



Jackson County Board of Commissioners

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Date: April 19, 2022

To: All Qualified Bidders and Plan Holders

From: Jackson County Airport
Myrna Yarbrough, Jackson County Purchasing Manager

RE: Addendum 3 to Jackson County ITB 220011, Runway and Taxiway Pavement Rehabilitation, Jackson County Airport

This Addendum is hereby made a part of the contract documents and specifications of the above referenced project. All other requirements of the original specifications and drawings shall remain in effect in their respective order. Acknowledge receipt of this addendum by inserting its number and date in the proposal form. All other terms and conditions in ITB 220011 remain unchanged.

GENERAL

1. Any inquiries concerning Addendum 3 should be made to Jason Kennedy of WK Dickson at jkennedy@wkdickson.com.
2. Jackson County reserves the right to reject all proposals, to waive any technicalities or irregularities and to award the offer based upon the most responsive, responsible submission.
3. Bidders must acknowledge receipt of addenda, by either signing and attaching this copy, or by writing "Acknowledge Addenda #3" at bottom of the proposal.

BID FORMS

1. The Schedule of Work (Bid Forms I-52 to I-61) has been revised to reflect updated quantities and pay items and is attached to this addendum. Pay items that changed are noted with "Add. No. 3". Bidders shall remove the Schedule of Work from I-52 to I-61 in its entirety and replace it with the revised Schedule of Work with header note "Addendum No. 3". This revised Schedule of Work shall be used for the preparation of bid packages.

TECHNICAL SPECIFICATIONS DOCUMENTS

1. REVISE Specification P-101 as follows:
 - a. REVISE section 101-3.2 to read as follows:

"Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25 mm). If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Routing will be necessary where cracks are between 1/4 inch (6 mm) wide and 1 1/2 inch (38 mm)

wide, or where the edges are loose and raveled. Widen crack with router or random crack saw by removing a minimum of 1/16 inch (2 mm) from each side of crack. Following routing or sawing, any remaining vegetation, dirt, dampness, and loose materials will be removed by use of a hot lance combined with oil and water-free compressed air. The crack faces shall be surface dry when the seal is applied. Fill all cracks between 1/4 inch (6 mm) wide and 1 1/2 inch (38 mm) wide with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to exceed 1/4 inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide (38 mm)), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below. Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the Engineer.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches (+0 to -3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.”

- b. REVISE section 101-3.9.1 to read as follows:
“Prepare cracks in accordance with paragraph 101-3.2.”
- c. REVISE Method of Measurement section to remove paragraphs 4.1 through 4.7 and replace with the following:
“101-4.1 Bituminous Pavement Milling to be Hauled Off Site (Variable Depth). The unit of measure for Bituminous Pavement Milling to be Hauled Off

Site (Variable Depth) shall be per square yard. The location of the Bituminous Pavement Milling to be Hauled Off Site (Variable Depth) shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

101-4.2 Placement of Millings on Proposed Access Road (8" Deep). The unit of measure for Placement of Millings on Proposed Access Road (8" Deep) shall be per square yard. The location of this work shall be as shown on the plans.

101-4.3 Joint and crack repair. Measurement and basis of payment for Joint and Crack Repair and Seal shall be per item P-605."

- d. REVISE Basis of Pavement section to remove items P-101 Item 5.1 through Item 5.7 and replace with the following:
 - **Item P-101-5.1** Bituminous Pavement Milling to be Hauled Off Site (Variable Depth) – per square yard
 - **Item P-101-5.2** Placement of Millings on Proposed Access Road (8" Deep) – per square yard
2. REVISE Specification P-605 as follows:
 - a. REVISE section 605-3.3b Preparation of Cracks to read as follows:

“Prepare cracks in accordance with specification P-101, paragraph 101-3.2.”
 - b. REVISE Method of Measurement section to read as follows:

“605-4.1 Joint and crack repair and seal for existing asphalt pavements shall be measured by the linear foot of repaired joints and cracks in place, completed, and accepted. Preparation of joints and cracks, routing, cleaning, heating, and cleanup shall be incidental to the Joint and Crack Repair and Seal pay item.
 - c. REVISE Basis of Payment section to read as follows:

“605-5.1 Payment for joint and crack repair and seal for existing asphalt pavements shall be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605 – Joint and Crack Repair and Seal - per linear foot”
3. Item P-620, REVISE paragraph 620.3.3b to read as follows. The text no longer lists rotary grinding as an acceptable method for pavement marking removal.

