JVIATION®
A WOOLPERT COMPANY

August 12, 2022

To: Plan Holders for Improvements to the
Rosecrans Memorial Airport
St. Joseph, Missouri
MoDOT Project No. 21-012A-2

Transmitted herewith is Addendum **No. 2** to the Issued for Bid Contract Documents, Specifications and Plans dated June 30, 2022, for Improvements to the Rosecrans Memorial Airport.

Schedule I – Reconstruct Runway 17/35
Schedule II – Relocate Vehicle Service Road Outside Object Free Area
Schedule III – Rehabilitate Taxiway D
Schedule IV – Install New FAA NAVAID Equipment

As a reminder, bids are due Tuesday, **August 16, 2022** at 2:00 PM.

Sincerely,

Jviation, A Woolpert Company

Kevin Scherr.
Project Manager

Main 816.243.1322
12200 NW Ambassador Drive | Suite 610 | Kansas City, MO | 64163
JVIATION.COM

ADDENDUM NO. 2
TO
CONTRACT DOCUMENTS, SPECIFICATIONS AND PLANS
FOR IMPROVEMENTS TO THE
ROSECRANS MEMORIAL AIRPORT
ST. JOSEPH, MISSOURI
MODOT PROJECT NO. 21-012A-1

To All Bidders: You are requested to make all changes and/or additions contained in this addendum to the Bidding Documents. Failure to acknowledge this Addendum in Proposal shall result in rejection of bid. Bidders are informed that the above referenced Contract Documents, Specifications and Plans are modified as follows as of August 12, 2022:

1. CONTRACT DOCUMENTS/SPECIFICATIONS

Contract Documents.

Sections: Bid Proposal

Revision: Quantities were updated for pavement markings, 14-inch Concrete Pavement, 9-inch Concrete Pavement, storm drain pipe and airfield signage. Items P-501a, P-501b, P-5016c, P-620c, P-705a, L-125g, L-125h, L-125i, and L-125j were modified.

Justification: Quantities were updated to reflect changes to the drawings.

Specifications.

Sections: L-107 Airport Wind Cones

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-108 Underground Power Cable for Airports

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-110 Airport Underground Electrical Duct Banks and Conduits

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-115 Electrical Manholes and Junction Structures

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-125 Installation of Airport Lighting Systems

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

2. PLANS

Sheet No.: G050 (17 of 216)
Title: CONSTRUCTION SAFETY NOTES AND DETAILS
Revision: Revised the first sentence in Section 2. "-THIS PROJECT CONSISTS OF FIVE PHASES. SEE CONSTRUCTION SAFETY DRAWINGS FOR PHASING REQUIREMENTS."
Justification: Updated number of phases in the project.

Sheet No.: G060 (28 of 216)
Title: TEMPORARY RELOCATED THRESHOLD DETAILS
Revision: Updated notes that called out threshold paint quantities.
Justification: Updated threshold paint quantities.

Sheet No.: E200 (186 of 216)
Title: ELECTRICAL PLAN STA. 14+20.00 TO STA. 22+00.00 RUNWAY 17/35
Revision: Note for REIL installation was added.
Justification: Note was added to clarify REIL installation.

Sheet No.: E202 (188 of 216)
Title: ELECTRICAL PLAN STA. 29+80.00 TO STA. 37+60.00 RUNWAY 17/35
Revision: Note for PAPI installation was added.
Justification: Note was added to clarify PAPI installation.

Sheet No.: E204 (190 of 216)
Title: ELECTRICAL PLAN STA. 45+50.00 TO STA. 53+20.00 RUNWAY 17/35
Revision: Duct was moved and added. Notes to protect utilities were added.
Justification: Duct was moved and added for future vault relocation. Notes were added to show protecting existing utilities.

Sheet No.: E209 (195 of 216)
Title: ELECTRICAL PLAN STA. 84+40.00 TO STA. 92+20.00 RUNWAY 17/35
Revision: Note for PAPI installation was added.
Justification: Note was added to clarify PAPI installation.

Sheet No.: E211 (197 of 216)
Title: ELECTRICAL PLAN STA. 100+20.00 TO STA. 107+80.00 RUNWAY 17/35
Revision: Note for REIL installation was added.
Justification: Note was added to clarify REIL installation.

Sheet No.: E266 (214 of 216)
Title: FAA PAPI DETAILS REFERENCE SHEET 009
Revision: Sheet was added in its entirety.

Justification: Plan sheet shows additional wiring for the FAA supplied PAPIs.

Sheet No.: E267 (215 of 216)
Title: L-858 GUIDANCE SIGN TABLE
Revision: Sheet was added in its entirety.
Justification: Plan sheet shows the sign table for the L-858 signs.

Sheet No.: E268 (216 of 216)
Title: L-858 GUIDANCE SIGN LAYOUT PLAN
Revision: Sheet was added in its entirety.
Justification: Plan sheet shows locations for the L-858 guidance signs.

3. QUESTIONS

1. **Would a P-219 Specification be considered in lieu of the P-209 Specification for the 6" Agg Base Layer?**
    a. *P-209 is the only material allowed. Crushed concrete from the project is not to be utilized as base course.*
2. **Will the contractor be required to provide compaction testing for embankments, agg base, CTB, etc. in addition to the RPR QA compaction testing for this project?**
    a. *As a part of the quality control plan, the contractor is responsible for outlining how they intend to meet the specifications and the actions they will take if material does not meet the specifications. The RPR will provide QA on these materials, once the contractor ensures the RPR the material is within specification.*
3. **Items C-102a "Temporary Air & Water Pollution, Soil Erosion and Siltation Control is a Bid Item of 1 Lump Sum. However it says the work will be measured as described in section 102-4.1 (items a. thru e.). These items all have units. Can you provide information if these items are installed that the contractor will be paid by units installed. Will these items if needed be added by change order since they are as directed by the Engineer?**
    a. *The contractor is to provide a lump sum cost for providing temporary air & water pollution. The plans show a minimum amount of BMPs based on the work associated with the project. If additional BMPs are needed due to the contractors means and methods, these items will be directed by the RPR. The contractor is responsible for maintaining BMP's throughout the project.*
4. **Can clarification be made on how the earthwork quantities will be paid in reference to the table on sheet G005?**
    a. *The dirt table shows that a net of 30,225 cubic yards of embankment is needed on this project. T-905a pays the contractor to import the needed material for the project. As discussed in addendum no. 1, this material does not need to be typical topsoil material, rather meet safety area grading requirements in terms of no rocks.*
5. **Sheet G003A general note 17 states topsoiling will not be paid for re-handling, however there is not a bid item for it to be paid when you remove and stockpile. Can clarification be made if the topsoil quantities are included in your earthwork calculations on sheet G005. If they are not, will a bid item be added for topsoiling that would be separate from your import topsoil bid item.**
    a. *Topsoil will be paid as embankment material. The quantity is included in the quantity of P-152a embankment.*
6. **Would Type IL be acceptable in lieu of Type I or II?**
    a. *Type IL is acceptable for the cement.*
7. **Can the 24-inch Cement Treated Subgrade be constructed in multiple lifts, or does it have to be constructed in one lift?**
    a. *It is anticipated that the P-156 Cement Treated Subgrade will be constructed in two lifts. If possible to construct in one lift, this would be our preference.*

8. **Can you clarify the removal of the 30" RCP? Plans have two bid items one for 1,200 LF and another for 600 LF.**
    a. *The 600 LF Bid item was removed from the bid form.*
9. **Is the intent to pay the two 30" RCP as a double run or should the quantity be 1,200 LF?**
    a. *The P-701b quantity was updated to show 1,200 lf of 30" RCP*
10. **Can you provide clarification for tying the 30-inch RCP into the existing structure?**
    a. *The existing structure is a 60" box culvert. The contractor may need to core into the side of the box culvert for the second 30" pipe as it was not found in exploration of the box culvert.*
11. **What are the backfill requirements for storm pipes under pavement?**
    a. *The backfill material will need to meet the requirements of P-152 embankment under pavement until they reach the bottom of subgrade in which case the backfill will have to meet subgrade density and/or P-156 will be utilized.*
12. **Typical section for the ANG apron is 14-inches. Is there a pay item for this?**
    a. *A new bid item P-501b for 14-inch concrete and P-501c for 9-inch concrete was added to the bid form.*
13. **Can an electric form be provided for bidding purposes?**
    a. *An electric bidding form will not be provided for bidding. If the contractor uses a different form then what is provided, they are responsible for any error that may disqualify their bid.*
14. **Grading Plans Sheet C306 have a match line showing additional grading on C307. C307 is not a continuation. Is a sheet missing?**
    a. *Grading finishes roughly at sta. 107+00 and another sheet is not needed. There should not be a match line on sheet C306.*
15. **What is the size that concrete rubble needs to be broken down to be used for the P-218a pay item?**
    a. *Concrete Rubble should be broken down to 8-inch minus material to allow for the material to alleviate voids in the material.*
16. **Can additional material be placed in Browning Lake?**
    a. *The contractor can work with the RPR to place additional material in Browning Lake if approved environmentally. For bidding purposes, assume material will be disposed off-site.*
17. **What are the limits for the overexcavation pay item?**
    a. *Overexcavation is to utilized in areas where subgrade material is not suitable. This quantity is a contingency line item and may not be needed on the project*
18. **Will the contractor be able to drive over the stabilization fabric?**
    a. *The contractor is responsible for their means and methods. If damage to the stabilization fabric occurs from the contractors operations, the contractor may be notified to cease operations.*
19. **Will the contractor be able to drive over the stabilization fabric?**
    a. *The contractor is responsible for their means and methods. If damage to the stabilization fabric occurs from the contractors operations, the contractor may be notified to cease operations..*
20. **RE: Technical Specification P-304-5.6 PLACING: The second sentence says "The longitu dinal joints shall be located so there is no offset from planned joints in any overlying layer. "This is counter to other FAA Projects in this region we have constructed over the past 20 years. In these cases the longitudinal construction joint for the CTB layer is purposely not allowed to align with the longitudinal pavement joints above. Additionally, this project by design requires 30' wide paving lanes. The equipment typically used for placing CTB will only place a maximum width of 29'. Please review and consider changing this to a minimu m offset of 2' (An allowed option in FAA AC 150/5370-10H).**
    a. *This will be reviewed and looked at after the bid. For bidding purposes please bid it as it reads in the specification.*
21. **Will the contractor be allowed to open the pavement to traffic before 7 days if the test result show the pavement has reached a flexural strength of 450 psi or more?**

a. *The contractor may open the pavement to traffic if the contractor has proof the pavement is over 450 psi. If the contractor elects not to take additional beams to break early, 7 days is the minimum cure time prior to opening to traffic.*

22. **A lot will consist of a day's production not to exceed 2,000 cubic yards" and "will be divided…into sublots between 400 -600 cubic yards". This project will have many days that will exceed 2,000 cubic yards per day, but not by a large amount. Is it possible to modify this to a lot size of 2,300 CY/ Day with 5 Sublots?**
    a. *The specification allows for partial lots to be added to previous lots. It is possible some lots will exceed 2,000 lots. Sublots still need to be between 400-600 cubic yards.*
23. **Sheet G007, general note 7. SWMP Requirements? Can this be clarified.**
    a. *The Engineer and city are responsible for the SWPP. The contractor must adhere to those items in the plan which are required by the SWPP. This is paid under item C-102a,*
24. **Sheet G007, general note 8. Penalty for Violations? Can this be clarified.**
    a. *If the contractor elects not to follow the SWPP as directed by the RDR and there are penalties assessed to the project, these penalties will be transferred to the Contractor.*
25. **Sheet G050, Note 2. Phasing says the project consists of 7 phases, sheet G051 shows 5 phases. Can this be clarified.**
    a. *There are only five phases. This has been corrected.*
26. **Bid Item D-701a Install 24" RCP has a bid quantity of 1185 lf, there is 1300 lf in the plans. Can this be clarified.**
    a. *This has been updated in the bid documents.*
27. **Sheet G003A – Utilities Note 1 third paragraph "It shall be the responsibility of the contractor to relocate all existing utilities that conflict with the proposed improvements shown on these plans" Could this be clarified if the Contractor is responsible for coordination or if the contractor is responsible for the costs. Can more information be provided that identifies what if any utilities need to be moved.**
    a. *Please refer to sheets C580-C583 for utilities that may need to be adjusted with this project.*
28. **Do the low profile barricades need to be water filled?**
    a. *Low profile barricades need to be weighted down. Water is one was to complete this.*
29. **Are the Runway Closure X's required to be lighted?**
    a. *Yes they are to be lighted. The contractor is responsible for maintaining the lighted X's including replacing light bulbs through the duration of the project.*
30. **I am not finding 132,000 SF of black, is black paint being applied to the temporary coat?**
    a. *This quantity was updated. Temporary markings will receive a black outline*
31. **I am not finding 48,300 SF of white, of white on the displaced threshold. I have the end bar, threshold, number 35, (5) arrow heads, and (1) arrow tail. Am I missing any markings on this?**
    a. *This sheet was updated. The markings for the displaced threshold will be paid as temporary markings.*

**** END OF ADDENDUM NO. 2****

ADDENDUM NO. 2
TO
CONTRACT DOCUMENTS, SPECIFICATIONS AND PLANS
FOR IMPROVEMENTS TO THE
ROSECRANS MEMORIAL AIRPORT
ST. JOSEPH, MISSOURI
MODOT PROJECT NO. 21-012A-1

To All Bidders: You are requested to make all changes and/or additions contained in this addendum to the Bidding Documents. Failure to acknowledge this Addendum in Proposal shall result in rejection of bid. Bidders are informed that the above referenced Contract Documents, Specifications and Plans are modified as follows as of August 12, 2022:

1. CONTRACT DOCUMENTS/SPECIFICATIONS

Contract Documents.

Sections: Bid Proposal

Revision: Quantities were updated for airfield signage. Items L-125g, L-125h, L-125i, and L-125j were modified.

Justification: Quantities were updated to reflect changes to the drawings.

Specifications.

Sections: L-107 Airport Wind Cones

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-108 Underground Power Cable for Airports

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-110 Airport Underground Electrical Duct Banks and Conduits

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-115 Electrical Manholes and Junction Structures

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

Specifications.

Sections: L-125 Installation of Airport Lighting Systems

Revision: Specification was added in its entirety.

Justification: Specification was omitted from the original Issued for Bid specifications.

2. PLANS

Sheet No.: E200 (186 of 216)
Title: ELECTRICAL PLAN STA. 14+20.00 TO STA. 22+00.00 RUNWAY 17/35
Revision: Note for REIL installation was added.
Justification: Note was added to clarify REIL installation.

Sheet No.: E202 (188 of 216)
Title: ELECTRICAL PLAN STA. 29+80.00 TO STA. 37+60.00 RUNWAY 17/35
Revision: Note for PAPI installation was added.
Justification: Note was added to clarify PAPI installation.

Sheet No.: E204 (190 of 216)
Title: ELECTRICAL PLAN STA. 45+50.00 TO STA. 53+20.00 RUNWAY 17/35
Revision: Duct was moved and added. Notes to protect utilities were added.
Justification: Duct was moved and added for future vault relocation. Notes were added to show protecting existing utilities.

