secondaries of isolating transformers.
- b. Leave sufficient slack in each cable, but in no case less than:
  - (1) Three feet in base cans
  - (2) Six feet in light boxes

3. 5000 Volt Series Lighting Cables

- a. For connection of the airport Constant Current Regulator output to the primaries of the isolating transformers.
- b. Leave sufficient slack in each cable, but in no case less than:
  - (1) Fifteen feet in manholes
  - (2) Ten feet in handholes
  - (3) Ten feet in lightboxes
  - (4) Six feet in base cans

B. Connections and Terminations

1. General Purpose Wires and Cables

After the cable has been installed, the connections and terminations shall be installed in accordance with the manufacturer's instructions.

2. 5000 Volt Series Lighting Cables

a. Connections to Transformers

- (1) At each isolating transformer for runway and taxiway lights and taxiway signs and as shown on the Contract Drawings, the primary connectors shall consist of an assembly of L-823 Single Pole Plug and Receptacle cable connectors, and heat shrinkable insulation tubing.

- (a.) Heat shrinkable insulation tubing shall be 13 inches minimum length and its interior shall be coated with elastic mastic to assure a watertight seal after shrinking.

- (b.) Heat shrinkable insulation tubing may be installed in three sections to accommodate a connector that is not uniform in shape. The lengths of the sections shall be two at six inches long and one at eight inches long.

- (2) After the cable has been installed, the connectors shall be installed on the ends of the Series Lighting Cable in accordance with the manufacturer's instructions.

- (a.) The receptacle shall be installed at one end of the cable and the plug at the other end to establish a continuous plug and receptacle sequence through the wiring system and its associated isolating transformers.

- (b.) Precautions shall be taken to release trapped air when inserting the plug in the receptacle. After the joint has been made and wiped clean of excess jelly, a heat shrinkable insulation tube shall be applied over the plug and receptacle in accordance with the manufacturer's recommendations and as approved by the Engineer.

b. Connections

- (1) Where the Primary Series Lighting Cables are run through or into taxiway light boxes, handholes, or manholes, without connection to an isolating transformer, a plug and connector type installation as described immediately above, shall be used.
- (2) The maximum lengths of uncut wires and cables shall depend on the lengths of the wire and cable that can be installed without damage.

C. Identification of Wires and Cables

1. Each wire and cable shall be identified by its circuit in all cabinet boxes, manholes, handholes, wireways and other enclosures or access locations, and at all terminal points.
2. The circuit designations shall be as shown on the Contract Drawings. Tags shall be attached to wires and cables in such a manner as to be readily visible.
3. Wire and Cable tags shall be fastened to both ends of the series lighting wires and cables.

3.03 FIELD TESTS

In addition to other tests that may be required in other Sections, the Contractor shall perform the following field tests in the presence of the Engineer, to demonstrate the reliability of the electrical installation.

- A. Tests on the cables shall be made in accordance with the FAA-AC 150/5340-19.
- B. All series lighting cables and circuits shall be tested with a 5000-volt megohm meter. The following test procedure shall be performed on all series lighting circuits:
  1. Each single conductor 5000 volt insulated cable from the regulator to the first isolation transformer: Insulation value shall not be below RCI, computed as by the following formula.

$$RCI = \frac{8 \times 106 \text{ (Megohms)}}{L_{ci}}$$

Where  $L_{ci}$  is the length of the single conductor cable under test in feet.

2. The remaining portion of circuit from the first isolation transformer to the last isolation transformer shall have an insulation value of not less than  $R_{is}$ , computer by the following formula.

$$\frac{1}{R_{is}} = \frac{N_{it}}{2000 \text{ Megohms}} + \frac{N_s}{4000 \text{ Megohms}}$$

Where  $N_{it}$  is the number of isolation transformers,  $N_s$  is the number of slices.

3. Each single conductor 5000 volt insulated cable from the last isolation transformer to the regulator: Insulation value shall not be below Rc2, computed as by the following formula:

$$Rc2 = \frac{8 \times 106 \text{ (Megohms)}}{Lc2}$$

Where Lc2 is the length of the single conductor cable under test in feet.