“620-3.3.b Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by ~~rotary grinding~~, water blasting, or by other methods approved by the ENGINEER minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to ‘block out’ the removal area to eliminate ‘ghost’ markings.

4. ADD Specification Item P-623 Emulsified Asphalt Spray Seal Coat. This item is attached to this addendum.
5. ADD Specification Item L-108 Underground Power Cable for Airports. This item is attached to this addendum.
6. ADD Specification Item L-125 Installation of Airport Lighting Systems. This item is attached to this addendum.

PLANS

1. Sheet C5, REVISE Demolition Note to read as follows:
“5. PRIOR TO CONSTRUCTION, DIGGING, OR EXCAVATION, THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES (PUBLIC AND/OR PRIVATE) THAT MAY EXIST AND CROSS THROUGH THE AREA(S) OF CONSTRUCTION, WHETHER INDICATED ON THE PLANS OR NOT. CALL "811" A MINIMUM OF 72 HOURS PRIOR TO DIGGING OR EXCAVATING. REPAIRS TO ANY UTILITY DAMAGED RESULTING FROM CONSTRUCTION ACTIVITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.”
2. Sheet C25, Grading Notes, ADD note number 6 which reads as follows:
“6. Shoulder grading shall be constructed to the grades and slopes indicated on the grading plans and cross sections. Preparation of shoulders shall be completed as outlined in specification P-152 for areas located outside of pavement. Material used for shoulder grading shall meet the requirements of specification T-905.”
3. REVISE Details 1/C47 and 2/C47 to include note number 2 which reads as follows:
2. See Airfield Lighting System Adjustment Notes this sheet.
4. ADD detail 5/C47 “Airfield Lighting System Adjustment Notes”
 - a. Prior to construction the contractor shall utilize a private utility locator to locate and mark in the field all existing above and below ground utilities, (including runway and taxiway edge lighting circuits). Utilities shall be located throughout the entire project area and to the termination/origin point at the airfield electrical vault.
 - b. Prior to construction, contractor shall inspect the existing runway and taxiway edge lighting system in the presence of the engineer to inventory lights and determine the number of existing stake mounted and base mounted lights. Inventory shall be documented and submitted to the Engineer.
 - c. Contractor shall submit redline drawings to the Engineer showing the location of base mounted and stake mounted lights, and the location of underground cables/circuits for the runway and taxiway edge lighting system.
 - d. Prior to start of work, the Inventory and redlines of the underground cables will be used to confirm the quantities for removal of existing cable, installation of new cable, installation of new transformers, cable splices, ground rods and adjustments to stake and base mounted lights. Quantities for these items as shown on the bid documents are an estimate. Actual quantities for these work items may vary. Contractor agrees to provide the electrical work items at the proposed unit price, regardless of the actual quantity that is ultimately needed.

- e. Contractor shall install new cable, isolation transformers, splices and ground rods in locations directed by the engineer and in accordance with applicable building codes and specification Item L-108 Underground Power Cable for Airports.
- f. Contractor shall make adjustments to light fixtures as noted on the plans and in accordance with Item L-125 and all applicable building codes.
- g. Testing for new electrical cabling and adjusted light fixtures shall be completed in the presence of the Engineer and in accordance with L-108 and L-125.
- h. Payment for electrical work shall be per applicable pay items defined in Items L-108 and L-125. Contract shall coordinate with the Engineer as needed through out the work to create and maintain a clear record of the electrical work pay items that have been completed and accepted for payment.

BIDDER QUESTIONS:

1. **Question:** You have changed the leveling to 12.5mm which is fine as long as the thickness of the leveling is greater than 1.25” thick. If you are trying to level less than 1.25” then 12.5mm will not work due to the size of the rock in the mix. If your leveling is less than 1.25” then you need to use a 9.5mm for the leveling.

Answer: According to GDOT 400, Table 3, the minimum lift thickness for 12.5mm when used for leveling is 1.5”. Areas were leveling of less than 1.50” thick is needed, shall be milled at variable depths to ensure the minimum lift thickness of leveling course is achieved. Limits of milling for leveling are now shown on the Demo Plan. The pay item named “Bitumionous Pavement Milling to be Hauled Off Site (Variable Depth)” is for all variable depth milling required for the project and it includes both milling required for leveling and milling required for pavement tie-in areas. This pay item is included on the schedule of work.

2. **Question:** Just a thought, On the Demo plans it calls for the removal of the existing pavement markings, it seems like a waste of money to pay to remove the existing pavement markings before you mill and/or surface treat, then repave the Runway. Couldn’t this work be eliminated to save you some money?