Sheet No.: E209 (195 of 216)
Title: ELECTRICAL PLAN STA. 84+40.00 TO STA. 92+20.00 RUNWAY 17/35
Revision: Note for PAPI installation was added.
Justification: Note was added to clarify PAPI installation.

Sheet No.: E211 (197 of 216)
Title: ELECTRICAL PLAN STA. 100+20.00 TO STA. 107+80.00 RUNWAY 17/35
Revision: Note for REIL installation was added.
Justification: Note was added to clarify REIL installation.

Sheet No.: E266 (214 of 216)
Title: FAA PAPI DETAILS REFERENCE SHEET 009
Revision: Sheet was added in its entirety.
Justification: Plan sheet shows additional wiring for the FAA supplied PAPIs.

Sheet No.: E267 (215 of 216)
Title: L-858 GUIDANCE SIGN TABLE
Revision: Sheet was added in its entirety.
Justification: Plan sheet shows the sign table for the L-858 signs.

Sheet No.: E268 (216 of 216)
Title: L-858 GUIDANCE SIGN LAYOUT PLAN
Revision: Sheet was added in its entirety.
Justification: Plan sheet shows locations for the L-858 guidance signs.

**** END OF ADDENDUM NO. 2****

BID PROPOSAL SUMMARY

Bidder Name: _____

SCHEDULE I TOTAL	$	_____
SCHEDULE II TOTAL	$	_____
SCHEDULE III TOTAL	$	_____
SCHEDULE IV TOTAL	$	_____
TOTAL ALL SCHEDULES	$	_____

Bidder has examined the proposed site and is familiar with all site conditions.

_____

Signature

SCHEDULE I						
Item No.	**Description**		**Units**	**Estimated Quantity**	**Unit Price**	**Total**
C-100a	Contractor Quality Control Program (CQCP)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-102a	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-105a	Mobilization (10% Maximum)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
P-101a	Full Depth Concrete Removal	at the unit price of: _____ dollars and _____ cents.	SY	152,000	$	$
P-101b	Full Depth Asphalt Removal	at the unit price of: _____ dollars and _____ cents.	SY	5,500	$	$
P-101c	Partial Depth Asphalt Removal (Profile Mill)	at the unit price of: _____ dollars and _____ cents.	SY	675	$	$
P-101d	Remove Existing 30" Reinforced Concrete Pipe	at the unit price of: _____ dollars and _____ cents.	LF	1,200	$	$
P-101e	Remove 4'x27' Concrete Pad - Complete	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
P-101f	Remove Miscellanous Concrete Pad	at the unit price of: _____ dollars and _____ cents.	EA	4	$	$
P-152a	Embankment	at the unit price of: _____ dollars and _____ cents.	CY	35,000	$	$
P-152b	Overexcavation and Replacement	at the unit price of: _____ dollars and _____ cents.	CY	15,600	$	$
P-156a	Cement-Treated Subgrade - 24 Inches	at the unit price of: _____ dollars and _____ cents.	SY	142,000	$	$
P-156b	Cement-Treated Subgrade - 12 Inches	at the unit price of: _____ dollars and _____ cents.	SY	11,500	$	$
P-156c	Class C Cement - 6%	at the unit price of: _____ dollars and _____ cents.	TON	12,400	$	$
P-209a	6-Inch Crushed Aggregate Base Course	at the unit price of: _____ dollars and _____ cents.	CY	25,600	$	$
P-209b	Stabilization Fabric	at the unit price of: _____ dollars and _____ cents.	SY	153,500	$	$
P-304a	Cement Treated Base Course	at the unit price of: _____ dollars and _____ cents.	SY	142,000	$	$
P-304b	Bond Breaker Fabric	at the unit price of: _____ dollars and _____ cents.	SY	142,000	$	$
P-403a	Bituminous Pavement	at the unit price of: _____ dollars and _____ cents.	TON	2,515	$	$
P-501a	Portland Cement Concrete Pavement (12-Inches)	at the unit price of: _____ dollars and _____ cents.	SY	140,000	$	$
P-501b	Portland Cement Concrete Pavement (14-Inches)	at the unit price of: _____ dollars and _____ cents.	SY	2,100	$	$

SCHEDULE I						
Item No.	**Description**		**Units**	**Estimated Quantity**	**Unit Price**	**Total**
P-501c	Portland Cement Concrete Pavement (9-Inches)	at the unit price of: _____ dollars and _____ cents.	SY	220	$	$
P-603a	Emulsified Asphalt Tack Coat	at the unit price of: _____ dollars and _____ cents.	GAL	1,050	$	$
P-620a	Permanent Pavement Markings	at the unit price of: _____ dollars and _____ cents.	SF	125,000	$	$
P-620b	Temporary Pavement Markings	at the unit price of: _____ dollars and _____ cents.	SF	130,000	$	$
P-620c	Pavement Marking Outline - Black Paint	at the unit price of: _____ dollars and _____ cents.	SF	80,000	$	$
P-620d	Pavement Marking Obliteration	at the unit price of: _____ dollars and _____ cents.	SF	90,000	$	$
P-621a	Runway Grooving	at the unit price of: _____ dollars and _____ cents.	SY	116,500	$	$
F-162a	Chain-Link Fence with 3-Strand Barbed Wire, 8-Foot	at the unit price of: _____ dollars and _____ cents.	LF	1,200	$	$
F-162b	Remove 6-Foot Wood Post Fence	at the unit price of: _____ dollars and _____ cents.	LF	1,160	$	$
D-701a	Install 24" Reinforced Concrete Pipe, Class V	at the unit price of: _____ dollars and _____ cents.	LF	1,300	$	$
D-701b	Install 30" Reinforced Concrete Pipe, Class V	at the unit price of: _____ dollars and _____ cents.	LF	1,200	$	$
D-705a	Install 6-Inch Perforated Polyethylene Pipe	at the unit price of: _____ dollars and _____ cents.	LF	16,500	$	$
D-705b	Install 6-Inch Non-Perforated Polyethylene Pipe	at the unit price of: _____ dollars and _____ cents.	LF	6,440	$	$
D-751a	Install 6-Inch Underdrain Cleanout	at the unit price of: _____ dollars and _____ cents.	EA	9	$	$
D-751b	Install New Inspection Pit	at the unit price of: _____ dollars and _____ cents.	EA	31	$	$
D-751c	Install Aircraft Rated Double Inlet	at the unit price of: _____ dollars and _____ cents.	EA	6	$	$
T-901a	Seeding with Hydromulch	at the unit price of: _____ dollars and _____ cents.	AC	115	$	$
T-905a	Imported Top Soil	at the unit price of: _____ dollars and _____ cents.	CY	40,000	$	$
L-107a	Remove L-806 Windcone, Complete	at the unit price of: _____ dollars and _____ cents.	EA	2	$	$
L-107b	Install L-806 LED Windcone, Complete	at the unit price of: _____ dollars and _____ cents.	EA	2	$	$
L-108a	Install #8 AWG, L-824C, 5000 Volt Wire	at the unit price of: _____ dollars and _____ cents.	LF	32,000	$	$

SCHEDULE I						
Item No.	**Description**		**Units**	**Estimated Quantity**	**Unit Price**	**Total**
L-108b	Install #6 AWG Bare Copper Counterpoise, including Ground Rods	at the unit price of: _____ dollars and _____ cents.	LF	22,000	$	$
L-110a	Install 1-2" Sch. 40 PVC Conduit (DEB)	at the unit price of: _____ dollars and _____ cents.	LF	18,000	$	$
L-110b	Install 1-2" Sch. 40 PVC Conduit (CE)	at the unit price of: _____ dollars and _____ cents.	LF	1,500	$	$
L-110c	Install 4-3" Sch. 40 PVC Conduit (CE)	at the unit price of: _____ dollars and _____ cents.	LF	2,000	$	$
L-115a	Remove Junction Box, Complete	at the unit price of: _____ dollars and _____ cents.	EA	6	$	$
L-115b	Remove Electrical Pullbox, Complete	at the unit price of: _____ dollars and _____ cents.	EA	3	$	$
L-115c	Install L-867B Junction Box, Complete	at the unit price of: _____ dollars and _____ cents.	EA	15	$	$
L-115d	Install Aircraft Rated Electrical Pullbox, Complete	at the unit price of: _____ dollars and _____ cents.	EA	3	$	$
L-115e	Adjust Electrical Pullbox Complete	at the unit price of: _____ dollars and _____ cents.	EA	6	$	$
L-125a	Remove Elevated Runway/Taxiway Edge Light, Complete	at the unit price of: _____ dollars and _____ cents.	EA	138	$	$
L-125b	Remove and Reinstall Stake Mounted Solar Powered MOANG NVG Runway Light, Complete	at the unit price of: _____ dollars and _____ cents.	EA	11	$	$
L-125c	Install LED L-861T Taxiway Edge Light, Complete	at the unit price of: _____ dollars and _____ cents.	EA	39	$	$
L-125d	Install LED L-862 Runway Edge Light, Complete	at the unit price of: _____ dollars and _____ cents.	EA	79	$	$
L-125e	Install LED L-862E Runway Threshold Light, Complete	at the unit price of: _____ dollars and _____ cents.	EA	16	$	$
L-125f	Install LED L-850C In-Pavement Runway Edge Light, Complete	at the unit price of: _____ dollars and _____ cents.	EA	1	$	$
L-125g	Remove L-858 Guidance Sign, Complete	at the unit price of: _____ dollars and _____ cents.	EA	42	$	$
L-125h	Install LED L-858 Guidance Sign, 2 Module, Size 1, Complete	at the unit price of: _____ dollars and _____ cents.	EA	23	$	$
L-125i	Install LED L-858 Guidance Sign, 3 Module, Size 1, Complete	at the unit price of: _____ dollars and _____ cents.	EA	9	$	$
L-125j	Install LED L-858 Guidance Sign, 4 Module, Size 1, Complete	at the unit price of: _____ dollars and _____ cents.	EA	3	$	$
L-125k	Install LED L-858 Guidance Sign, RDR, Size 4, Complete	at the unit price of: _____ dollars and _____ cents.	EA	7	$	$
L-125p	Spare Parts for Airport Visual Aids (Unit Cost Fixed at $10,000.00)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$

SCHEDULE I					
Item No.	**Description**	**Units**	**Estimated Quantity**	**Unit Price**	**Total**

SCHEDULE I TOTAL $ _____

SCHEDULE II						
Item No.	**Description**		**Units**	**Estimated Quantity**	**Unit Price**	**Total**
C-100a	Contractor Quality Control Program (CQCP)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-102a	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-105a	Mobilization (10% Maximum)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
P-101b	Full Depth Asphalt Removal	at the unit price of: _____ dollars and _____ cents.	SY	3,500	$	$
P-209a	6-Inch Crushed Aggregate Base Course	at the unit price of: _____ dollars and _____ cents.	CY	575	$	$
P-209b	Stabilization Fabric	at the unit price of: _____ dollars and _____ cents.	SY	3,300	$	$
P-218a	Placement of Rubblized Recycled Concrete Section	at the unit price of: _____ dollars and _____ cents.	CY	46,600	$	$
P-403a	Bituminous Pavement	at the unit price of: _____ dollars and _____ cents.	TON	900	$	$
P-603a	Emulsified Asphalt Tack Coat	at the unit price of: _____ dollars and _____ cents.	GAL	400	$	$
D-701a	Install 24" Reinforced Concrete Pipe, Class V	at the unit price of: _____ dollars and _____ cents.	LF	120	$	$

SCHEDULE II TOTAL $ _____

PAGE INTENTIONALLY LEFT BLANK

SCHEDULE III						
Item No.	**Description**		**Units**	**Estimated Quantity**	**Unit Price**	**Total**
C-100a	Contractor Quality Control Program (CQCP)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-102a	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-105a	Mobilization (10% Maximum)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
P-101b	Full Depth Asphalt Removal	at the unit price of: _____ dollars and _____ cents.	SY	4,650	$	$
P-156a	Cement-Treated Subgrade - 24 Inches	at the unit price of: _____ dollars and _____ cents.	SY	4,650	$	$
P-156c	Class C Cement - 6%	at the unit price of: _____ dollars and _____ cents.	TON	400	$	$
P-209a	6-Inch Crushed Aggregate Base Course	at the unit price of: _____ dollars and _____ cents.	CY	800	$	$
P-209b	Stabilization Fabric	at the unit price of: _____ dollars and _____ cents.	SY	4,650	$	$
P-304a	Cement Treated Base Course	at the unit price of: _____ dollars and _____ cents.	SY	4,650	$	$
P-304b	Bond Breaker Fabric	at the unit price of: _____ dollars and _____ cents.	SY	4,650	$	$
P-501a	Portland Cement Concrete Pavement (12-Inches)	at the unit price of: _____ dollars and _____ cents.	SY	4,650	$	$
P-620a	Permanent Pavement Markings	at the unit price of: _____ dollars and _____ cents.	SF	1,550	$	$
P-620b	Temporary Pavement Markings	at the unit price of: _____ dollars and _____ cents.	SF	1,550	$	$
P-620c	Pavement Marking Outline - Black Paint	at the unit price of: _____ dollars and _____ cents.	SF	2,000	$	$
P-620e	Hold Position Sign - Thermoplastic	at the unit price of: _____ dollars and _____ cents.	EA	1	$	$

SCHEDULE III TOTAL $ _____

PAGE INTENTIONALLY LEFT BLANK

SCHEDULE IV						
Item No.	**Description**		**Units**	**Estimated Quantity**	**Unit Price**	**Total**
C-100a	Contractor Quality Control Program (CQCP)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-102a	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
C-105a	Mobilization (10% Maximum)	at the unit price of: _____ dollars and _____ cents.	LS	1	$	$
P-403a	Bituminous Pavement	at the unit price of: _____ dollars and _____ cents.	TON	250	$	$
P-603a	Emulsified Asphalt Tack Coat	at the unit price of: _____ dollars and _____ cents.	GAL	50	$	$
L-125l	Remove FAA REIL System, Complete	at the unit price of: _____ dollars and _____ cents.	EA	2	$	$
L-125m	Install FAA Furnished REIL System, Complete	at the unit price of: _____ dollars and _____ cents.	EA	2	$	$
L-125n	Remove FAA PAPI System, Complete	at the unit price of: _____ dollars and _____ cents.	EA	2	$	$
L-125o	Install FAA Furnished PAPI System, Complete	at the unit price of: _____ dollars and _____ cents.	EA	2	$	$

SCHEDULE IV TOTAL $ _____

PAGE INTENTIONALLY LEFT BLANK

ITEM L-107 AIRPORT WIND CONES

DESCRIPTION

107-1.1 This item shall consist of removal of existing airport wind cones; furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified in AC 150/5345-53, Airport Lighting Equipment Certification Program (ALECP) and listed in the ALECP Addendum.

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 RPR.

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 RPR) 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 RPR 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). 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 RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be in electronic pdf format, tabbed by specification section. The RPR 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.

107-2.2 WIND CONES. The supplemental wind cone assembly shall be LED Type L-806, Style I-B, Size 1.