4. The complete circuit after all splices are completed must have an insulation value of not less than Rt, computed by the following formula:

$$\frac{1}{Rt} = \frac{1}{Ris} + \frac{1}{Rci} + \frac{1}{Rc2}$$

Test shall use the step voltage method, using a minimum of 3 voltage levels; 1000 volts, 2500 volts and 5000 volts. Sufficient time shall be allowed for charging currents to subside. Minimum insulation values shall be met at any and all voltage levels. A written record of all tests shall be furnished to the Engineer before acceptance of the insulation. Tests shall be performed by qualified personnel and strict adherence to requirements of the Port Authority and the manufacturer of the equipment. All safety and operating rules shall be strictly observed and enforced.

- C. After the installation has been completed, the Contractor shall successfully operate all electrical equipment for a continuous 24-hour period.
- D. Unless otherwise shown on the Contract Drawings, all labor, materials and power required for the above tests shall be furnished by the Contractor. Only power for the operating test will be furnished by the Authority.
- E. Should the foregoing test results reveal any defects, promptly correct such defects and rerun the tests until the entire installation is satisfactory to the Engineer in all aspects.
- F. If any defects in existing equipment or materials are disclosed by the foregoing tests, the Contractor shall so notify the Engineer. After verification by the Engineer, and upon the Engineer's written order, the Contractor shall correct the installation to the extent directed by the Engineer. Any work so ordered by the Engineer and performed by the Contractor in connection with replacing of existing defective equipment or materials shall be compensated for in accordance with the clause of the Form of Contract entitled "Compensation for Extra Work." Damage to existing equipment or materials caused by the Contractor's acts or omissions shall be repaired at the Contractor's cost.

**END OF SECTION**

## SECTION 16129

### TAXIWAY/RUNWAY WIRES AND CABLES

#### APPENDIX A

##### SUBMITTAL REQUIREMENTS

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts, and Samples" of DIVISION 1 - GENERAL PROVISIONS:

- A. Catalog Cuts
  - 1. Primary Series Lighting Cable
  - 2. Primary Series Lighting Cable Connections and Terminations
  - 3. Secondary Series Lighting Cable
  - 4. Secondary Series Lighting Cable Splices
  - 5. Grounding Cable
  - 6. Single Pole Plug Connector
  - 7. Double Pole Plug Connector
  - 8. Flanged Receptacle Connector
  - 9. Cable Tags
  - 10. Sealer
- B. Certified factory or in-plant test reports for wires and cables.
- C. Certified independent laboratory test report for wires and cables.
- D. Field Test reports for wires and cables, including all test data and methodology.

END OF APPENDIX "A"

B. Other Items

1. Specify required submittals by editing Appendix A "SUBMITTAL REQUIREMENTS".
2. Specify manufacturers for wires, cables, wire and cable splicing and terminating of one the following manufacturers, or approved equal:

- a. Wires and Cables

American Insulated Wire Corporation  
Pirelli Cable Corporation  
The Okonite Company  
BIW Cable Systems Incorporated  
Rome Cable Corporation  
BICC

- b. Splicing and Terminating

Wire and cable manufacturer as specified above.

Crouse Hinds  
Thomas and Betts Corporation  
Burdny Corporation  
Elastimold  
Raychem Corporation  
Minnesota Mining and Manufacturing Company (3M)  
MAC Products Incorporated

**END OF INSTRUCTIONS**



## DIVISION 16

### SECTION 16542

#### TAXIWAY/RUNWAY LIGHT FIXTURES

#### PART 1. GENERAL

##### 1.01 SUMMARY

This Section specifies requirements for light fixtures, light bases and accessories for Taxiway and Runway Lighting Systems.

##### 1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

##### Federal Specifications

SS-S-1401 Sealant, Joint, Non-Jet-Fuel-Resistant, Hot Applied, For Portland Cement And Asphalt Concrete Pavements

##### Federal Aviation Administration, Advisory Circulars (FAA-AC)

FAA-AC 150/5340-4C Installation Details for Runway Centerline and Touchdown Zone Lighting Systems

FAA-AC 150/5340-19 Taxiway Centerline Lighting System

FAA-AC 150/5340-24 Runway and Taxiway Edge Lighting System

FAA-AC 150/5345-26B Specification for L-823 Plug and Receptacle, Cable Connectors

FAA-AC 150/5345-42C Specification for Airport Light Base and Transformer Housings, Junction Boxes, and Accessories