Answer: Please bid as shown. In areas where milling will not occur, removal of markings is proposed prior to surface treatment and overlay.

3. **Question:** For the Seal Coat (P-623) I don’t recall seeing any Special Provision P-623 in the documents, can this you

Answer: Seal Coat shall be per P-623. This specification is added to the contract documents with Addendum #3.

4. **Question:** Do you intend to leave in the Proposed Access Road (made with Millings) in place when the project is finished? Or do we need to remove it?

Answer: Yes. Proposed access road shall remain.

5. You show two Staging areas on the project, one on either end of Taxiway B.
 - a. **Question:** Are we to assume that both are required?

Answer: Staging area on the west side of the airport shall be used for Phase 1 and 2 work. The east side staging area shall be used only for phase 3.

- b. Will the expectation be that these areas are to be built of some type of Stoned Pad Area?

Answer: Staging areas shall be stabilized as needed for the contractors anticipated use. Stabilization must be provided to prevent erosion, rutting, and tracking of mud onto the adjacent haul roads and pavement and to promote positive drainage and avoid standing water. Staging areas must be returned to existing conditions and stabilized with permanent grass cover at the conclusion of construction.

- c. If the Staging Areas are to be built of some stone aggregates could you please provide the expectations for a Typical Section for them both? Of particular concern is the one on the West End of Taxiway B, it looks like we are to build a connection between the Millings Haul Road and the End of the existing Taxiway.

Answer: See previous response.

ATTACHMENTS

1. Revised Schedule of Work
2. Schedule of Work, Excel File
3. Item P-623 Emulsified Asphalt Spray Seal Coat
4. Item L-108 Underground Power Cable for Airports.
5. Item L-125 Installation of Airport Lighting Systems.

END OF ADDENDUM NO. 3

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
Bid Schedule 1: Runway Pavement Rehabilitation						
1 C-105	Add. No. 1	MOBILIZATION @ (write in words)	1	LS		
2 C-100	Add. No. 1	CONTRACTOR QUALITY CONTROL PROGRAM @ (write in words)	1	LS		
3 C-102	Add. No. 2	TEMPORARY CONSTRUCTION EXIT, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	1	EA		
3.1 C-102	Add. No. 2	TEMPORARY CONSTRUCTION EXIT WITH 18" CMP, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	1	EA		
4 C-102	Add. No. 2	TEMPORARY COMPOST FILTER SOCK, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	13,500	LF		
5 C-102	Add. No. 1	NPDES MONITORING AND TESTING @ (write in words)	7	MO		
6 C-102	Add. No. 1	NPDES PERMITS, FEES, MONITORING IMPLEMENTATION, NOI, NOT, ETC. @ (write in words)	1	LS		
7 P-101	Add. No. 2	BITUMINOUS PAVEMENT MILLING TO BE HAULED OFF SITE (VARIABLE DEPTH) @ (write in words)	33,000	SY		
7.1 P-101	Add. No. 2	PLACEMENT OF MILLINGS ON PROPOSED ACCESS ROAD (8" DEEP) @ (write in words)	1,200	SY		

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
8 P-620	Add No. 2	PAVEMENT MARKING REMOVAL @ (write in words)	17,300	SF		
9 P-104	Add No. 2	UNCLASSIFIED EXCAVATION/SHOULDER GRADING @ (write in words)	2,000	CY	\$0.00	\$0.00
10 P-152	Add. No. 1	UNDERCUT EXCAVATION AND BACKFILL @ (write in words)	1,000	CY		
11 P-152	Add. No. 1	WOVEN GEOTEXTILE @ (write in words)	2,000	SY		
12 GDOT 400	Add No. 2	ASPHALTIC CONCRETE 12.5MM SUPERPAVE LEVELING COURSE, GROUP I OR II, INCLUDING BITUMINOUS MATERIALS AND HYDRATED LIME @ (write in words)	5,500	TN		
13 GDOT 400	Add No. 2	ASPHALTIC CONCRETE 12.5MM SUPERPAVE SURFACE COURSE, GROUP I OR II, INCLUDING BITUMINOUS MATERIALS AND HYDRATED LIME @ (write in words)	6,800	TN		
14 GDOT 413	Add No. 2	BITUMINOUS TACK COAT @ (write in words)	6,100	GAL		
15 GDOT 424	Add. No. 1	SINGLE SURFACE TREATMENT, NO. 7 STONE, GROUP I OR II @ (write in words)	54,500	SY		