107-2.3 ELECTRICAL WIRE AND CABLE. Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

107-2.5 PLASTIC CONDUIT (FOR USE BELOW GRADE ONLY). Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

107-2.6 CONCRETE. The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

107-2.7 PAINT.

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer compatible with the manufacturer's recommendations for the intermediate or topcoat.

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

107-3.2 SUPPORT POLE ERECTION. The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

107-3.3 ELECTRICAL CONNECTION. The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

Underground cable and duct for cable installation shall be installed in accordance with Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits in locations as shown on the plans.

107-3.4 BOOSTER TRANSFORMER. Not used.

107-3.5 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 6 American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod. If desired resistance to ground levels are still not achieved, see FAA-STD-019 for guidance on the application of coke breeze.

107-3.6 PAINTING. Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

107-3.7 LIGHT SOURCES. The Contractor shall furnish and install lamps per the manufacturer's instruction book.

107-3.8 CHAIN AND PADLOCK. The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the RPR.

107-3.9 SEGMENTED CIRCLE. Not used.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid shall be the number of wind cones installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for removal of existing airport wind cones; 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:

Item L-107a	Remove L-806 Windcone, Complete – per each
Item L-107b	Install L-806 LED Windcone, Complete – 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 150/5340-5	Segmented Circle Airport Marker System
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 150/5345-27	Specification for Wind Cone Assemblies
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)

Federal Standard (FED STD)

FED STD 595	Colors Used in Government Procurement

Master Painter's Institute (MPI)

MPI Reference #9	Alkyd, Exterior, Gloss (MPI Gloss Level 6)

Mil Standard

MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit – Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
UL Standard 1242	Electrical Intermediate Metal Conduit - Steel

National Fire Protection Association (NFPA)

NFPA-70	National Electric Code (NEC)

****END OF ITEM L-107****

INTENTIONALLY LEFT BLANK

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 RPR. 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 RPR.

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 RPR) 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 RPR 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 RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specific section. The RPR 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 B, 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-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) 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 RPR 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 Item P-610, Concrete for Miscellaneous Structures.

108-2.7 FLOWABLE BACKFILL. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

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 (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) 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 RPR. 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 RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. 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 (75-150 mm) 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 RPR 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 (1 m) 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 (30 cm) 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 RPR.

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 (6 mm) 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 RPR 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 RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. 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 RPR, 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 (75 mm) 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 (0.5 m) 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 (91 cm) unless otherwise specified.

- Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). 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 (75 mm) 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 (6.3 mm) 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 RPR, 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 (75 mm) deep, loose measurement; and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25.0 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8

inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) 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 backfill with controlled low strength material (CLSM) in accordance with P-153.

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 RPR. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) 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 (200 mm) 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 seeding 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 backfill with controlled low strength material (CLSM) in accordance with P-153. 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 (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) 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 (61 m) 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 (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) 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 RPR. 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 RPR. 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 RPR.

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 (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) 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 (38 mm) on each side of the joint. (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) 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 (6 mm) 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 (75 mm) 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 (25 mm) 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 contaminates 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 (6.4 mm) 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 AWGcopper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR 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. Not used.

b. Isolation. Counterpoise size is as shown on the plans. 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 (203 mm) 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.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate 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 (150 m) 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 RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, 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 3MTM ScotchkoteTM, 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 RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. 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 RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. 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 RPR 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 RPR the following:

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

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

c. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 50 megohms. Verify continuity of all series airfield lighting circuits prior to energization.

d. 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.

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

f. 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.

g. 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 RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. 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. Cable and counterpoise slack is considered incidental to this item and is included in the Contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

108-4.3 No separate payment will be made for ground rods.

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 RPR. 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-108a	Install #8 AWG, L-824C, 5000V, Wire – per linear foot
Item L-108b	Install #6 AWG, Bare Copper Counterpoise Including Ground Rods and Terminations – per linear foot

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
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

****END OF ITEM L-108****

INTENTIONALLY LEFT BLANK

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits and removal of existing duct banks. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

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

.

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

c. All materials and equipment used to construct this item shall be submitted to the RPR 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 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 made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR 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.

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.

110-2.2 STEEL CONDUIT. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings-shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I–Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 PRECAST CONCRETE STRUCTURES. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 DETECTABLE WARNING TAPE. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, 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 recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.
Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank 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 (6.3 mm) sieve. Flowable backfill may alternatively be used

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

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:

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

b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, 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.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

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, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 RESTORATION. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

110-3.8 OWNERSHIP OF REMOVED CABLE. The Contractor shall remove all abandoned/unused conductors contained in conduits in which new conductors will be installed. No abandoned conductors shall be left in place at the completion of the job. All removed wire shall become the property of the Contractor and the Contractor shall be held responsible for removing the wire off airport property. The removal of existing conductors shall be considered incidental to the respective duct pay item and no separate payment will be made.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) for L-110a/b/c and by the lump sum for L-110d of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage

structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for L-110a/b/c and by the lump sum for L-110d for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, 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 per the provisions and intent of the plans and specifications.

Payment will be made under:

Item	L-110a	Install 1-2" Sch. 40 PVC Conduit (DEB) - per linear foot
Item	L-110b	Install 1-2" Sch. 40 PVC Conduit (CE) - per linear foot
Item	L-110c	Install 4-3" Sch. 40 PVC Conduit (CE) - per linear foot

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 Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

****END OF ITEM L-110****

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the RPR. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the RPR including removal of existing manholes and junction structures as shown on the plans.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the RPR.

b. 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 RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR 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.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR 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.

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 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.

115-2.2 CONCRETE STRUCTURES. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures. Cast-in-place concrete structures shall be as shown on the plans.

115-2.3 PRECAST CONCRETE STRUCTURES. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. Provide precast concrete structures where shown on the plans.

Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb aircraft loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown on the plans.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the RPR shall be submitted by the Contractor to allow for a full evaluation by the RPR. The RPR shall review per the process defined in the General Provisions.

115-2.4 JUNCTION BOXES. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a L-894 blank cover, gasket, and stainless steel hardware. All bolts, studs, nuts, lock washers, and other similar fasteners used for the light fixture assemblies must be fabricated from 316L (equivalent to EN 1.4404), 18-8, 410, or 416 stainless steel. If 18-8, 410, or 416 stainless steel is utilized it shall be passivated and be free from any discoloration. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868. All junction boxes shall be provided with both internal and external ground lugs.

115-2.5 MORTAR. The mortar shall be composed of one part of cement and two parts of mortar sand, by volume. The cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C206. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.6 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Concrete for Miscellaneous Structures.

115-2.7 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

a.	ASTM A48	Gray iron castings
b.	ASTM A47	Malleable iron castings
c.	ASTM A27	Steel castings
d.	ASTM A283, Grade D	Structural steel for grates and frames
e.	ASTM A536	Ductile iron castings
f.	ASTM A897	Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

115-2.8 LADDERS. Ladders, if specified, shall be galvanized steel or as shown on the plans.

115-2.9 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.10 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.11 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.12 CABLE TRAYS. Cable trays shall be of galvanized steel**]**. Cable trays shall be located as shown on the plans.

115-2.13 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.14 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.15 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8-inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.16 GROUND RODS. Ground rods shall be one piece, copper clad steel**.** The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the RPR without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.All excavation shall be unclassified and shall be considered incidental to Item L-115. Dewatering necessary for structure installation and erosion per federal, state, and local requirements is incidental to Item L-115.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the RPR. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the RPR. Structures shall be placed after the RPR has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the RPR as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the RPR and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written approval is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the RPR and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately. Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 INSTALLATION OF LADDERS. Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The RPR may direct the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

Backfill shall not be placed against any structure until approval is given by the RPR. In the case of concrete, such approval shall not be given until tests made by the laboratory under supervision of the RPR establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the RPR may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective Item L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 MANHOLE ELEVATION ADJUSTMENTS. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise or lower the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. The Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and

dewatering:; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing

115-4.2 Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall 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, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the RPR.

Payment will be made under:

L-115a	Remove Junction Box, Complete – per each
L-115b	Remove Electrical Pullbox, Complete – per each
L-115c	Install L-867B Junction Box, Complete – per each
L-115d	Install Aircraft Rated Electrical Pullbox, Complete – per each
L-115e	Adjust Electrical Pullbox Complete – 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.

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

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

Advisory Circular (AC)

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 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description (CID)

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime

FAA Engineering Brief (EB)

EB #83	In Pavement Light Fixture Bolts

Mil Spec

MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

****END OF ITEM L-115****

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 RPR.

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 AC 150/5345-53, current version. FAA certified airfield lighting 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 performs as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for 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 RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR 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 RPR 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 RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR'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.

All LED light fixtures, with the exception of obstruction lighting (AC 150/5345-43) must be warranted by the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics." Obstruction lighting warranty is set by the individual manufacturer.

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 indicated, 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.

Lights

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-850C	2	1	3	NA	L-868	Per Plan	L-830 Size Per Manufacturer	LED with Artic Kit
L-861T	2	1	NA	4	L-867	Blue	L-830 Size Per Manufacturer	LED with Artic Kit
L-862	2	1	NA	4	L-867	Per Plan	L-830 Size Per Manufacturer	LED with Artic Kit
L-862E	2	1	NA	4	L-867	Per Plan	L-830 Size Per Manufacturer	LED with Artic Kit

125-2.8 RUNWAY AND TAXIWAY SIGNS. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44.

Signs

Type	Size	Style	Class	Mode	Notes
L-858L/R/Y	1	2/3	2	2	LED
L-858B	4	3	2	2	LED

125-2.9 RUNWAY END IDENTIFIER LIGHT (REIL). REIL equipment to be furnished by the FAA to the Contractor.

125-2.10 PRECISION APPROACH PATH INDICATOR (PAPI). PAPI equipment to be furnished by the FAA to the Contractor.

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 or 1B, 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.

All electrical work, including conduits, handholes, grounding, power distribution equipment, wiring, junction boxes, etc., pertaining to navigational aids (REILs, and PAPIs) shall be constructed in accordance with FAA Specifications FAA-C-1217 (latest edition), FAA-C-1391 (latest edition), AND FAA-STD-019E (latest edition), in addition to the specifications contained within the contract documents.

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 RPR, 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 Runway and taxiway lights, and guidance signs will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR.

125-4.2 Runway End Identifier Lights shall be measured by each system installed as a completed unit in place, ready for operation, and accepted by the RPR.

125-4.3 Precision Approach Path Indicator shall be measured by each system installed as a completed unit, in place, ready for operation, and accepted by the RPR.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete runway or taxiway light, guidance sign, reflective marker, 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.

125-5.2 Payment will be made at the Contract unit price for each complete runway end identification light, installed by the Contractor and accepted by the RPR. This payment will be full compensation for installing the FAA furnished REIL equipment, furnishing all other materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item. Separate payments for conduit, wire, power frames, power equipment, concrete, etc. shall not be made for this item but shall be considered incidental to the bid item.

125-5.3 Payment will be made at the Contract unit price for each complete precision approach path indicator system, installed by the Contractor and accepted by the RPR. This payment will be full compensation for installing the FAA furnished PAPI equipment, furnishing all other materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item. Separate payments for conduit, wire, power frames, power equipment, concrete, etc. shall not be made for this item but shall be considered incidental to the bid item.

Payment will be made under:

Item	L-125a	Remove Elevated Runway/Taxiway Edge Light, Complete – per each
Item	L-125b	Remove and Reinstall Stake Mounted Solar Powered MOANG NVG Runway Light, Complete – per each
Item	L-125c	Install LED L-861T Taxiway Edge Light, Complete – per each
Item	L-125d	Install LED L-862 Runway Edge Light, Complete – per each
Item	L-125e	Install LED L-862E Runway Threshold Light, Complete – per each
Item	L-125f	Install LED L-850C In-Pavement Runway Edge Light, Complete – per each
Item	L-125g	Remove L-858 Guidance Sign, Complete – per each
Item	L-125h	Install LED L-858 Guidance Sign, 2 Module, Size 1, Complete – per each
Item	L-125i	Install LED L-858 Guidance Sign, 3 Module, Size 1, Complete – per each
Item	L-125j	Install LED L-858 Guidance Sign, 4 Module, Size 1, Complete – per each
Item	L-125k	Install LED L-858 Guidance Sign, RDR, Size 4, Complete – per each
Item	L-125l	Remove FAA REIL System, Complete - per each
Item	L-125m	Install FAA Furnished REIL System, Complete - per each
Item	L-125n	Remove FAA PAPI System, Complete - per each
Item	L-125o	Install FAA Furnished PAPI System, Complete - per each
Item	L-125p	Spare Parts for Airport Visual Aids (Unit Cost Fixed at $10,000.00) – per lump sum

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
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

****END OF ITEM L-125****

INTENTIONALLY LEFT BLANK

1. COORDINATION

-ALL COORDINATION WILL TAKE PLACE THROUGH THE RESIDENT ENGINEER AND ROSECRANS MEMORIAL AIRPORT (STJ) DIRECTOR OF OPERATIONS & AIRPORT OPERATIONS SPECIALIST. NO CLOSURES WITHIN THE MOVEMENT AREAS WILL BE PERMITTED WITHOUT A NOTAM IN PLACE FOR EACH SPECIFIC CLOSURE. PRIOR TO COMMENCEMENT OF ANY WORK, THE CONTRACTOR SHALL GIVE 72 HOURS ADVANCE NOTICE TO THE RESIDENT ENGINEER AND AIRPORT OPERATIONS FOR FILING OF ALL NOTAMS.

-A WEEKLY CONSTRUCTION PROGRESS MEETING WILL BE REQUIRED TO DISCUSS ALL OPERATIONAL SAFETY TOPICS THAT HAVE BEEN AFFECTED OR WILL BE AFFECTED IN THE NEAR FUTURE. IN ATTENDANCE WILL BE THE CONTRACTOR, ENGINEER, AND STJ PERSONNEL.

-ANY CHANGES TO SCOPE OR SCHEDULE MUST BE NOTIFIED TO THE ENGINEER AND STJ DEVELOPMENT AND OPERATIONS MANAGERS. ALL PARTIES WILL EVALUATE THE IMPACT OF THE CHANGE AND WILL DETERMINE THE MEASURES NEEDED TO MAINTAIN A SAFE CONSTRUCTION SITE.

-THE FAA AIR TRAFFIC OPERATORS WILL BE NOTIFIED IMMEDIATELY IF ANY CHANGES AFFECT AIRCRAFT MOVEMENT. ALL COMMUNICATIONS WITH THE FAA TOWER WILL BY HANDLED BY AIRPORT OPERATIONS.

-AIRPORT RUNWAYS AND TAXIWAYS SHOULD REMAIN IN USE BY AIRCRAFT TO THE MAXIMUM EXTENT POSSIBLE.
-AIRCRAFT USE OF AREAS NEAR THE CONTRACTOR'S WORK SHOULD BE CONTROLLED TO MINIMIZE DISTURBANCE TO THE CONTRACTOR'S OPERATION.