FAA-AC 150/5345-46A Specification for Runway and Taxiway Light Fixtures

FAA-AC 150/5345-47 Isolation Transformers for Airport Lighting Systems

FAA-AC 150/5370-10 Standards for Specifying Construction of Airports

##### American Society for Testing and Materials (ASTM)

ASTM A 386 Structural Steel

ASTM A 572 High-Strength Low-Alloy Columbium Vanadium Steels of Structural Quality

ASTM D 3405 Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements

##### National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code

### 1.03 QUALITY ASSURANCE

- A. Entities performing the Work of this Section shall have experience on at least two projects involving complexities similar to those required under this Contract.
- B. Before any light fixture type is installed in a permanent installation, it shall meet the requirement of a successful one-year test installation at an Authority airport.

### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturers original, unopened, protective packaging.
- B. Store materials in a clean, dry space and protect them from weather.
- C. Handle in a manner to prevent damage to finished surfaces.
- D. Where possible, maintain protective coverings until installation is complete and remove such coverings as part of final cleanup.

### 1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

## **PART 2. PRODUCTS**

### 2.01 LIGHT FIXTURES

- A. General
  - 1. Quantity, type, location, beam direction (unidirectional, bidirectional or omnidirectional), and other requirements of light fixtures shall be as shown on the Contract Drawings.
  - 2. Lamp type and wattage and filter color shall be as shown on the Contract Drawings.
  - 3. Light fixtures and components for which there are established UL standards, shall be UL listed and shall bear the Underwriters Laboratories Inc. (UL) label.
  - 4. Light fixtures shall be furnished completely, assembled and, unless otherwise shown on the Contract Drawings, shall be furnished with two 40-inch leads terminated in an FAA Specification L-823 two pole plug, and one color-coded green ground wire.
  - 5. Light fixtures shall comply with environmental, photometric, dimensional and other requirements specified in the latest edition of FAA-AC 150/5345-46(A).

B. Runway Inpavement Light Fixtures

1. General

Runway inpavement fixtures shall have a light assembly that produces a beam with color and photometric distribution as specified in FAA-AC 150/5345-46. Unless otherwise noted on the Contract Drawings, the casting that houses the light assembly shall be high strength Nickel-Molybdenum alloy. The casting shall be a single piece construction or an inset type with an adapter ring.

Runway inpavement fixtures shall be connected to the light bases by means of six threaded bolts. Studs or other spacers are not permitted for the runway fixtures.

2. Runway Centerline Light Fixtures; L-850A

Each such fixture shall have a light assembly that produces a narrow bidirectional beam and utilizes a quartz halogen lamp rated at 6.6 amperes. The lamp life shall be rated at a minimum of 5000 hours if operated at brightness Step III.

3. Runway Touchdown Zone Light Fixtures; L-850B

Each such fixture shall have a light assembly that produces a narrow unidirectional beam and utilizes a quartz halogen lamp rated at 6.6 amperes. The lamp life shall be rated at a minimum of 5000 hours if operated at brightness Step III. Each casting shall have a directional 4° toe-in arrow stamped in window area that denotes a location of the runway centerline.

4. Runway Edge Light Fixtures; L-850C

Each fixture shall have a light assembly that produces a bidirectional narrow beam and utilizes a quartz halogen lamp rated at 6.6 amperes.

5. Runway Threshold/End Light Fixtures; L-850D

Each such fixture shall have a light assembly that produces a narrow unidirectional or bidirectional beam and utilizes a quartz halogen lamp rated at 6.6 amperes. The beam shall be toed-in 32° towards the runway centerline.

6. Approach Threshold Light Fixtures; L-850E

Each such fixture shall have a light assembly that produces a wide unidirectional beam and utilizes a quartz halogen lamp rated at 6.6 amperes.

C. Taxiway Inpavement Light Fixtures

1. General

Taxiway inpavement fixtures shall have a light assembly that produces a beam with color and photometric distribution as specified in FAA-AC 150/5345-46. Unless otherwise noted on the Contract Drawings, the casting that houses the light assembly shall be high strength Nickel-Molybdenum alloy. The casting shall be a single piece construction or an inset type with an adapter ring.