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
16 P-605	Add. No. 1	JOINT AND CRACK REPAIR AND SEAL @ (write in words)	35,000	LF		
17 P-620	Add. No. 1	AIRFIELD MARKINGS, TEMPORARY, TYPE II WATERBORNE YELLOW, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	5,109	SF		
18 P-620	Add. No. 1	AIRFIELD MARKINGS, TEMPORARY, TYPE II WATERBORNE WHITE, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	28,007	SF		
19 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE YELLOW, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	1,352	SF		
20 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE YELLOW, WITH REFLECTIVE MEDIA AND MICROBICIDE @ (write in words)	3,757	SF		
21 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE WHITE, WITH REFLECTIVE MEDIA AND MICROBICIDE @ (write in words)	28,007	SF		
22 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE BLACK, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	2,807	SF		
23 T-901	Add. No. 1	PERMANENT GRASSING, INCLUDING SEED, LIME, FERTILIZER, AND MULCH @ (write in words)	5.0	AC		

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
24 T-904	Add. No. 1	SODDING @ (write in words)	16,310	SY		
25 T-905	Add. No. 2	TOPSOIL DISPOSAL @ (write in words)	4,500	CY	\$0.00	\$0.00
26 T-905	Add. No. 2	TOPSOIL OBTAINED OFF-SITE (SHOULDER GRADING) @ (write in words)	2,000	CY		
26.1 T-908	Add. No. 2	TEMPORARY MULCHING @ (write in words)	5.0	AC		
26.2 L-108	Add. No. 3	REMOVAL OF EXISTING CABLE @ (write in words)	15,000	LF		
26.3 L-108	Add. No. 3	INSTALLATION OF NEW NO. 8 AWG, 5KV, L-824, TYPE C CABLE, INSTALLED IN TRENCH, DIRECT EARTH BURIED OR CONDUIT @ (write in words)	15,000	LF		
26.4 L-108	Add. No. 3	INSTALLATION OF NEW L-830 ISOLATION TRANSFORMER @ (write in words)	53	EA		
26.5 L-108	Add. No. 3	INSTALLATION OF NEW L-823 CABLE SPLICE CONNECTOR KIT, COMPLETE @ (write in words)	20	EA		
26.6 L-108	Add. No. 3	INSTALLATION OF NEW CU CLAD GROUND ROD, 10' X 3/4" @ (write in words)	20	EA		
27 L-125	Add. No. 3	ADJUST STAKE MOUNTED LIGHT @ (write in words)	25	EA		

Schedule of Work

Addendum No. 3
4/19/2022

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
27.1 L-125	Add No. 3	ADJUST BASE MOUNTED LIGHT @ (write in words)	28	EA		
TOTAL SCHEDULE 1 BID: \$						

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
Bid Schedule 2: Taxiway Pavement Rehabilitation						
28 C-105	Add. No. 1	MOBILIZATION @ (write in words)	1	LS		
29 C-100	Add. No. 1	CONTRACTOR QUALITY CONTROL PROGRAM @ (write in words)	1	LS		
30 C-102	Add. No. 3	TEMPORARY CONSTRUCTION EXIT, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	4	EA	\$0.00	\$0.00
31 C-102	Add. No. 2	TEMPORARY COMPOST FILTER SOCK, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	1,820	LF		
32 C-102	Add. No. 1	NPDES MONITORING AND TESTING @ (write in words)	1	MO		
33 C-102	Add. No. 2	NPDES PERMITS, FEES, MONITORING- IMPLEMENTATION, NOI, NOT, ETC. @ (write in words)	4	LS	\$0.00	\$0.00
34 P-101	Add. No. 1	BITUMINOUS PAVEMENT MILLING TO BE HAULED OFF SITE (VARIABLE DEPTH) @ (write in words)	400	SY		
35 P-620	Add. No. 3	PAVEMENT MARKING REMOVAL @ (write in words)	404	SF		
36 P-152	Add. No. 2	UNCLASSIFIED EXCAVATION/SHOULDER GRADING @ (write in words)	400	CY	\$0.00	\$0.00