-CONSTRUCTION THAT IS WITHIN THE SAFETY AREA OF AN ACTIVE RUNWAY, TAXIWAY, OR APRON THAT IS PERFORMED UNDER NORMAL OPERATIONAL CONDITIONS MUST BE PERFORMED WHEN THE RUNWAY, TAXIWAY, OR APRON IS CLOSED OR USE-RESTRICTED AND INITIATED ONLY WITH PRIOR PERMISSION FROM THE AIRPORT OPERATOR AND WITH PROPER NOTAMS IN PLACE.

-THE CONTRACTING OFFICER, AIRPORT OPERATOR, OR OTHER DESIGNATED AIRPORT REPRESENTATIVE MAY ORDER THE CONTRACTOR TO SUSPEND OPERATIONS; MOVE PERSONNEL, EQUIPMENT, AND MATERIALS TO A SAFE LOCATION; BARRICADE ANY OPEN TRENCHES AND STAND BY UNTIL AIRCRAFT USE IS COMPLETED.

-ALL VEHICLES AND EQUIPMENT OPERATING IN THE AOA MUST HAVE FLAG (DAY ONLY) OR BEACON (DAY AND NIGHT) ATTACHED TO THE VEHICLE.

-ALL VEHICLES WITHOUT PRIOR APPROVAL FROM AIRPORT THAT MUST TRAVEL IN THE AOA WILL BE ESCORTED BY THE CONTRACTOR AND AIRPORT OPERATIONS. THOSE VEHICLES ARE REQUIRED TO ADHERE TO ALL RULES AND REGULATIONS AS SET BY THE ROSECRANS MEMORIAL AIRPORT AND ADVISORY CIRCULAR 150/5370-2G, OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION. IDENTIFICATION AND FLAGS/BEACONS MUST BE ATTACHED TO THE VEHICLE AS STATED IN THE PREVIOUS NOTE.

-VEHICLE TRAFFIC LOCATED IN OR CROSSING AN ACTIVE MOVEMENT AREA MUST HAVE A WORKING TWO-WAY RADIO IN CONTACT WITH AIR TRAFFIC OR BE ESCORTED BY A PERSON IN RADIO CONTACT WITH AIR TRAFFIC. THE DRIVER, THROUGH PERSONAL OBSERVATION SHOULD CONFIRM THAT NO AIRCRAFT IS APPROACHING THE VEHICLE POSITION. THE CONTRACTOR PERSONNEL MAY OPERATE IN THE MOVEMENT AREA WITHOUT TWO-WAY RADIO COMMUNICATION PROVIDED A NOTAM IS ISSUED CLOSING THE AREA AND THE AREA IS PROPERLY MARKED TO PREVENT INCURSIONS. TWO-WAY RADIO COMMUNICATIONS ARE REQUIRED BETWEEN THE CONTRACTOR AND AIR TRAFFIC. CONTINUOUS MONITORING IS REQUIRED ONLY WHEN EQUIPMENT MOVEMENT IS NECESSARY IN CERTAIN AREAS. CONTRACTOR SHALL HAVE A MINIMUM OF TWO ICOM AC-200 TOWER/CTAF RADIOS ON SITE AT ALL TIMES. THESE ITEMS SHALL BE PURCHASED FOR THIS PROJECT AND PAID FOR UNDER ITEM GP-105, MOBILIZATION.
ATCT/CTAF - 126.90 (MON-FRI 0700-1900, SAT-SUN 0800-1759)
GROUND CONTROL - 121.90 (WHEN TOWER CLOSED)

-CONTRACTOR IS REQUIRED TO NOTIFY AND COORDINATE WITH THE RESIDENT ENGINEER PRIOR TO ENTERING ANY ACTIVE SURFACE SAFETY AREAS OR OBJECT FREE AREAS.

-CONTRACTOR, SUBCONTRACTOR, AND SUPPLIER EMPLOYEES OR ANY UNAUTHORIZED PERSONS MUST BE RESTRICTED FROM ENTERING AN AIRPORT AREA THAT WOULD BE HAZARDOUS.

2. PHASING

-THIS PROJECT CONSISTS OF FIVE PHASES. SEE CONSTRUCTION SAFETY DRAWINGS FOR PHASING REQUIREMENTS.

-CONTRACTOR TO NOTIFY ENGINEER AND STJ DEVELOPMENT MANAGER & OPERATIONS MANAGER IF A CHANGE IN PHASE IS NEEDED.

3. AREAS AND OPERATIONS AFFECTED BY CONSTRUCTION ACTIVITY

-ALL WORK WITHIN AIRPORT OPERATIONS AREA (AOA) SHALL CONFORM TO ADVISORY CIRCULAR 150/5370-2G, OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

-CONTRACTOR SHALL ADHERE TO REQUIREMENTS AS MENTIONED ON THIS SHEET AND CONSTRUCTION SAFETY DRAWINGS. THESE REQUIREMENTS INCLUDE, BUT ARE NOT LIMITED TO, ARFF EMERGENCY ACCESS ROUTES, AIRCRAFT ROUTES, PEDESTRIAN ROUTES, CONSTRUCTION ACCESS ROUTES, CONSTRUCTION LIMITS, AND BARRICADE LOCATIONS.

4. PROTECTION OF NAVIGATION AIDS (NAVAIDS)

-NAVIGATIONAL AIDS INCLUDE INSTRUMENT LANDING SYSTEM COMPONENTS AND VERY HIGH-FREQUENCY OMNIDIRECTIONAL RANGE, AIRPORT SURVEILLANCE RADAR. SUCH RESTRICTED AREAS ARE DEPICTED ON CONSTRUCTION PLANS.

-THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY DAMAGE TO THE EXISTING NAVAIDS AND WILL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE AIRPORT.

5. CONTRACTOR ACCESS

-PRIOR TO CONSTRUCTION, CONTRACTOR SHALL SUBMIT A CERTIFICATION LETTER THAT ALL EMPLOYEES WHO WILL HAVE UNESCORTED ACCESS TO THE AOA HAVE BEEN CHECKED FOR EMPLOYMENT, SECURITY, AND CRIMINAL HISTORY AS STATED IN THE CONSTRUCTION SAFETY AND PHASING PLAN.

-CONTRACTOR MOVEMENT SHALL BE RESTRICTED TO THE PRE-DETERMINED ACCESS ROUTES AS SHOWN ON PHASING SHEETS.

-ALL VEHICLES AND EQUIPMENT OPERATING IN THE AOA MUST CLEARLY IDENTIFY THEMSELVES WITH AN 8-INCH (MINIMUM) BLOCK-TYPE CHARACTERS OF A CONTRASTING COLOR AND EASY TO READ. THEY MAY BE APPLIED EITHER BY USING TAPE OR A WATER-SOLUABLE PAINT TO FACILITATE REMOVAL. MAGNETIC SIGNS ARE ALSO ACCEPTABLE. IN ADDITION, VEHICLES MUST DISPLAY IDENTIFICATION MEDIA, AS SPECIFIED IN THE APPROVED AIRPORT SECURITY PLAN.

6. WILDLIFE MANAGEMENT

-CONTRACTOR SHALL ADHERE TO ALL WILDLIFE MANAGEMENT PRACTICES AS STATED IN ADVISORY CIRCULAR 150/5200-33, HAZARDOUS WILDLIFE ATTRACTIONS ON OR NEAR AIRPORTS, AND CERTALERT 98-08, GRASSES ATTRACTIVE TO HAZARDOUS WILDLIFE.

-CONTRACTOR IS RESPONSIBLE FOR COMPLETING A DAILY INSPECTION OF TRASH AND OR FOREIGN OBJECTS ON THE CONSTRUCTION SITE THAT MIGHT ATTRACT WILDLIFE.

-CONTRACTOR IS RESPONSIBLE FOR COMPLETING A DAILY INSPECTION OF STANDING WATER THAT MIGHT ATTRACT WILDLIFE ONTO THE CONSTRUCTION SITE.

-CONTRACTOR SHALL MAINTAIN ALL FENCES AND GATES THROUGHOUT THE PROJECT TO THE SATISFACTION OF THE RESIDENT ENGINEER.

-CONTRACTOR SHALL NOTIFY RESIDENT ENGINEER WHEN A WILDLIFE SIGHTING HAS OCCURRED ON THE PROJECT SITE.

7. FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT

-CONTRACTOR SHALL KEEP ALL PAVEMENTS IN THE AOA INCLUDING APRONS, TAXIWAYS, AND RUNWAYS FREE FROM FOD AT ALL TIMES TO PREVENT ANY DEBRIS FROM BEING INGESTED INTO AN AIRCRAFT'S ENGINE OR ANY DEBRIS FROM BEING LAUNCHED DUE TO JET BLAST.

-CONTRACTOR IS REQUIRED TO MAINTAIN FOD SEVERAL TIMES A DAY TO THE SATISFACTION OF THE ENGINEER.

-PRIOR TO OPENING ANY PAVEMENT TO AIRCRAFT, THE CONTRACTOR SHALL CONDUCT A SWEEP OF THE PAVEMENT TO VERIFY THAT THE PAVEMENT IS FREE FROM FOD.

-THE CONTRACTOR IS ADVISED THAT DUST CONTROL, CLEANUP OF ACTIVE PAVEMENTS, TRACKING DEBRIS ONTO ACTIVE PAVEMENT AND GENERAL JOBSITE CLEANLINESS IS A SERIOUS SAFETY CONCERN. FOREIGN OBJECT DEBRIS (FOD) IS CONSIDERED AS ANY ITEM THAT COULD POSSIBLY IMPACT THE OPERATIONS OF AN AIRPORT OR ROADWAY. FOD COULD CAUSE INJURY OR DEATH THROUGH INGESTION IN MOVING AIRCRAFT ENGINES. SPECIFIC ITEMS OF CONCERN INCLUDE, BUT ARE NOT LIMITED TO; ANY PACKAGING FROM MATERIAL INSTALLATION, GRAVEL LEFT ON ACTIVE PAVEMENTS, DUST TRACKED ONTO ACTIVE PAVEMENTS, HAND TOOLS, HARDWARE DROPPED, ETC.

8. HAZARDOUS MATERIAL (HAZMAT) MANAGEMENT

-CONTRACTOR SHALL NOTIFY RESIDENT ENGINEER AND AIRPORT EMERGENCY PERSONNEL IF HAZARDOUS MATERIALS ARE ENCOUNTERED ON THIS PROJECT.

9. NOTIFICATION OF CONSTRUCTION ACTIVITIES

AGENCY NAME	AGENCY TYPE	TELEPHONE
ST. JOSEPH POLICE DEPARTMENT	SHERIFF'S DEPARTMENT	(816) 271-4702 OR 911
ST. JOSEPH FIRE DEPARTMENT	FIRE DEPARTMENT	(816) 271-4603 OR 911
MOSAIC LIFE CARE	URGENT CARE	(816) 271-7077
HEARTLAND HEALTH MEDICAL CENTER	HOSPITAL / AMBULANCE	(816) 271-6000 OR 911
AIRPORT ADMINISTRATIVE/BADGING	AIRPORT ADMINISTRATION	(816) 271-4886
ST. JOSEPH PUBLIC WORKS	PUBLIC WORKS DEPARTMENT	(816) 271-4848
ABE FORNEY	AIRPORT MANAGER	(816) 271-5374

BEFORE BEGINNING ANY CONSTRUCTION ACTIVITY, THE CONTRACTOR MUST, THROUGH THE RESIDENT ENGINEER AND AIRPORT OPERATIONS, GIVE NOTICE USING THE NOTICE TO AIR MISSIONS (NOTAM) SYSTEM OF PROPOSED LOCATION, TIME, AND DATE OF COMMENCEMENT OF CONSTRUCTION. ALL NOTAMS SHALL BE ISSUED BY STJ. UPON COMPLETION OF WORK AND RETURN OF ALL SUCH AREAS TO STANDARD CONDITIONS, THE CONTRACTOR MUST COORDINATE WITH THE RESIDENT ENGINEER AND VERIFY THE CANCELLATION OF ALL NOTICES ISSUED VIA THE NOTAM SYSTEM. THROUGHOUT THE DURATION OF THE CONSTRUCTION PROJECT, THE CONTRACTOR MUST:

A. BE AWARE OF AND UNDERSTAND THE SAFETY PROBLEMS AND HAZARDS DESCRIBED IN ADVISORY CIRCULAR 150/5370-2G, OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.
B. CONDUCT ACTIVITIES SO AS NOT TO VIOLATE ANY SAFETY STANDARDS CONTAINED IN ADVISORY CIRCULAR 150/5370-2G OR ANY OF THE REFERENCES THEREIN.
C. INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY TO BE AWARE OF CONDITIONS.
D. PROMPTLY TAKE ALL ACTIONS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS AS SOON AS THEY ARE DISCOVERED.
E. THE CONTRACTOR SHALL ADHERE TO THE REQUIREMENTS, PROVISIONS, AND PROCEDURES OUTLINED IN CONSTRUCTION SAFETY PHASING PLAN (SEE DIVISION 6 OF THE CONTRACT DOCUMENTS).

-ANY CHANGES TO SCOPE OR SCHEDULE MUST BE NOTIFIED TO THE RESIDENT ENGINEER AND STJ OPERATIONS AND DEVELOPMENT MANAGER SO THAT NOTAMS CAN BE ISSUED, MAINTAINED, AND CANCELED.

-IN AN EVENT OF AN EMERGENCY, CONTRACTOR SHALL NOTIFY ENGINEER, STJ OPERATIONS MANAGER, AND AIRPORT EMERGENCY.

-ANY CONSTRUCTION OR ALTERATION THAT AFFECTS NAVIGABLE AIRSPACE AS DEFINED IN PART 77, MUST BE BROUGHT TO THE RESIDENT ENGINEER'S ATTENTION.

10. INSPECTION REQUIREMENTS

-CONTRACTOR SHALL COMPLETE A DAILY INSPECTION FOR SAFETY ON THE PROJECT SITE BY COMPLETING THE CHECKLIST PROVIDED IN ADVISORY CIRCULAR 150/5370-2G, APPENDIX D, SAFETY AND PHASING PLAN CHECKLIST.

-THE CONTRACTOR, ENGINEER AND AIRPORT OPERATOR MUST PERFORM ONSITE INSPECTIONS THROUGHOUT THE PROJECT, WITH IMMEDIATE REMEDY OF ANY DEFICIENCIES, WHETHER CAUSED BY NEGLIGENCE, OVERSIGHT, OR PROJECT SCOPE CHANGE.

-CONTRACTOR SHALL COMPLETE A FINAL INSPECTION FOR SAFETY ON THE PROJECT SITE AT THE END OF EACH PHASE. THE INSPECTION WILL INCLUDE A COMPLETED CHECKLIST PROVIDED IN ADVISORY CIRCULAR 150/5370-2G, APPENDIX D, SAFETY AND PHASING PLAN CHECKLIST.

11. APPROACH CLEARANCE TO RUNWAYS

-RUNWAY THRESHOLDS MUST PROVIDE AN UNOBSTRUCTED APPROACH SURFACE OVER EQUIPMENT AND MATERIALS. (REFER TO CHAPTER 3 IN ADVISORY CIRCULAR 150/5300-13A, AIRPORT DESIGN, FOR GUIDANCE.)