2. Taxiway Centerline Light Fixtures, straight sections; L-852A

Each such fixture shall be Type IV and shall have a light assembly that produces a narrow beam, is bi-directional and utilizes a quartz halogen lamp rated at 6.6 amperes.

3. Taxiway Centerline Light Fixtures, curved sections; L-852B

Each such fixture shall be Type IV and shall have a light assembly that produces a wide beam, is bidirectional and utilizes a quartz halogen lamp rated at 6.6 amperes.

4. Narrow Beam Fixtures; L-852C

Each such fixture shall have a light assembly that produces a narrow beam, is bidirectional and utilizes a quartz halogen lamp rated at 6.6 amperes.

5. Wide Beam Fixtures; L-852D

Each such fixture shall have a light assembly that produces a wide beam, is bidirectional and utilizes a quartz halogen lamp rated at 6.6 amperes.

6. Omnidirectional Fixtures; L-852E

Each such fixture shall have a light assembly that produces a omnidirectional light and utilizes a quartz halogen lamp rated at 6.6 amperes. The casting that houses the assembly shall be totally flush.

D. Elevated Light Fixtures

1. Elevated Runway/Taxiway Light Fixtures; L-861

Each such fixture shall be furnished with breakable couplings and stems to provide for an overall height of 16 inches. The light source shall be a 45-watt quartz halogen lamp housed in a glass globe with 360 degree, internal blue filter.

2. High Intensity Runway Edge Light Fixtures; L-862

Each such fixture shall be furnished with breakable couplings and stems to provide for an overall height of 12 inches above the surface. The light source shall be a 115-watt quartz halogen lamp housed in a glass globe with internal lens assembly and 180/360 degree internal color filters.

E. Accessories

1. Isolation Transformers; L-830

Isolation transformers shall be rubber encapsulated, 5000-volt rated, series to series, with primary ampere rating as shown on the Contract Drawings, and a 6.6-ampere secondary. The wattage rating shall be as shown on the Contract Drawings. The flanged receptacle on the secondary cable shall conform to FAA Specification L-823, Figure No. 15. Transformers shall comply with FAA-AC 150/5345-47 and shall conform to FAA Specification L-830.

2. Ground Rods

Ground rods shall be copper bonded with diameters and lengths as shown on the Contract Drawings.

3. Single Pole Plug and Receptacle Connectors; L-823

Single pole plug and receptacle connectors for 5000-volt series lighting cable shall comply with FAA-AC 150/5345-26B and shall conform to FAA Specification L-823f Fig. No. 1.

4. Double Pole Plug and Receptacle Connectors; L-823

Double pole plug and receptacle connectors for 600-volt secondary system shall comply with FAA-AC 150/5345-26B and shall conform to FAA Specification L-823, Fig. No. 1.

2.02 LIGHT BASES

A. General

1. Quantity, type, location and other requirements of light bases shall be as shown on the Contract Drawings.
2. All electrical materials and equipment for which there are established UL standards, shall bear the UL label.

B. Base Cans and Extensions for Taxiway Centerline Fixtures; L-868

1. Base Cans

Base cans shall be 12 inches in outside diameter, of ASTM A 386 hot-dipped galvanized steel, with 1/4-inch thick bottom plate protruding 3/16 inches outward from the outside face of the cylindrical wall. A ground lug shall be provided to accept a #6 AWG grounding cable as shown on the Contract Drawings. The base can overall depth shall be as shown on the Contract Drawings and shall be provided with grommeted openings for conduit entrance as shown on the Contract Drawings. The top flange shall have twelve, 3/8-inch diameter tapped holes, equally spaced on an 11-1/4-inch bolt circle to accept the mounting of top section base can. The base can shall comply with FAA-AC 150/5345-42C and shall conform to FAA Specification L-868.

2. Base Can Extensions

Base can extensions shall be 12 2 inches in outside diameter, of ASTM A 386 hot-dipped galvanized steel, with provision on the top flange for twelve, 3/8-inch diameter tapped holes, equally spaced on an 11 1/4-inch bolt circle, to accept a taxiway centerline fixture mounting. The bottom of the can shall be provided with six, 7/16-inch diameter holes equally spaced on an 11 1/4-inch bolt circle and six 3/8-inch stainless steel bolts and two piece lockwashers of the proper length for mounting to the top of the bottom section base can. The exact depth of the top section base can shall be determined from field measurements. Minimum depth shall be 2 inches. The base can shall comply with FAA-AC 150/5345-42C and shall conform to FAA Specification L-868.