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
37 GDOT 400	Add. No. 2	ASPHALTIC CONCRETE 12.5MM SUPERPAVE SURFACE COURSE, GROUP I OR II, INCLUDING BITUMINOUS MATERIALS AND HYDRATED LIME @ (write in words)	500	TN		
38 GDOT 413	Add. No. 1	BITUMINOUS TACK COAT @ (write in words)	600	GAL		
39 GDOT 424	Add. No. 1	SINGLE SURFACE TREATMENT, NO. 7 STONE, GROUP I OR II @ (write in words)	3,500	SY		
40 P-605	Add. No. 1	JOINT AND CRACK REPAIR AND SEAL @ (write in words)	3,000	LF		
41 P-620	Add. No. 1	AIRFIELD MARKINGS, TEMPORARY, TYPE II WATERBORNE YELLOW, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	381	SF		
42 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE YELLOW, WITH REFLECTIVE MEDIA AND MICROBICIDE @ (write in words)	381	SF		
43 T-901	Add. No. 1	PERMANENT GRASSING, INCLUDING SEED, LIME, FERTILIZER, AND MULCH @ (write in words)	1.0	AC		
44 T-904	Add. No. 1	SODDING @ (write in words)	2,000	SY		
45 T-905	Add. No. 2	TOPSOIL DISPOSAL @ (write in words)	400	CY	\$0.00	\$0.00

Schedule of Work

Addendum No. 3
4/19/2022

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
46 T-905	Add. No. 2	TOPSOIL OBTAINED OFF-SITE (SHOULDER GRADING) @ (write in words)	100	CY		
46.1 T-908	Add. No. 2	TEMPORARY MULCH @ (write in words)	1.0	AC		
47 L-125	Add. No. 2	MODIFY EXISTING RUNWAY AND TAXIWAY EDGE-LIGHTS @ (write in words)	1	EA	\$0.00	\$0.00

TOTAL SCHEDULE 2 BID: \$ _____

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
Bid Schedule 3: Parallel Taxiway Seal Coat and Remark						
48 C-105	Add. No. 1	MOBILIZATION @ (write in words)	1	LS		
48.1 C-102	Add. No. 2	TEMPORARY CONSTRUCTION EXIT, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	1	EA		
48.2 C-102	Add. No. 2	TEMPORARY COMPOST FILTER SOCK, INCLUDING INSTALLATION, MAINTENANCE, AND REMOVAL @ (write in words)	500	LF		
49 P-620	Add. No. 3	PAVEMENT MARKING REMOVAL @ (write in words)	2,368	SF		
50 P-605	Add. No. 1	JOINT AND CRACK REPAIR AND SEAL @ (write in words)	13,200	LF		
51 P-620	Add. No. 1	AIRFIELD MARKINGS, TEMPORARY, TYPE II WATERBORNE YELLOW, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	2,339	SF		
52 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE YELLOW, NON-REFLECTIVE WITH MICROBICIDE @ (write in words)	93	SF		
53 P-620	Add. No. 1	AIRFIELD MARKINGS, PERMANENT, TYPE II WATERBORNE YELLOW, WITH REFLECTIVE MEDIA AND MICROBICIDE @ (write in words)	2,247	SF		
54 P-623	Add. No. 1	SEAL COAT @ (write in words)	16,203	SY		

Item No. & Spec.	Addendum	Description and Unit Price in Words	Quantity	Unit	Unit Price	Extended Total
54.1 T-901	Add. No. 2	PERMANENT GRASSING, INCLUDING SEED, LIME, FERTILIZER, AND MULCH @ (write in words)	1.0	AC		

TOTAL SCHEDULE 3 BID: \$ _____

TOTAL SCHEDULE 1 + 2 BID: \$ _____

TOTAL SCHEDULE 1 + 2 + 3 BID: \$ _____

The Owner reserves the right to award and/or reject any or all schedules of work.

CONTRACT TIME

- PHASE 1 & 2: 105 CALENDAR DAYS
- PHASE 3: 10 CALENDAR DAYS

LIQUIDATED DAMAGES

- PHASE 1 & 2: \$1,000 PER CALENDAR DAY
- PHASE 3: \$1,000 PER CALENDAR DAY

DBE GOAL: 25.7%

ITEM P-623
EMULSIFIED ASPHALT SPRAY SEAL COAT

DESCRIPTION

623-1.1 This item shall consist of the application of a polymer modified, asphalt emulsion spray seal coat (seal coat) composed of an emulsion of binders prepared from crude petroleum, mineral fillers, water and polymer, applied to an existing, previously prepared asphalt surface. The seal coat shall be applied in accordance with these specifications, and as shown on the plans or as directed by the ENGINEER.

623-1.2 Application rate per square yard (square meter). The approximate amounts of seal coat per square yard (square meter) for the spray seal will be applied as provided in the Application Rate Table. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative and approved by the ENGINEER from the test area/sections evaluation.