12. RUNWAY AND TAXIWAY VISUAL AIDS

-FLASHER BARRICADES, CLOSED 'X' MARKINGS AND RUNWAY CLOSURE MARKERS (RCMS) ARE TO BE PLACED AS DETAILED IN THE PLANS AND IN ALL DESIGNATED AREAS AS SHOWN ON THE CONSTRUCTION SAFETY DRAWINGS.

-APPROVED FLASHER BARRICADES SHALL BE PROVIDED AND MAINTAINED BY THE CONTRACTOR.

-CLOSED 'X' MARKINGS SHALL BE PROVIDED BY THE CONTRACTOR AND MAINTAINED BY THE CONTRACTOR. (RCMS) SHALL BE PROVIDED BY THE AIRPORT AND MAINTAINED BY THE CONTRACTOR.

-CONTRACTOR TO COVER ALL TAXIWAY EDGE LIGHTS, TAXIWAY SIGNS, RUNWAY SIGNS, AND APRON EDGE LIGHTS FOR AREAS CLOSED BY NOTAM TO THE APPROVAL OF THE ENGINEER.

13. MARKING AND SIGNS FOR ACCESS ROUTES

-ALL REQUIRED SIGNS AND MARKINGS SHALL CONFORM TO ADVISORY CIRCULAR 150/5340-18, STANDARD FOR AIRPORT SIGN SYSTEMS, OR THE FEDERAL HIGHWAY ADMINISTRATION MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).

-ALL SIGNS ADJACENT TO AREAS USED BY AIRCRAFT MUST COMPLY WITH THE FRANGIBLE REQUIREMENTS AS STATED IN ADVISORY CIRCULAR 150/5220-23, FRANGIBLE CONNECTIONS.

14. HAZARD MARKINGS AND LIGHTING

-PRIOR TO CLOSING ANY AREAS IN THE AOA TO AIRCRAFT OR EMERGENCY TRAFFIC, CONTRACTOR MUST CLEARLY MARK AND DEFINE CLOSED AREAS WITH WARNING LIGHTS, BARRICADES, CLOSED 'X' MARKINGS, RCMS, AND FLAGS TO THE APPROVAL OF THE RESIDENT ENGINEER. CONTRACTOR TO REFER TO CONSTRUCTION SAFETY DRAWINGS.

-HAZARDOUS AREAS ON THE MOVEMENT AREA WILL BE MARKED WITH FLASHER BARRICADES. THESE BARRICADES RESTRICT ACCESS AND MAKE HAZARDS OBVIOUS TO AIRCRAFT, PERSONNEL, AND VEHICLES. DURING PERIODS OF LOW VISIBILITY AND AT NIGHT, IDENTIFY HAZARDOUS AREAS WITH RED FLASHING LIGHTS.

15. PROTECTION OF RUNWAY AND TAXIWAY AREAS

-SAFETY AREAS - CONTRACTOR SHALL NOT IMPEDE ON THE SAFETY AREAS WITHOUT A CLOSURE OF THE RUNWAY/TAXIWAY BY MEANS OF A NOTAM.

-OBJECT FREE AREAS - CONTRACTOR SHALL NOT PLACE EQUIPMENT, MATERIAL, OR STOCKPILES IN THIS AREA. ALL OBJECTS OR MATERIALS ADJACENT TO THIS AREA SHALL BE PROPERLY MARKED/LIT PER ADVISORY CIRCULAR 150/5370-2G. CONTRACTOR CANNOT WORK IN ACTIVE OBJECT FREE AREA WITHOUT WING WALKERS TO MAINTAIN A 5' CLEARANCE FROM THE WINGSPAN OF THE AIRCRAFT TO CONSTRUCTION EQUIPMENT OR MATERIAL.

-OBSTACLE FREE ZONE- CONTRACTOR TO PREVENT PERSONNEL, MATERIAL, AND/OR EQUIPMENT FROM PENETRATING THE OBSTACLE FREE ZONE AS DEFINED IN ADVISORY CIRCULAR 150/5300-13A, PARAGRAPH 306.

ROSECRANS MEMORIAL AIRPORT - RUNWAY 17/35
-RUNWAY SAFETY AREA (RSA) 250' FROM CENTERLINE OF RUNWAY
-RUNWAY OBJECT FREE AREA (ROFA) 400' FROM CENTERLINE RUNWAY

ROSECRANS MEMORIAL AIRPORT - RUNWAY 13/31
-RUNWAY SAFETY AREA (RSA) 75' FROM CENTERLINE RUNWAY
-RUNWAY OBJECT FREE AREA (ROFA) 250' FROM CENTERLINE RUNWAY

ROSECRANS MEMORIAL AIRPORT - TAXIWAY
-TAXIWAY SAFETY AREA (TSA) 85.5' FROM CENTERLINE TAXIWAY
-TAXIWAY OBJECT FREE AREA (TOFA) 129.5' FROM CENTERLINE TAXIWAY

16. AIRPORT SECURITY

-CONTRACTOR SHALL ADHERE TO AIRPORT SECURITY REQUIREMENTS AT ALL TIMES. SECURITY IDENTIFICATION BADGES AND RELATED AIRPORT FAMILIARIZATION REQUIREMENTS ARE MANDATORY. KEY CONSTRUCTION SUPERINTENDENTS AND ANY OTHER PERSONNEL DEEMED NECESSARY BY THE AIRPORT SHALL BE REQUIRED TO BE BADGED BY THE AIRPORT, COMPLETE A SECURITY CLASS AND AN AIRPORT DRIVING CLASS AT THE EXPENSE OF THE CONTRACTOR PRIOR TO CONSTRUCTION. UNBADGED CONSTRUCTION PERSONNEL SHALL BE ESCORTED AT ALL TIMES DURING AIRSIDE CONSTRUCTION.

17. OTHER LIMITATIONS ON CONSTRUCTION

ADDITIONAL LIMITATIONS ON CONSTRUCTION INCLUDE:

A. PROHIBITING OPEN-FLAME WELDING OR TORCH CUTTING OPERATIONS UNLESS ADEQUATE FIRE SAFETY PRECAUTIONS ARE PROVIDED AND THESE OPERATIONS HAVE BEEN AUTHORIZED BY THE AIRPORT OPERATOR (AS TAILORED TO CONFORM TO LOCAL REQUIREMENTS AND RESTRICTIONS).
B. PROMINENTLY MARKING OPEN TRENCHES, EXCAVATIONS, AND STOCKPILED MATERIALS AT THE CONSTRUCTION AND LIGHTING THESE OBSTACLES DURING HOURS OF RESTRICTED VISIBILITY AND DARKNESS.
C. MARKING AND LIGHTING CLOSED, DECEPTIVE, AND HAZARDOUS AREAS ON AIRPORTS, AS APPROPRIATE.
D. CONSTRAINING STOCKPILED MATERIAL TO PREVENT ITS MOVEMENT AS A RESULT OF THE MAXIMUM ANTICIPATED AIRCRAFT BLAST AND FORECAST WIND CONDITIONS.
E. NO USE OF TALL EQUIPMENTS (CRANES, CONCRETE PUMPS, AND SO ON) UNLESS A FAA 7460-1 DETERMINATION LETTER IS ISSUED FOR SUCH EQUIPMENT.

18. DUST CONTROL

-CONTRACTOR IS RESPONSIBLE FOR CONTROLLING DUST FROM THE CONSTRUCTION SITE AT ALL TIMES. CONTRACTOR SHALL HAVE A WATER TRUCK AND OPERATOR AVAILABLE 24 HOURS A DAY TO CONTROL DUST. THE PROJECT'S LOCATION IS NEAR ACTIVE RUNWAYS AND HIGHWAYS AND IS IN A LOCATION THAT EXPERIENCES HIGH WIND. IT IS CRITICAL FOR THE CONTRACTOR TO KEEP DUST TO AN ABSOLUTE MINIMUM BOTH DURING CONSTRUCTION, AND AFTER CONSTRUCTION UNTIL THE EXPOSED SURFACES CONTAIN SUSTAINABLE VEGETATION. CONTRACTOR SHALL PROVIDE THE RESIDENT ENGINEER AND AIRPORT OPERATIONS WITH A CONTACT FOR 24 HOUR DUST CONTROL.

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

MARK J. LOVATO PE-2009002094 07/14/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: K.J.S.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	06/30/2022	ISSUED FOR BID
2	M.J.L.	08/12/2022	ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

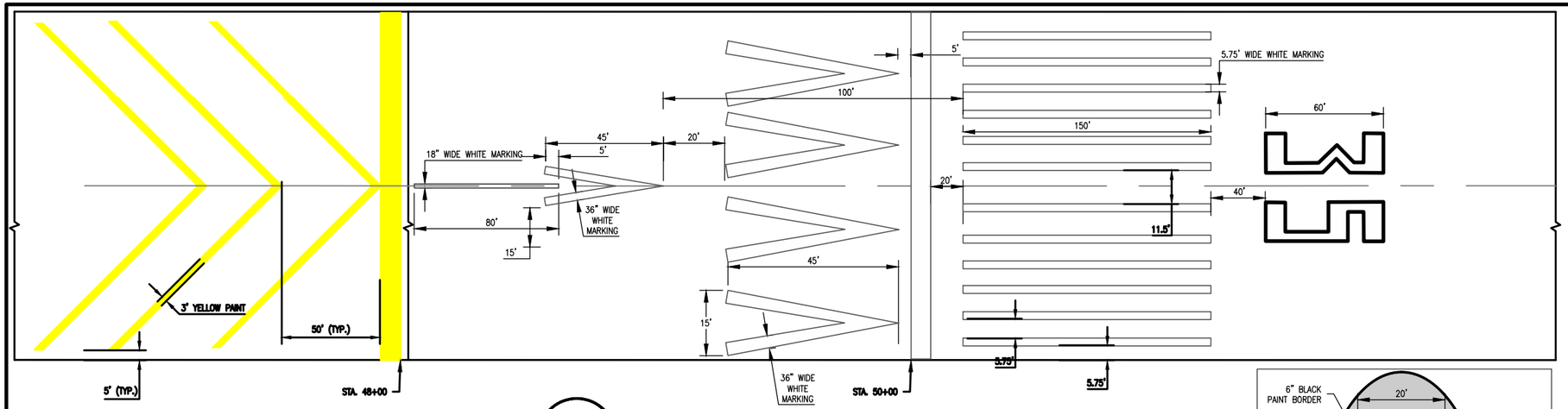
CONSTRUCTION SAFETY NOTES AND DETAILS

AIP PROJ. NO.
MODOT NO. 21-012A-01

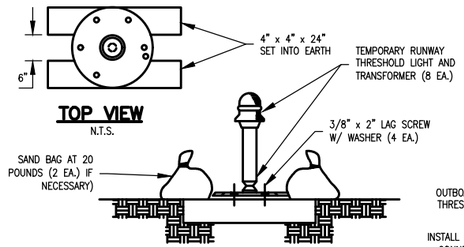
JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
G050

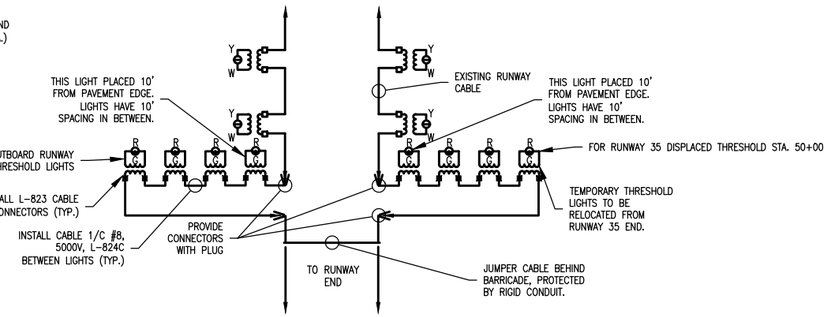
SHEET NO.
17 of 216



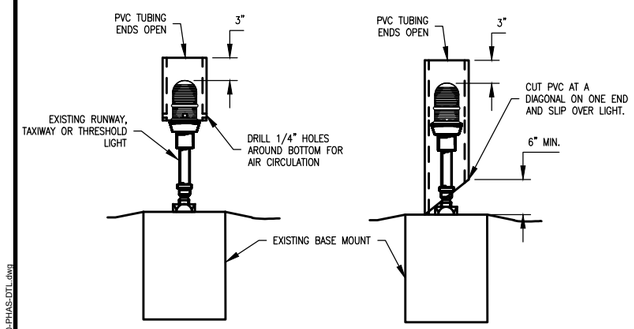
1 G060 **PAINTED RUNWAY 35 DISPLACED THRESHOLD AREA**
N.T.S.



2 G060 **TEMPORARY DISPLACED THRESHOLD LIGHT MOUNTING DETAIL**
N.T.S.



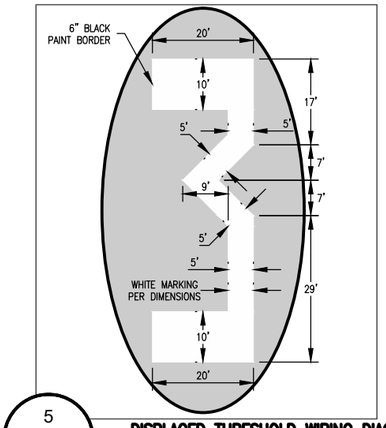
4 G060 **DISPLACED THRESHOLD WIRING DIAGRAM**
N.T.S.



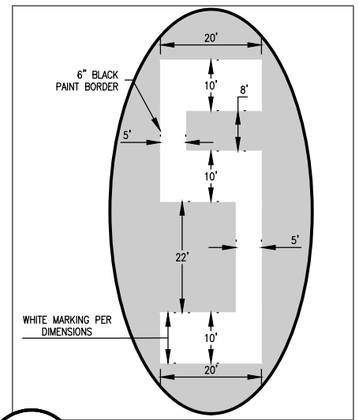
3 G060 **TYPICAL COVERED LIGHT DETAILS**
N.T.S.

DO NOT REMOVE LIGHT BULBS FROM FIXTURES.

GLOBE LEGEND	
B	BLUE/OPAQUE
Y	YELLOW/AMBER
G	GREEN
R	RED
W	WHITE



5 G060 **DISPLACED THRESHOLD WIRING DIAGRAM**
N.T.S.



6 G060 **DISPLACED THRESHOLD WIRING DIAGRAM**
N.T.S.

TEMPORARY DISPLACED THRESHOLD NOTES

1. THE CONTRACTOR SHALL PROVIDE THE RESIDENT ENGINEER AND THE AIRPORT A MINIMUM 48-HOUR NOTICE PRIOR TO INSTALLING THE DISPLACED THRESHOLD.

   THE MARKING OBLITERATION FOR THE TEMPORARY DISPLACED THRESHOLD SHALL BE ACCOMPLISHED BY WATER BLASTING OR ANOTHER APPROVED METHOD. ANY DAMAGE TO EXISTING PAINT MARKINGS SHALL BE REPAINTED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE COST OF OBLITERATING THE MARKINGS IS PAID PER ITEM P-620D.