C. Base Cans for Elevated Edge Light Fixtures; L-867

Base cans shall be 13 2 inches in outside diameter, of ASTM A 386 hot-dipped galvanized steel, with 1/8-inch thick bottom plate protruding 3/16 inches outward from the outside face of the cylindrical wall with six, 4 5/8-inch long, 3/8-inch deep steel ribs welded radially on its underside. A 3/8-inch by 2-inch bar shall be welded around the circumference at the top of the can. The top flange shall be provided with six, 3/8-inch diameter tapped holes, equally spaced on a 10 1/4-inch bolt circle for mounting of the base plate. The base can shall be 10 inches in overall depth and shall be complete with grommeted openings for conduit entrance as shown on the Contract Drawings. A ground lug shall be provided to accept a #10 AWG ground cable. Additional requirements shall be as shown on the Contract Drawings. The base can shall comply with FAA-AC 150/5345-42C and shall conform to FAA Specification L-867.

D. Type I Marker Light Boxes; L-867

Type I boxes shall be of reinforced concrete construction and shall be 15 inches wide by 36 inches long (inside dimensions) with a depth as shown on the Contract Drawings. The steel cover shall be capable of accepting a base plate for an elevated taxiway, edge light fixture. All ancillary equipment and additional requirements shall be as shown on the Contract Drawings. Precast boxes may be substituted for those shown on the Contract Drawings subject to the approval of the Engineer. All precast boxes shall meet the same requirements as specified herein and as shown on the Contract Drawings.

E. Type III Marker Light Boxes; L-867

Type III boxes shall be concrete encased ASTM A 386 hot-dipped galvanized steel base cans 17 1/4-inches in diameter by 20 inches deep. A 3/8-inch by 2-inch bar shall be welded around the circumference at the top of the can. Boxes shall be provided with 2-inch couplings at 180 degrees at the bottom of the box. A ground lug shall be welded on the inside wall of the box and a 1 3/8-inch diameter hole shall be provided at the bottom of the base for the installation of a ground rod. The hole shall be plugged with a solid neoprene plug. Additional requirements shall be as shown on the Contract Drawings. Boxes shall comply with FAA-AC 150/5345-42C and shall conform to FAA Specification L-867.

F. Base Plates for Elevated Edge Light Fixtures

Base plates shall be ASTM A 572, Grade 50 steel, 12 inches in diameter and 2-inch thick, complete with a 1 2 or 2 inches threaded conduit hub, gasket, stainless steel bolts and a connector clamp capable of supporting an FAA Specification L-823 flanged secondary receptacle. Base plates shall have six, 7/16-inch holes on a 10 1/4-inch bolt circle, except for Type III marker box which shall have 14 1/4-inch bolt circle.

G. Flanged Secondary Receptacles; L-823

Flanged secondary receptacles shall be clamped to the underside of the taxiway edge light base plate, where required, and have two #14 AWG, 15-inch long pigtails molded, under one jacket, to the receptacle body. Receptacles shall comply with FAA-AC 150/5345-26B and shall conform to FAA Specification L-823, Fig. No.1C.

H. Flange Rings for L-868 Cans

Flange rings shall be composed of a 12 1/8-inch by 2-inch thick ASTM A 386 zinc plated steel ring containing six, 7/16-inch diameter holes equally spaced at 60 degree intervals on an 11 1/4-inch bolt circle. An indented 'O' ring gasket shall be furnished with the flange ring to render the unit weatherproof. An 1/8-inch thick ASTM A 386 zinc plated steel ring shall be continuously welded to the outside edge of the flange ring providing an overall height of 1 1/8 inches and an overall outside diameter of 12 3/8 inches.

I. Temporary Mud Covers for L-867 and L-868 Cans

Temporary mud covers shall be 12 3/8 inches in outside diameter containing six, 7/16-inch diameter holes on an 11 1/4-inch bolt circle for L-868 cans and 10 1/4-inch bolt circle for L-687 cans. Mud covers shall be made of a 1/8-inch thick, hot-dipped galvanized steel plate with three raised concentric rings, two one-inch thick knockouts about the center, and an indented center point mounted on a 5/8-inch thick exterior grade plywood cover.