Application Rate

	3-coat application (gal/yd²)
1st Coat	0.14 - 0.20
2nd Coat	0.10 - 0.20
3rd Coat	0.08 - 0.15
Total Application	0.30 – 0.55

MATERIALS

623-2.1 Polymer modified asphalt emulsion spray seal (seal coat). A seal coat fortified with fillers created from binders prepared from crude petroleum shall meet the properties in the following table:

Polymer Modified Asphalt Emulsion Spray Seal Properties¹

Property	Characteristics	
	Minimum	Maximum
Density at 77°F (25°C), lb./gal (g/mL)	9 (1.0)	12 (1.5)
Residue by evaporation, %	44	...
Water content, %	...	56
Ash content of residue, %	30	40
Uniformity	Uniform homogeneous consistency.	
Wet film continuity	No separation, coagulation, or settlement that cannot be overcome by moderate agitation.	
Resistance to heat	No blistering, sagging, or slipping.	
Resistance to water	No loss of adhesion and no blistering or tendency to re-emulsify.	
Flash point	No tendency to flash.	
Flexibility	No flaking, cracking, or loss of adhesion to the substrate.	
Polymer modification	Minimum 3% by weight of asphalt binder.	

¹ For water content testing, use ASTM Test Method D95. For flash point testing, use ASTM Test Method D93. For other properties, use AASHTO T 59 and T 111..

The Contractor shall provide a copy of the manufacturer’s Certificate of Analysis (COA) for material delivered to the project. If the asphalt emulsion is diluted at other than the manufacturer’s facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties. The COA shall be provided to and approved by the ENGINEER before material is applied. The furnishing of the vendor’s certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer’s COA may be subject to verification by testing the material delivered for use on the project.

623-2.2 Polymer modification. The type of polymer used for modification shall be chosen by the manufacturer. The polymer modifier shall be incorporated in the manufacturing process. The Contractor shall submit manufacturer’s technical data, the manufacturer’s certification indicating that the polymer meets the requirements of the specification, and the manufacturer’s approval of its use to the ENGINEER. The amount of polymer will be a minimum 3% of the weight of the asphalt binder in the seal coat surface treatment.

623-2.3 Water. Water used in mixing or curing shall be from potable water sources, free of harmful soluble salts, and at least 50°F (10°C). Other sources shall be tested in accordance with ASTM C1602 prior to use.

623-2.4 Friction characteristics. The Contractor shall submit to the ENGINEER friction tests, from previous airport projects which used the emulsified asphalt spray seal coat in a similar environment, in accordance with AC 150/5320-12, at 40 mph wet, showing, as a minimum; friction value of pavement surface prior to sealant application; two values, tested between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value tested at no less than 180 days or greater than 360 days after the application. The results of the two tests between 24 and 96 hours shall indicate friction is increasing

at a rate to obtain similar friction value of the pavement surface prior to application, and the long-term test shall indicate no apparent adverse effect with time relative to friction values and existing pavement surface. The Contractor shall submit to the ENGINEER a list of airports which meet the above requirements, as well as technical details on application rates, aggregate rates, and point of contact at these airports to confirm use and success of sealer. Friction tests shall be submitted from no less than one of the airports on the list and each set of tests described above, must be from one project.

Submittals without the required friction performance will not be approved. Friction tests performed on this project cannot be used as a substitute of this requirement.

CONSTRUCTION METHODS

623-4.1 Worker safety. The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt sealer product and aggregate and require workmen to follow the manufacturer's recommended safety precautions. All additional industry standard safety precautions regarding the storage and applications of asphalts should be understood and followed by the Contractor.

623-4.2 Control strip. Prior to full production the Contractor shall construct a control strip, a minimum of 250 square yards. The test area will be designated by the ENGINEER in an area representative of the project. The control strip will determine the application rate to be used as well as to demonstrate the equipment and placement methods to be used. If the control strip should prove to be unsatisfactory, the necessary adjustments to the mix composition, application rate, placement operations and equipment shall be made. Additional control strips shall be placed and evaluated if required. Full production shall not begin without the ENGINEER's approval of an appropriate application rate. Acceptable control strips shall be paid for in accordance with paragraph 623-8.1.

623-4.3 Weather limitations. The spray seal shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or the humidity will not allow proper curing, or when the wind velocity will prevent the uniform application of the material. No material shall be applied when dust or sand is blowing or when rain is anticipated within eight (8) hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be above 50°F (10°C) and rising and is expected to remain above 50°F (10°C) for 24 hours, unless otherwise directed by the ENGINEER. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should emulsion get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the ENGINEER, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

623-4.3 Equipment and tools. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work. Equipment used to apply the seal coat shall have continuous agitation or mixing capabilities to maintain homogeneous consistency of the seal coat throughout the application process. Spray equipment shall be capable of mixing and spraying seal coat with aggregate added. Self-propelled squeegee equipment with mixing capability shall have at least two squeegee or brush devices (one behind the other) to ensure adequate distribution and penetration of seal coat surface treatment into pavement surface. Hand squeegees and brushes shall be acceptable in areas where practicality prohibits the use of mechanized equipment. A power broom or blower may be used for removing loose material from the surface to be treated.