2. THE CONTRACTOR SHALL COORDINATE DISPLACED THRESHOLD INSTALLATION WITH THE AIRPORT POINT OF CONTACT REGARDING SHUTOFF OR ADJUSTMENTS TO BE PERFORMED BY FAA TECHNICIANS TO FAA OPERATED NAVIGATIONAL AIDS.

3. THE WHITE AND YELLOW PAINT SHALL BE APPLIED AS A TEMPORARY COAT AND INCLUDE GLASS BEADS PER SPECIFICATION P-620. BLACK PAINT SHALL NOT INCLUDE GLASS BEADS.

4. COST FOR THE TEMPORARY DISPLACED THRESHOLD SHALL BE PAID BY INDIVIDUAL PAY ITEMS. APPROXIMATE QUANTITIES (CONTRACTOR TO VERIFY BEFORE ORDERING) INCLUDE:
   - MARKING OBLITERATION: PHASE 1 APROX. 88,000 S.F.
   - TEMPORARY WHITE PAINT: APROX. 16,500 S.F., TEMPORARY YELLOW PAINT: 2,700 S.F.
   - LIGHT RECONFIGURATION TO BE PAID AS INCIDENTAL TO OTHER BID ITEMS:
   - ANY OUTBOARD RUNWAY THRESHOLD LIGHTS – RELOCATE EXISTING RUNWAY THRESHOLD LIGHTS
   - YELLOW/CLEAR LENSES/GLOBES – CONTRACTOR SHALL RELOCATE EXISTING (IF APPLICABLE) YELLOW/CLEAR LENSES/GLOBES FOR RUNWAY EDGE LIGHTS SO THAT THE FIRST 2000' OF RUNWAY FROM DISPLACED THRESHOLD HAS RUNWAY EDGE LIGHTS WITH YELLOW/CLEAR LENSES/GLOBE.
   - CONNECTORS AND WIRE FOR SPLICES (IF APPLICABLE).
   - LIGHT MOUNTING MATERIALS. SEE DETAIL 2. (IF APPLICABLE).
   - AT LEAST 150' OF RIGID CONDUIT TO PROTECT JUMPER WIRE (IF APPLICABLE).

5. EXISTING RUNWAY NUMBERS (35) AND MARKINGS ON RUNWAY 35 MUST BE OBLITERATED AS SHOWN BEFORE SCHEDULE I, PHASE 1 CAN BEGIN.

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

MARK J. LOVATO PE-2009002094 07/14/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: K.J.S.

ISSUE RECORD

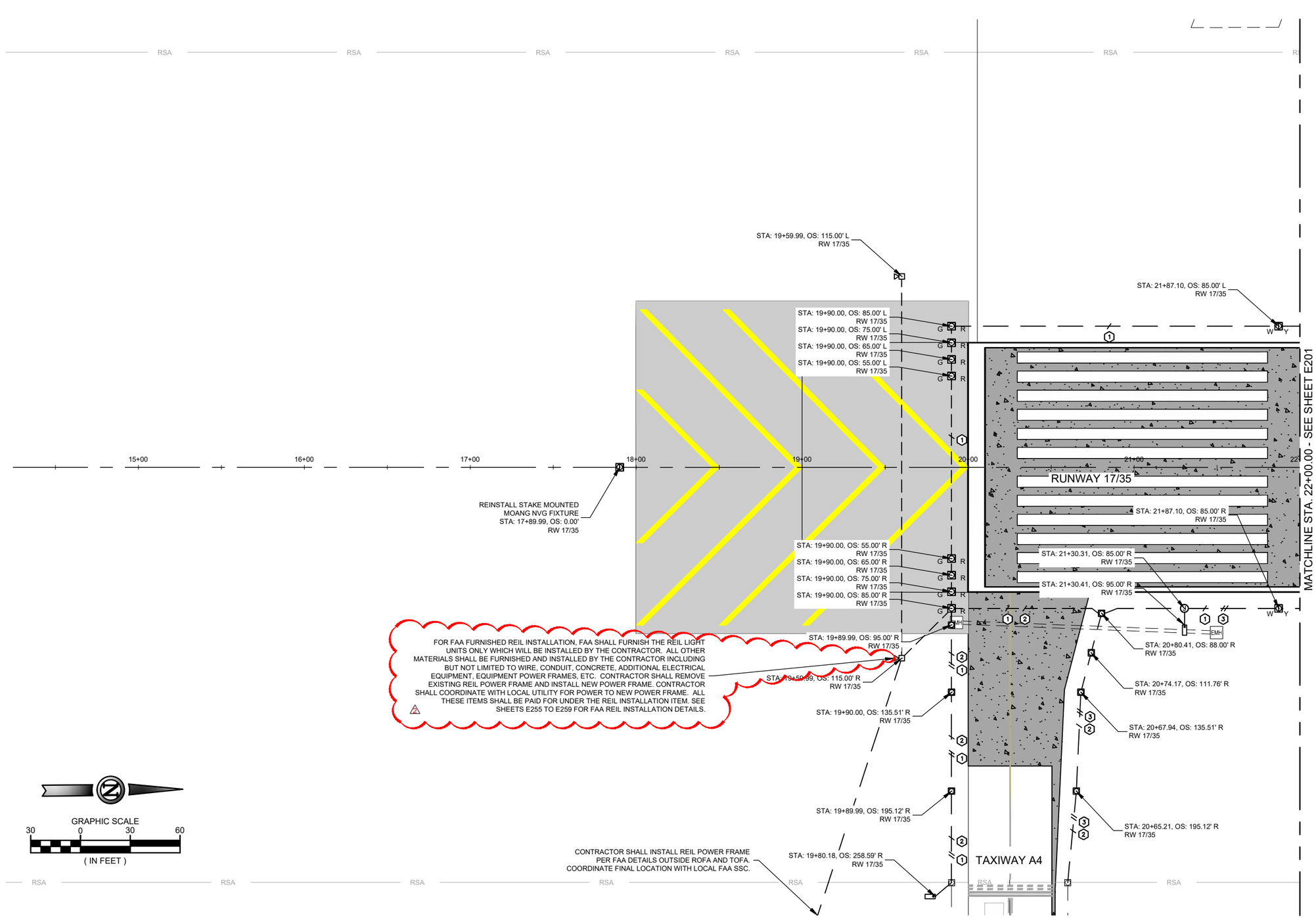
NO.	BY	DATE	DESCRIPTION
1	M.J.L.	06/30/2022	ISSUED FOR BID
2	M.J.L.	08/12/2022	ADDENDUM NO. 2

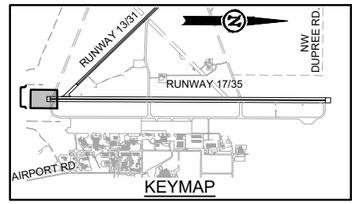
RUNWAY 17/35 RECONSTRUCTION

TEMPORARY RELOCATED THRESHOLD DETAILS

AIP PROJ. NO. MODOT NO. 21-012A-01
JVIATION PROJ. NO. 2020.STJ.01

SHEET NAME G060
SHEET NO. 28 of 216





NOTES

1. SEE SHEET E001 FOR ELECTRICAL LEGEND.
2. SEE SHEET E100 THROUGH E111 FOR ELECTRICAL DEMOLITION.
3. SEE SHEET E200 THROUGH E211 FOR AIRFIELD LIGHTING LAYOUT.
2. SEE SHEET E250 THROUGH E265 FOR ELECTRICAL DETAILS.
3. CONTRACTOR TO VERIFY AND PROTECT ALL UTILITIES AND AIRFIELD ELECTRICAL AND LIGHTING SYSTEMS DURING CONSTRUCTION.
4. ABANDON EXISTING DIRECT EARTH BURIED CABLE IN PLACE. CONTRACTOR SHALL REMOVE ANY CABLE THAT BECOMES UNEARTHED DURING CONSTRUCTION, INCIDENTAL TO THE VARIOUS BID ITEMS.
5. ANY PAVEMENT DAMAGED DURING REMOVAL OUTSIDE THE PROPOSED REMOVAL LIMITS SHALL BE SQUARED OFF TO THE SATISFACTION OF THE ENGINEER. ALL COSTS ASSOCIATED WITH THE ADDITIONAL REMOVAL AND RECONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CIRCUIT LEGEND	
1	RUNWAY 17/35
2	TAXIWAY A
3	RUNWAY 13/31
4	WINDCONE
5	BEACON
6	PAPI 13
7	PAPI 31
8	GROUND

EXISTING UTILITY INFORMATION SHOWN IN THE PLANS ARE BASED ON APPROXIMATE LOCATIONS, AND DO NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES ON THE SITE. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION AND NOTIFY THE STJ PROJECT MANAGER OF ANY DISCREPANCIES WHICH MAY CAUSE CONFLICTS.

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: K.J.S.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

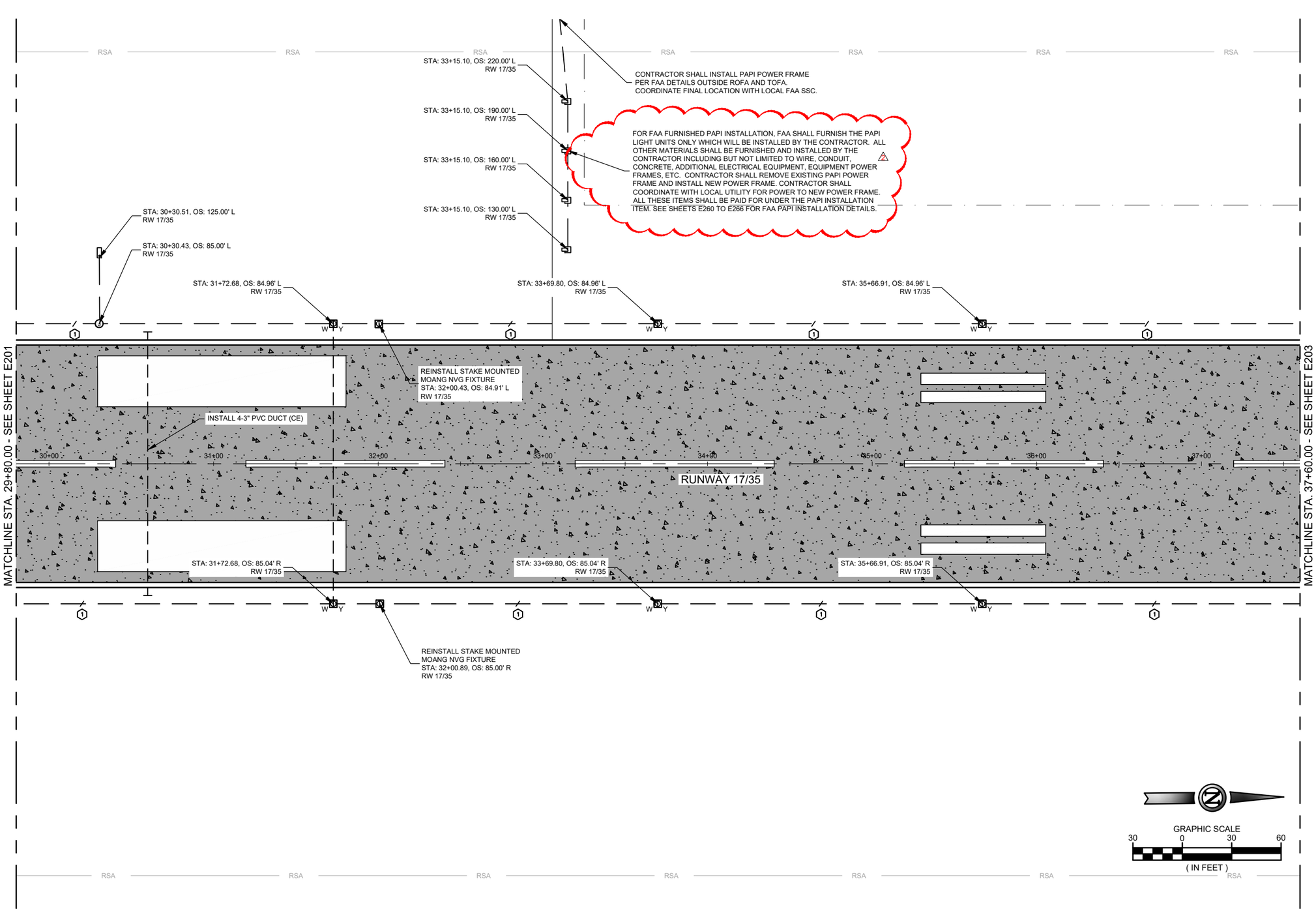
ELECTRICAL PLAN
STA. 14+20.00 TO STA. 22+00.00
RUNWAY 17/35

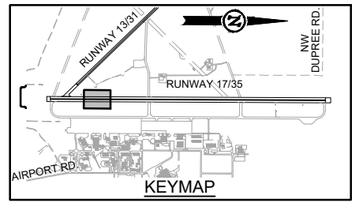
AIP PROJ. NO.
MODOT NO. 21-012A-01

JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E200

SHEET NO.
186 of 216





NOTES

1. SEE SHEET E001 FOR ELECTRICAL LEGEND.
2. SEE SHEET E100 THROUGH E111 FOR ELECTRICAL DEMOLITION.
3. SEE SHEET E200 THROUGH E211 FOR AIRFIELD LIGHTING LAYOUT.
2. SEE SHEET E250 THROUGH E265 FOR ELECTRICAL DETAILS.
3. CONTRACTOR TO VERIFY AND PROTECT ALL UTILITIES AND AIRFIELD ELECTRICAL AND LIGHTING SYSTEMS DURING CONSTRUCTION.
4. ABANDON EXISTING DIRECT EARTH BURIED CABLE IN PLACE. CONTRACTOR SHALL REMOVE ANY CABLE THAT BECOMES UNEARTHED DURING CONSTRUCTION, INCIDENTAL TO THE VARIOUS BID ITEMS.
5. ANY PAVEMENT DAMAGED DURING REMOVAL OUTSIDE THE PROPOSED REMOVAL LIMITS SHALL BE SQUARED OFF TO THE SATISFACTION OF THE ENGINEER. ALL COSTS ASSOCIATED WITH THE ADDITIONAL REMOVAL AND RECONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CIRCUIT LEGEND

1. RUNWAY 17/35
2. TAXIWAY A
3. RUNWAY 13/31
4. WINDCONE
5. BEACON
6. PAPI 13
7. PAPI 31
8. GROUND

EXISTING UTILITY INFORMATION SHOWN IN THE PLANS ARE BASED ON APPROXIMATE LOCATIONS, AND DO NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES ON THE SITE. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION AND NOTIFY THE STJ PROJECT MANAGER OF ANY DISCREPANCIES WHICH MAY CAUSE CONFLICTS.