J. Spacer Rings for L-868 Cans

Spacer rings shall be 12 inches in outside diameter, 1/8-inch thick zinc coated steel or 1/4-inch thick hot-dipped galvanized steel, as required, with a 10-inch diameter hole and six, 7/16-inch diameter holes equally spaced on an 11-1/4-inch bolt circle.

K. Blank Cover Plates for L-867 and L-868 Cans

Blank cover plates for FAA L-867 and L-868 cans shall be 12 inches in outside diameter and of 2-inch thick ASTM A 572, Grade 50 hot-dipped galvanized steel with six, 7/16-inch diameter holes on a 10-1/4-inch bolt circle for L-867 cans and 11-1/4-inch bolt circle for L-868 cans.

## 2.03 MISCELLANEOUS MATERIALS

### A. Flexible Non-Metallic Conduit

1. Flexible non-metallic conduit shall be made up of a polyvinyl chloride smooth inner core, a reinforcing nylon mesh and a polyurethane outer jacket.
2. Fittings shall be of a type designated to provide a liquid tight continuation of the conduit system as per manufacturer's recommendation.

### B. Hot Rubberized Asphalt Sealer

Hot rubberized asphalt sealer shall conform to Federal Specification SS-S-1401 and ASTM D 3405.

### C. Adhesive Sealant

Adhesive sealant shall be as shown on the Contract Drawings.

### D. Cement Compound

Cement compound shall be a two-component adhesive compound and shall comply with the requirements of FAA-AC 150/5370-10, P-606.

### E. Concrete and Grouting

Concrete and grouting shall be in accordance with applicable Section(s) of the Specifications or as shown on the Contract Drawings.

### F. Mildew and Rot-Proof Rope

Rope shall be 2 inch in outside diameter, of mildew and rot-proof hemp rope.

### G. Special Materials

Special materials, required for proper installation of the Work, shall be as shown on the Contract Drawings.

## PART 3. EXECUTION

### 3.01 INSTALLATION

#### A. General

1. Employ the services of a Land Surveyor licensed in the state where the Work is to be performed to establish the proposed locations of lighting fixtures whose general locations are shown on the Contract Drawings.
  2. Mark the proposed location and alignment for each base can or box. These locations and alignments shall be approved by the Engineer.
- B. Fixtures that have been installed shall be made operational prior to the end of the Work period.

- C. Provide a sufficient quantity of waterproof tarpaulins or employ other approved means of preventing blown sand, water and other foreign materials from entering the kerfs and cored holes.
- D. Heat rubberized asphalt sealer compound in a double-boiler, indirect-fired kettle. The space between the inner and outer shells shall be filled with suitable heat transfer oil having a flash point of not less than 550 degrees F. The kettle shall be equipped with satisfactory means of agitating the sealer at all times without excessive incorporation of air. High temperature shall not be necessary to melt the sealer. The kettle shall be equipped with thermostatic control for automatic regulation of the temperature of the oil bath and sealer and shall have a recording thermometer of the sealer temperature. A hose shall be directly connected to the melting kettle in such a manner as to permit pumping the melted sealer through the hose to a shoe-type applicator that shall direct and control the filling of the joints.
- E. All Work shall be in conformance with NFPA 70 requirements.
- F. All electrical connections shall be covered with heat shrink tubings. The heat shrink shall cover a minimum 3" of cable on both sides of the connection.
- G. Flush Runway and Taxiway Light Fixtures
  - 1. Installation of flush taxiway centerline light fixtures shall comply with FAA-AC 150/5340-19 and be done in accordance with fixture manufacturers installation procedures and as specified herein.
  - 2. Installation of flush runway centerline and edge light fixtures shall comply with FAA-AC 150/5340-4C and be done in accordance with fixture manufacturer's installation procedures and as specified herein.
  - 3. Longitudinal and Transverse Spacing