623-4.4 Preparation of asphalt pavement surfaces. Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

Remove oil or grease by scrubbing with a detergent, then wash thoroughly with clean water. Any additional surface preparation, such as crack repair, shall be in accordance with Item P-101, paragraph 101-3.6.

623-4.5 Emulsion mixing.

Contractor must ensure the mixture is homogeneous with no balling or lumping. Continue to agitate the seal coat mixture in the mixing tank at all times prior to and during application so that a consistent mix is available for application. Small additional increments of water may be needed to provide a workable consistency, but in no case is the water content to exceed the specified amount.

623-4.6 Application of seal coat. Application of seal coat generally consists of two application coats of material. The first coat must be dry prior to the application of the second coat or subsequent coats if more than two coats are being applied. During all applications, the surfaces of adjacent structures shall be protected to prevent their being spattered or marred. Should the seal coat get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the ENGINEER, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

Traffic shall not be allowed until the seal coat has thoroughly cured for approximately 24 hours.

If low spots and depressions greater than 1/2 inch (12 mm) in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be broomed with a broom drag. Brooming shall continue until the pavement surface is free of any pools of excess material. The ENGINEER shall inspect and approve areas after brooming.

623-4.7 Freight and weigh bills. The Contractor shall submit waybills and delivery tickets during the progress of the work. Before the final estimate is allowed, file with the ENGINEER certified waybills and certified delivery tickets for all seal coat used in the construction of the pavement covered by the contract. Do not remove seal coat from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

QUALITY CONTROL (QC)

623-5.1 Contractor qualifications. The Contractor shall furnish a certification demonstrating a minimum of three years of experience in the application of seal coats.

623-5.2 Sampling. A minimum of one sample per day shall be tested as specified in the table in paragraph 623-2.1. A random sample of approximately one-quart of the composite mix from the onsite storage tank will be obtained daily by the Contractor in the presence of the owner's representative and stored in a proper container. The containers shall be sealed against contamination and retained in storage by the Owner for a period of six months. Samples shall be stored at room temperature and not be subjected to freezing temperatures.

A sample of undiluted asphalt emulsion shall be obtained from each consignment shipped to the job.

MATERIAL ACCEPTANCE

623-6.1 Application rate. The rate of application of the asphalt emulsion shall be verified at least twice per day. The Contractor must furnish the ENGINEER the results daily.

METHOD OF MEASUREMENT

623-7.1 Asphalt seal coat. The quantity of seal coat shall be measured by the square yards of material applied in accordance with the plans and specifications and accepted by the ENGINEER.

BASIS OF PAYMENT

623-8.1 Payment shall be made at the contract unit price per square yard for the seal coat applied and accepted by the ENGINEER. This price shall be full compensation for all surface preparation, furnishing all materials, delivery and application of these materials, for all labor, equipment, tools, and incidentals necessary to complete the item control strip.

Payment will be made under:

Item P-623-8.1	Seal Coat – per square yard
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D93	Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
ASTM D95	Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation
ASTM D2939	
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys

Advisory Circulars (AC)

AC 150/5380-7	Airport Pavement Management Program (PMP)
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Code of Federal Regulations (CFR)

29 CFR 1910.1200	Occupational Safety and Health Standards, Toxic and Hazardous Substances, Hazard Communication
40 CFR	– Protection of Environment.

END OF ITEM P-623

ITEM L-108
UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

EQUIPMENT AND MATERIALS

108-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits

and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be copper. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet long and 3/4 inch in diameter.

108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.

b. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

c. The factory-molded plug-in splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The taped or heat-shrink splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete shall be proportioned, placed, and cured per state department of transportation structural concrete with minimum 25% Type F fly ash, and a minimum allowable compressive strength of 4,000 psi.

108-2.7 Flowable backfill. Not used.

108-2.8 Cable identification tags. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 Tape. Electrical tapes shall be Scotch™ Electrical Tapes - Scotch™ 88 (1-1/2 inch wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall

record the results on forms acceptable to the Engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the Engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing 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 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

CONSTRUCTION METHODS

108-3.1 General. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 Installation of direct-buried cable in trenches. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching

equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches below finished grade per NEC Table 300.5, except as follows:

- When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches unless otherwise specified.
- Minimum cable depth when crossing under a railroad track, shall be 42 inches unless otherwise specified.