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: M.J.L.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

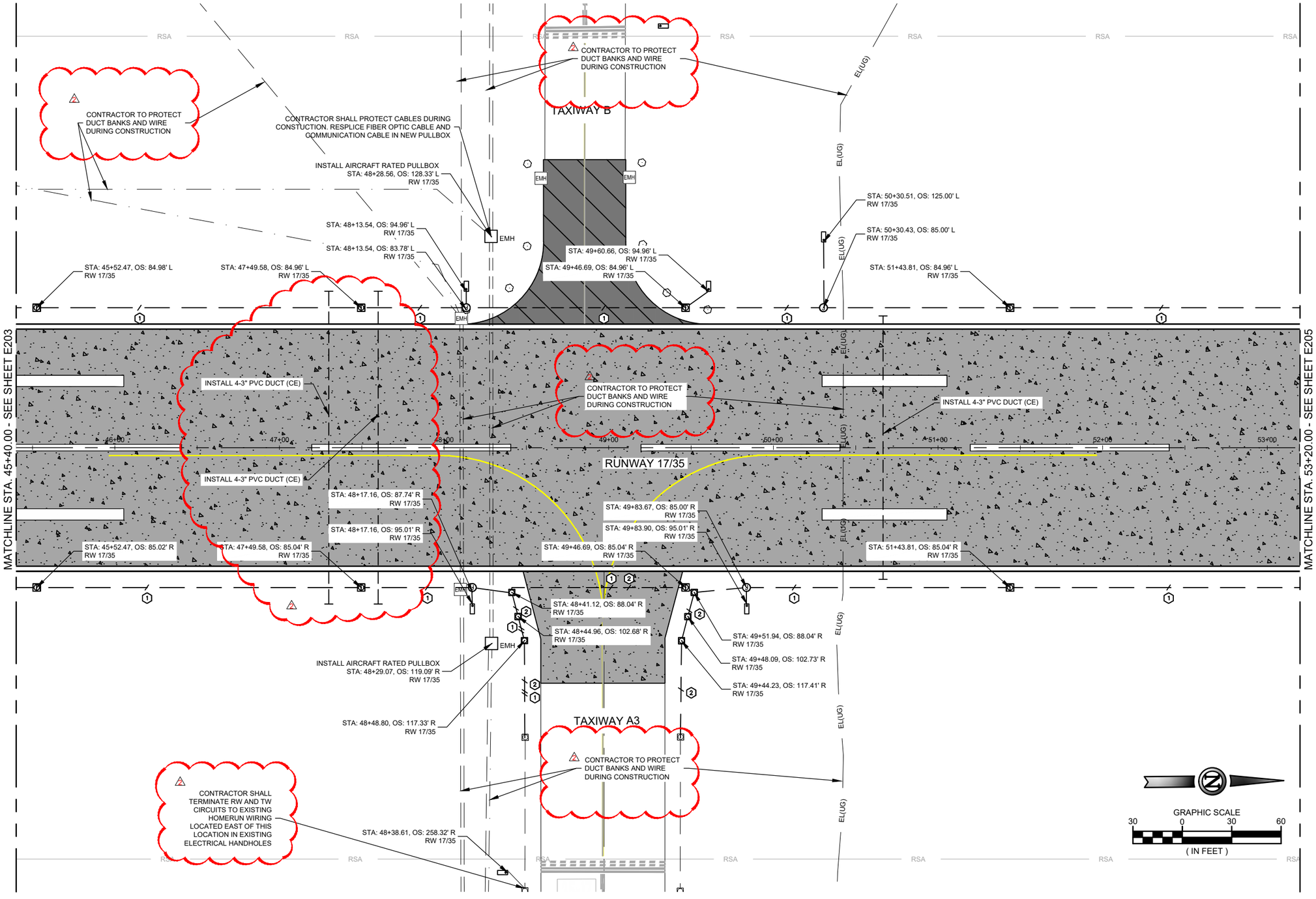
ELECTRICAL PLAN
STA. 29+80.00 TO STA. 37+60.00
RUNWAY 17/35

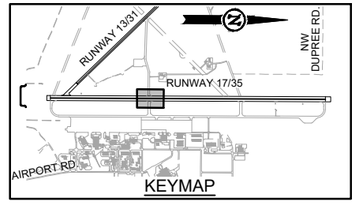
AIP PROJ. NO.
MODOT NO. 21-012A-01

JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E202

SHEET NO.
188 of 216





NOTES

1. SEE SHEET E001 FOR ELECTRICAL LEGEND.
2. SEE SHEET E100 THROUGH E111 FOR ELECTRICAL DEMOLITION.
3. SEE SHEET E200 THROUGH E211 FOR AIRFIELD LIGHTING LAYOUT.
2. SEE SHEET E250 THROUGH E265 FOR ELECTRICAL DETAILS.
3. CONTRACTOR TO VERIFY AND PROTECT ALL UTILITIES AND AIRFIELD ELECTRICAL AND LIGHTING SYSTEMS DURING CONSTRUCTION.
4. ABANDON EXISTING DIRECT EARTH BURIED CABLE IN PLACE. CONTRACTOR SHALL REMOVE ANY CABLE THAT BECOMES UNEARTHED DURING CONSTRUCTION, INCIDENTAL TO THE VARIOUS BID ITEMS.
5. ANY PAVEMENT DAMAGED DURING REMOVAL OUTSIDE THE PROPOSED REMOVAL LIMITS SHALL BE SQUARED OFF TO THE SATISFACTION OF THE ENGINEER. ALL COSTS ASSOCIATED WITH THE ADDITIONAL REMOVAL AND RECONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CIRCUIT LEGEND

1	RUNWAY 17/35
2	TAXIWAY A
3	RUNWAY 13/31
4	WINDCONE
5	BEACON
6	PAPI 13
7	PAPI 31
8	GROUND

EXISTING UTILITY INFORMATION SHOWN IN THE PLANS ARE BASED ON APPROXIMATE LOCATIONS, AND DO NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES ON THE SITE. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION AND NOTIFY THE STJ PROJECT MANAGER OF ANY DISCREPANCIES WHICH MAY CAUSE CONFLICTS.

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: M.J.L.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

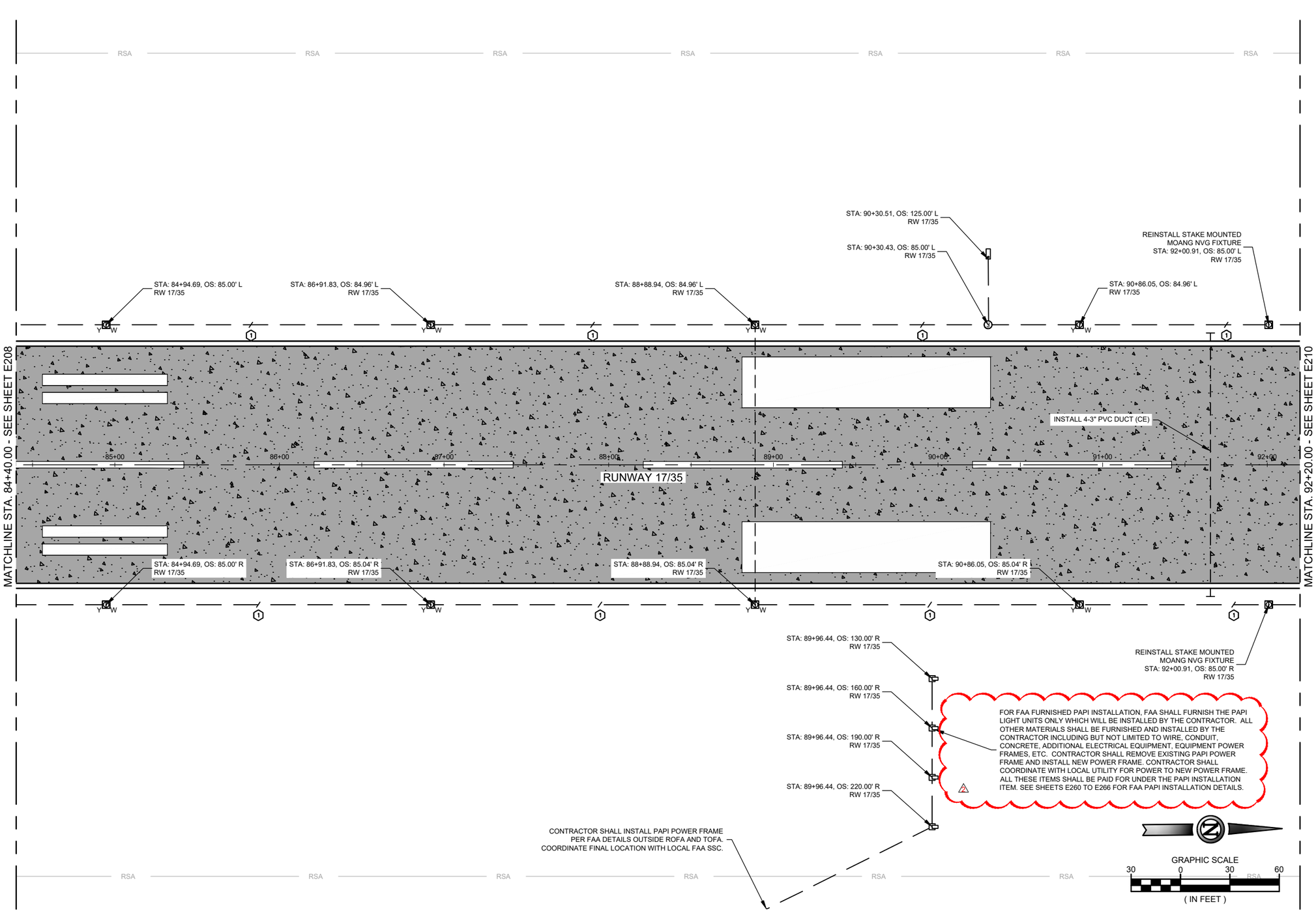
ELECTRICAL PLAN
STA. 45+40.00 TO STA. 53+20.00
RUNWAY 17/35

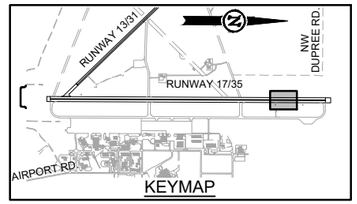
AIP PROJ. NO.
MODOT NO. 21-012A-01

JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E204

SHEET NO.
190 of 216





KEYMAP

NOTES

1. SEE SHEET E001 FOR ELECTRICAL LEGEND.
2. SEE SHEET E100 THROUGH E111 FOR ELECTRICAL DEMOLITION.
3. SEE SHEET E200 THROUGH E211 FOR AIRFIELD LIGHTING LAYOUT.
2. SEE SHEET E250 THROUGH E265 FOR ELECTRICAL DETAILS.
3. CONTRACTOR TO VERIFY AND PROTECT ALL UTILITIES AND AIRFIELD ELECTRICAL AND LIGHTING SYSTEMS DURING CONSTRUCTION.
4. ABANDON EXISTING DIRECT EARTH BURIED CABLE IN PLACE. CONTRACTOR SHALL REMOVE ANY CABLE THAT BECOMES UNEARTHED DURING CONSTRUCTION, INCIDENTAL TO THE VARIOUS BID ITEMS.
5. ANY PAVEMENT DAMAGED DURING REMOVAL OUTSIDE THE PROPOSED REMOVAL LIMITS SHALL BE SQUARED OFF TO THE SATISFACTION OF THE ENGINEER. ALL COSTS ASSOCIATED WITH THE ADDITIONAL REMOVAL AND RECONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CIRCUIT LEGEND

1. RUNWAY 17/35
2. TAXIWAY A
3. RUNWAY 13/31
4. WINDCONE
5. BEACON
6. PAPI 13
7. PAPI 31
8. GROUND

EXISTING UTILITY INFORMATION SHOWN IN THE PLANS ARE BASED ON APPROXIMATE LOCATIONS, AND DO NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES ON THE SITE. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION AND NOTIFY THE STJ PROJECT MANAGER OF ANY DISCREPANCIES WHICH MAY CAUSE CONFLICTS.

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: M.J.L.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

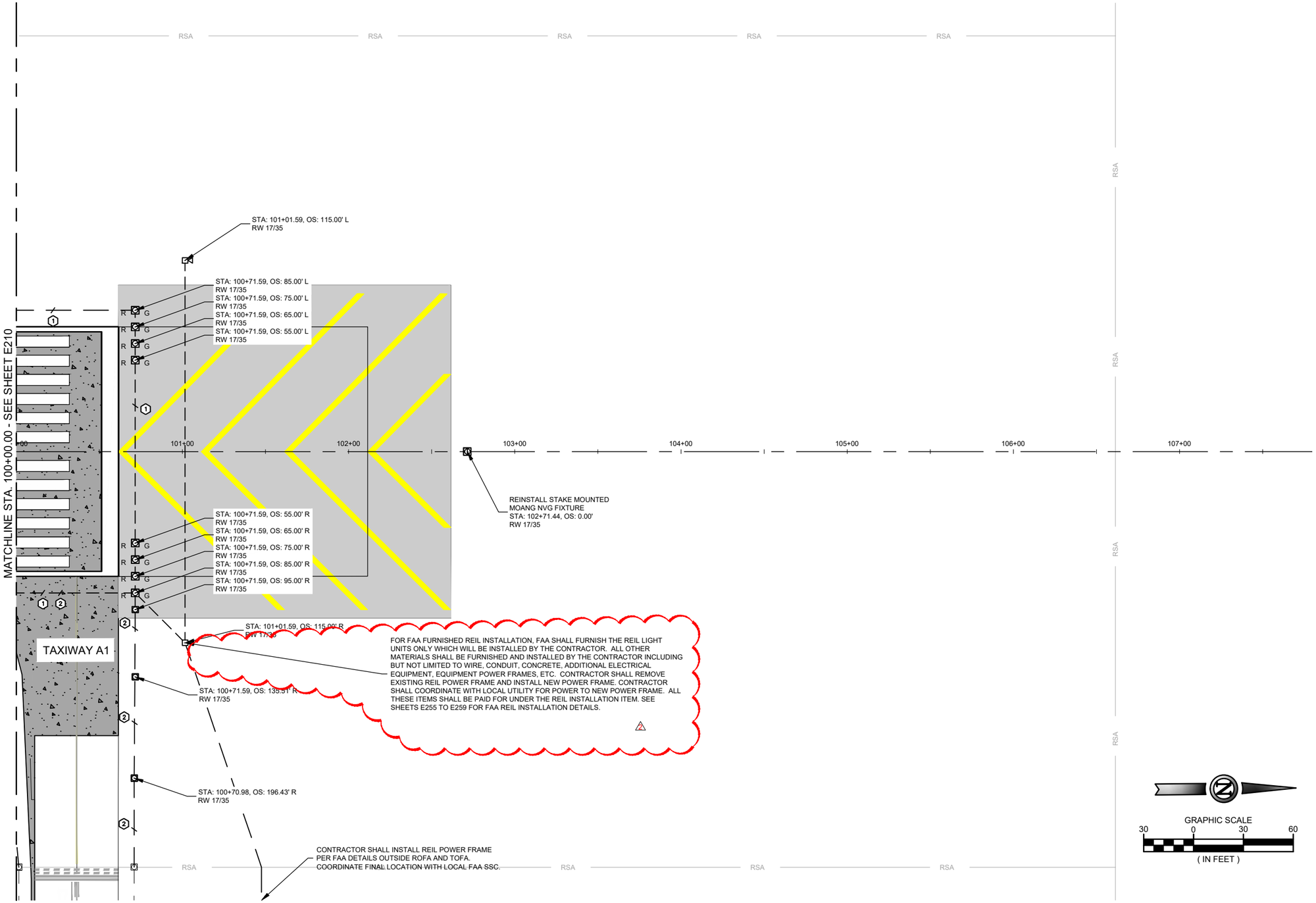
ELECTRICAL PLAN
STA. 84+40.00 TO STA. 92+20.00
RUNWAY 17/35