Space light fixtures longitudinally as shown on the Contract Drawings with a tolerance of plus or minus 10 percent. Locate light fixtures laterally not less than one foot from the designated centerline of taxiing paths. Displace lights a maximum of two feet from the designated centerline where necessary to avoid undesirable locations. Apply this lateral tolerance consistently to avoid abrupt and noticeable changes in guidance, i.e., no "zigzagging" from one side to the other side of the centerline.
  - 4. Orientation of Light Beam
    - a. On runways and on all straight portions of taxiway centerlines, orient the axis of the centerline light beam parallel to the centerline of the runway or taxiway path, respectively.
    - b. On curved portions of taxiways, excluding long radius exit taxiways, orient the axis of the two beams of bidirectional taxiway centerline lights parallel to the tangent of the nearest point of the curve designated as the true centerline of the taxiway path; orient the axis of a unidirectional light beam so that it is "toed-in" to intersect the centerline at a point approximately equal to four times the spacing of the lights on the curved portion and such spacing shall be measured along the chord of the curve.
    - c. On runways, orient the edge light beam as specified in FAA-AC 150/5340-4C.

H. Installation of Elevated Runway and Taxiway Edge Light Fixtures

Installation shall comply with FAA-AC 150/5340-24 and shall be done in accordance with fixture manufacturer's installation procedures.

I. Installation of Semi-Flush Runway Touchdown Zone Light Fixtures

Installation shall comply with FAA-AC 150/5340-4C and shall be done in accordance with fixture manufacturers installation procedures.

J. Light base manufacturer representative shall be present on site on the first day of installing light bases.

3.02 FIELD TESTS

A. General

1. Provide all labor and materials for functional and operational tests required and furnish the power for the functional tests. Power for the operational tests will be furnished by the Authority.
2. Should the tests reveal any defects in Taxiway and Runway Lighting System Equipment installed under this Contract, promptly correct such defects and rerun the tests until the entire installation is satisfactory to the Engineer in all respects.
3. Report immediately to the Engineer any defect found in portions of the Taxiway and Runway Lighting System not installed under this Contract. Do not attempt to rectify any defect found in a component of the system not installed under this Contract unless specifically instructed to do so by the Engineer. The Contractor's compensation for the rectifying of such defects at the direction of the Engineer will be determined in accordance with the clause of the Contract providing compensation for Extra Work.

B. Functional Tests

1. Perform functional tests, in the presence of the Engineer, to demonstrate the reliability of the electrical installation for the following:
  - a. Runway and taxiway edge lighting system in accordance with the requirements of FAA-AC 150/5340-24;
  - b. Taxiway centerline lighting system in accordance with the requirements of FAA-AC 150/5340-19;
  - c. Runway centerline and touchdown zone lighting systems in accordance with the requirements of FAA-AC 150/5340-4C.
2. Furnish the Engineer with a copy of the "Megger" readings for the tests specified in 3.02 B.1 above, together with an outline of the method used. If, in the opinion of the Engineer, any reading is lower than the values required by the above FAA-AC specifications, promptly replace the fixtures and accessories involved, or by other means raise the readings to acceptable values.

C. **Operational Tests**

After the functional tests have been completed, operate, in the presence of the Engineer, all electrical equipment for a period of twenty-four hours.

**END OF SECTION**

## SECTION 16542

### TAXIWAY/RUNWAY LIGHT FIXTURES

#### APPENDIX A

#### SUBMITTAL REQUIREMENTS

Submit the following in accordance with the requirements of Shop Drawings, Catalog Cuts, and Samples" of Division 1 - GENERAL PROVISIONS:

- A. Shop Drawings
  - 1. Station layout for taxiway and runway light fixtures
  - 2. All light fixtures
  - 3. Light fixture accessories, including isolation transformers, ground rods and plug connectors
  - 4. Light bases, including base cans, light boxes, base plates, flange rings, mud covers, spacer rings, cover plates
  - 5. Setting fixture (jig) and installation method description
  - 6. Miscellaneous materials, including sealants and the special materials shown on the Contract Drawings
- B. Submit an itemized list of spare parts, as recommended by the manufacturer, for the electrical equipment to be supplied under this Contract. The list should include quantities required, current unit prices and sources of supply. The Authority is not obligated to purchase any item on such a list.
- C. Prior to any installation operations at the construction site, submit a listing of the proposed equipment and methods to be used to install base cans and/or boxes in the pavement subject to the approval of the Engineer
- D. Submit field test reports, including AMegger" readings, with an outline of the method used.

**END OF APPENDIX "A"**