The Contractor shall excavate all cable trenches to a width not less than 6 inches. Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. Flowable backfill material may alternatively be used.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall encompass all cables; be 3 inches deep, loose measurement; and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. This layer shall not be compacted. The second layer shall be 5 inches deep, loose measurement, and shall contain no particles that would be retained on a one inch sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent material. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be to a minimum of 100 percent of ASTM D1557.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the direct-buried cable or the counterpoise wire if present. A 3-6 inch wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inches minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling, fertilizing, liming, seeding, and mulching as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be to a minimum of 100 percent of ASTM D1557. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 Cable markers for direct-buried cable. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet square and 4-6 inch thick, extending approximately one inch above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches high and 3 inches wide, with width of stroke 1/2 inch and 1/4 inch deep. Stencils shall be used for cable marker lettering; no hand lettering shall be permitted.

At the location of each underground cable connection/splice, except at lighting units, or isolation transformers, a concrete marker slab shall be installed to mark the location of the connection/splice. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the Engineer. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the Engineer.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches on each side of the joint. (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminants prior to application.

e. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

a. Equipotential. The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches minimum or 12 inches maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

b. Isolation Counterpoise size is selected by the Engineer. The isolation method is an alternate method for use only with edge lights installed in turf and stabilized soils and raceways installed parallel to and adjacent to the edge of the pavement. NFPA 780 uses 15 feet to define “adjacent to”.

The counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable being protected.

The counterpoise conductor shall be installed 8 inches minimum below grade. The counterpoise is not connected to the light base or mounting stake. An additional grounding electrode is required at each light base or mounting stake. The grounding electrode is bonded to the light base or mounting stake with a 6 AWG solid copper conductor.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Isolation Method of lightning protection.

c. Common Installation requirements. When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

d. Parallel Voltage Systems. Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the Engineer. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 100 megohms. Verify continuity of all series airfield lighting circuits prior to energization.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack.

L-108-11

108-4.3 The cost of ground rods and their installation shall be included in the unit price for counterpoise pay item.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-1	Removal of Existing Cable – per linear foot
Item L-108-2	Installation of New No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Direct Earth Buried or Conduit – per liner foot
Item L-108-3	Installation of New L-830 Isolation Transformer – per each
Item L-108-4	Installation of New L823 Cable Splice Connector Kit, Complete – per each
Item L-108-5	Installation of New CU Clad Ground Rod, 10' x ¾" – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes

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ASTM D4388 Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

Mil Spec

MIL-PRF-23586F Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical

MIL-I-24391 Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

NFPA-780 Standard for the Installation of Lightning Protection Systems

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

FAA STD-019E Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment

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ITEM L-125

INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with the current version of AC 150/5345-53, Appendices 3 and 4. FAA certified airfield lighting components shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not perform as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for it to operate properly.

b. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the ENGINEER and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The Engineer reserves the right to reject any or all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

125-2.2 Conduit/Duct. Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

125-2.3 Cable and Counterpoise. Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

125-2.4 Tape. Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

125-2.5 Cable Connections. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.6 Retroreflective Markers. Not required.

125-2.7 Runway and Taxiway Lights. Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type to match existing, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

125-2.8 Runway and Taxiway Signs. Not required.

125-2.9 Runway End Identifier Light (REIL). Not required.

125-2.10 Precision Approach Path Indicator (PAPI). Not required.

125-2.11 Circuit Selector Cabinet. Not required.

125-2.12 Light Base and Transformer Housings. Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light bases shall be Type L-867, Class 1A, Size B, shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.13 Isolation Transformers. Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47.

INSTALLATION

125-3.1 Installation. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

125-3.2 Testing. All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

125-3.3 Shipping and Storage. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the Engineer, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer’s recommendations.

125-3.4 Elevated and In-pavement Lights. Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

METHOD OF MEASUREMENT

125-4.1 The runway and taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the Engineer.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete runway or taxiway light adjustment, ~~guidance sign, reflective marker, runway end identification light, precision approach path indicator, or abbreviated precision approach path indicator~~ installed by the Contractor and accepted by the RPR. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

- L-125-2 Base Mounted Edge Light Adjustment– per each
- L-125-3 Stake Mounted Edge Light Adjustment– per each

L-125-3

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series-to-Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program

Engineering Brief (EB)

EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures
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