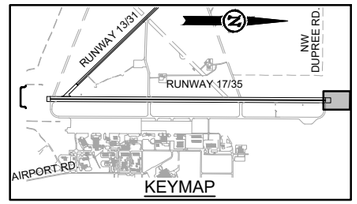
AIP PROJ. NO.
MODOT NO. 21-012A-01

JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E209

SHEET NO.
195 of 216





NOTES

1. SEE SHEET E001 FOR ELECTRICAL LEGEND.
2. SEE SHEET E100 THROUGH E111 FOR ELECTRICAL DEMOLITION.
3. SEE SHEET E200 THROUGH E211 FOR AIRFIELD LIGHTING LAYOUT.
2. SEE SHEET E250 THROUGH E265 FOR ELECTRICAL DETAILS.
3. CONTRACTOR TO VERIFY AND PROTECT ALL UTILITIES AND AIRFIELD ELECTRICAL AND LIGHTING SYSTEMS DURING CONSTRUCTION.
4. ABANDON EXISTING DIRECT EARTH BURIED CABLE IN PLACE. CONTRACTOR SHALL REMOVE ANY CABLE THAT BECOMES UNEARTHED DURING CONSTRUCTION, INCIDENTAL TO THE VARIOUS BID ITEMS.
5. ANY PAVEMENT DAMAGED DURING REMOVAL OUTSIDE THE PROPOSED REMOVAL LIMITS SHALL BE SQUARED OFF TO THE SATISFACTION OF THE ENGINEER. ALL COSTS ASSOCIATED WITH THE ADDITIONAL REMOVAL AND RECONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CIRCUIT LEGEND	
1	RUNWAY 17/35
2	TAXIWAY A
3	RUNWAY 13/31
4	WINDCONE
5	BEACON
6	PAPI 13
7	PAPI 31
8	GROUND

EXISTING UTILITY INFORMATION SHOWN IN THE PLANS ARE BASED ON APPROXIMATE LOCATIONS, AND DO NOT NECESSARILY REPRESENT ALL EXISTING UTILITIES ON THE SITE. CONTRACTOR TO FIELD VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION AND NOTIFY THE STJ PROJECT MANAGER OF ANY DISCREPANCIES WHICH MAY CAUSE CONFLICTS.

GRAPHIC SCALE
30 0 30 60
(IN FEET)

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: M.J.L.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

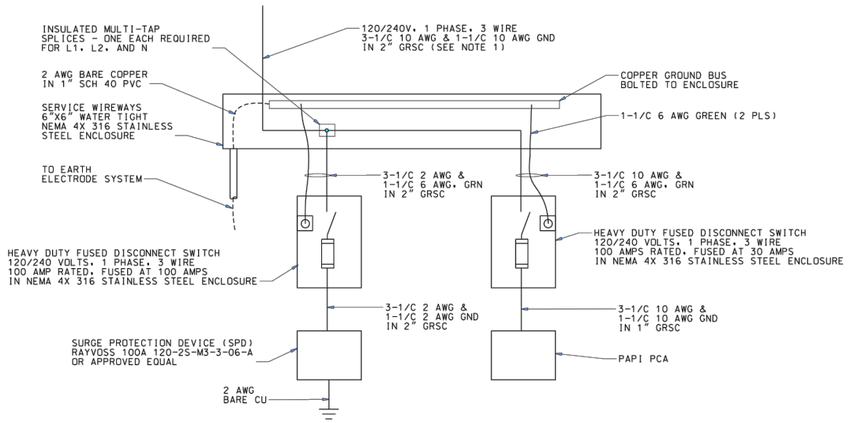
ELECTRICAL PLAN
STA. 100+00.00 TO STA. 107+80.00
RUNWAY 17/35

AIP PROJ. NO.
MODOT NO. 21-012A-01

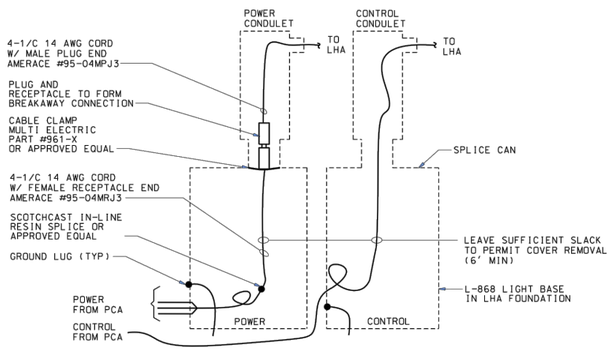
JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E211

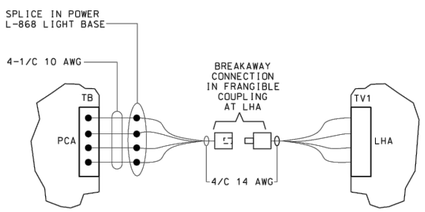
SHEET NO.
197 of 216



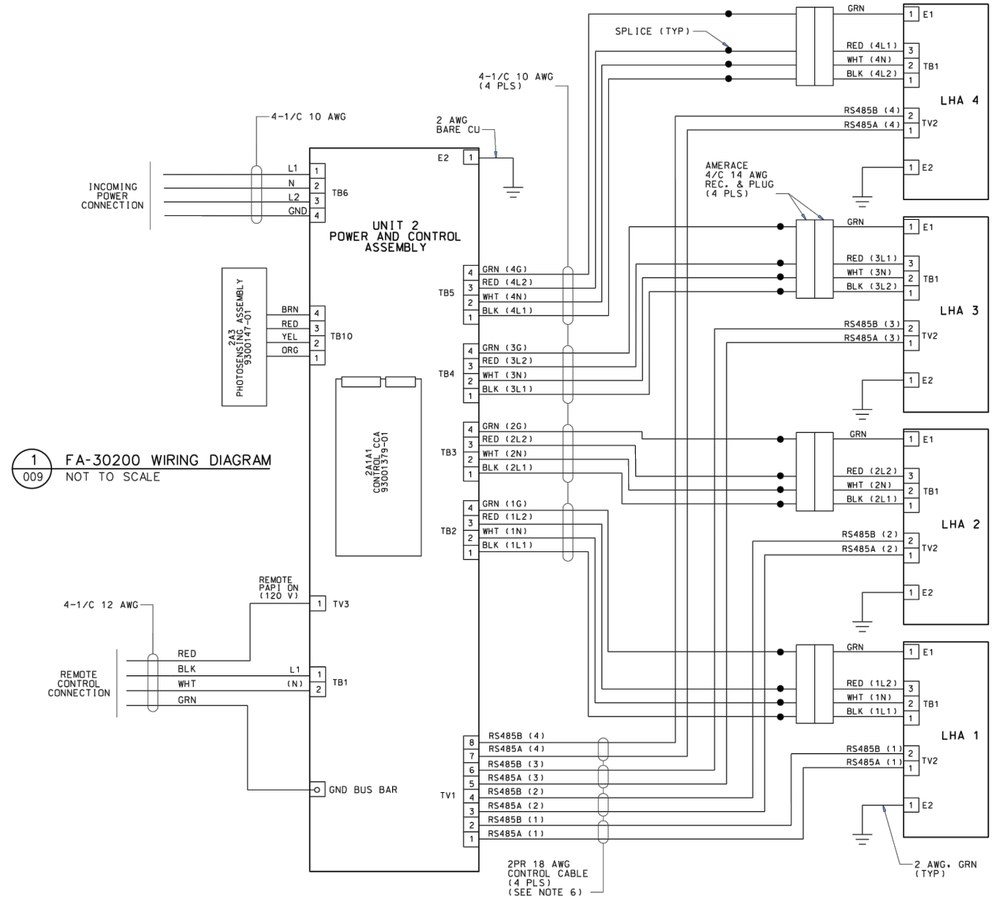
A 009 TYPICAL 120/240V ELECTRICAL POWER SERVICE
NOT TO SCALE



B 009 L868 BASE AND POWER/CONTROL CONDULET WIRING DETAIL
NOT TO SCALE (EACH LHA)



C 009 DETAIL PCA TO LHA WIRING
NOT TO SCALE (EACH LHA)



1 009 FA-30200 WIRING DIAGRAM
NOT TO SCALE

NOTES:

1. SITE CONDITIONS MAY REQUIRE LARGER POWER CONDUCTORS. REFER TO NOTE 1. DRAWING 004.
2. POWER WIRES INSTALLED BELOW GRADE SHALL BE XHHW OR XHHW-2. POWER WIRES ABOVE GRADE SHALL BE THWN OR THWN-2.
3. A 1/0 BARE COPPER STRANDED GUARD WIRE SHALL BE PROVIDED FOR ALL BURIED CABLES AND CONDUCTORS NOT ROUTED IN FERROUS CONDUIT.
4. SURGE PROTECTIVE DEVICE (SPD) SHALL CONFORM TO THE REQUIREMENTS OF FAA-STD-019 (LATEST VERSION). SPD MAY BE CONNECTED PARALLEL OR IN SERIES.
5. USE NEMA 4X, 316 STAINLESS STEEL TRANSFORMERS, DISCONNECT SWITCHES, SURGE PROTECTION DEVICES, ENCLOSURES, MOUNTING RAILS, AND HARDWARE.
6. LED PAPI SYSTEM MAX DRAW 6.25 AMPS + 15 AMP GFI OUTLET
7. EACH LHA MAX DRAW 1.25 AMPS FOR VOLTAGE DROP CALCULATIONS
8. INPUT POWER WIRING TO LHA1 & LHA2 DIFFERS FROM LHA3 AND LHA4. AT LHAS 1 & 2 THE PCA L1 IS LANDED ON TB1-1 AND THE PCA L2 IS LANDED ON TB1-3. ON LHAS 3 & 4 THE PCA L1 IS LANDED ON TB1-3 AND THE PCA L2 IS LANDED ON TB1-1.
9. INSTALL AN INSULATED GROUND BUSHING AT BOTH ENDS OF ALL METALLIC CONDUITS IN ALL ENCLOSURES.
10. THE PAPI PHOTOCELL SHALL BE MOUNTED ON THE EQUIPMENT RACK AND AIMED TO MAGNETIC NORTH. THE MOUNTING LOCATION SHALL PROVIDE AN UNOBSTRUCTED VIEW. ADDITIONAL CABLE MAY BE NEEDED TO EXTEND PHOTOCELL WIRING IN TO ENCLOSURE.

NEW SHEET ISSUED 2

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: K.J.S.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35 RECONSTRUCTION

FAA PAPI DETAILS REFERENCE SHEET 009

AIP PROJ. NO. MODOT NO. 21-012A-01

JVIATION PROJ. NO. 2020.STJ.01

SHEET NAME E266

SHEET NO. 214 of 216

AIRPORT GUIDANCE SIGNS

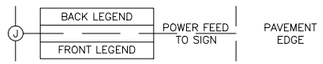
SIGN #	SIGN LEGEND FRONT	SIGN LEGEND BACK	L-858 SIGN TYPE FRONT	L-858 SIGN TYPE BACK	MODULES	SIZE	STYLE	SCHED. OF WORK
A-1	FBO ↑ MIL→	35-31↑	Y	Y	4	1	2	1
A-2	←A→	BLANK	Y	---	2	1	2	1
A-3		BLANK	Y	---	2	1	2	1
A-4			R	R	2	1	2	1
A1-1	BLANK	A1→	---	Y	2	1	2	1
A1-2	A1 17	A1	L/R	L	2	1	3	1
A2-1	BLANK	A2→	---	Y	2	1	2	1
A2-2	←A2	BLANK	Y	---	2	1	2	1
A2-3	A2 35-17	BLANK	L/R	---	3	1	3	1
A2-4	A2 ←A→	BLANK	L/Y	---	3	1	2	1
A2-5	←A2 A	BLANK	Y/L	---	3	1	2	1
A2-6	A A2→	17↑	L/Y	Y	3	1	2	1
A3-1	BLANK	A3→	---	Y	2	1	2	1
A3-2	←A3	BLANK	Y	---	2	1	2	1
A3-3	A3 35-17	←FBO MIL→	L/R	Y	4	1	3	1
A3-4	A3 ←A3→	13↑	L/Y	Y/L	3	1	2	1
A3-5	A3→	BLANK	Y	---	2	1	2	1
A3-6	A4 A→	35↑	L/Y	Y	2	1	2	1
A4-1	←A4	35	Y	L	2	1	2	1
A4-2	A4 35	A4	L/R	L	2	1	3	1
A4-3	A 31-APCH	BLANK	L/R	---	4	1	2	1

AIRPORT GUIDANCE SIGNS

SIGN #	SIGN LEGEND FRONT	SIGN LEGEND BACK	L-858 SIGN TYPE FRONT	L-858 SIGN TYPE BACK	MODULES	SIZE	STYLE	SCHED. OF WORK
B-1	B 17-35	13↑	L/R	Y	3	1	3	1
B-2	B 13-31	B	L/R	L	3	1	2	1
C1-1	C1→	BLANK	Y	---	2	1	2	1
C1-2	←A→	BLANK	Y	---	2	1	2	1
C1-3	←C1 A	BLANK	Y/L	---	3	1	2	1
C2-1	C2→	BLANK	Y	---	2	1	2	1
C2-2	← A →	BLANK	Y	---	2	1	2	1
C2-3	17↑	←C2	Y	Y	2	1	2	1
C3-1	C3→	MIL↑	Y	Y	2	1	2	1
C3-2	←A→	BLANK	Y	---	2	1	2	1
C3-3	←C3	A	Y	L	2	1	2	1
D-1	↖31	BLANK	Y	---	2	1	2	1
D-2	D 17-35	D	L/R	L	3	1	3	1
D-3	ILS	31	R	L	2	1	3	1
R-1	7	1	B	B	1	4	3	1
R-2	6	2	B	B	1	4	3	1
R-3	5	3	B	B	1	4	3	1
R-4	4	4	B	B	1	4	3	1
R-5	3	5	B	B	1	4	3	1
R-6	2	6	B	B	1	4	3	1
R-7	1	7	B	B	1	4	3	1

SIGN TYPE LEGEND

Y - BLACK LEGEND ON YELLOW BACKGROUND (L-858Y DIRECTIONAL)
R - WHITE LEGEND ON RED BACKGROUND (L-858R-MANDATORY)
L - YELLOW LEGEND ON BLACK BACKGROUND (L-858L-LOCATION)
B - WHITE LEGEND ON BLACK BACKGROUND (L-858B - RDR)



NOTES:

1. SIGNS SHALL BE LOCATED PER THE PLANS. IF NO STATION AND OFFSET IS GIVEN, SIGN SHALL BE INSTALLED IN SAME LOCATION AS EXISTING SIGN. WIRING SHALL BE PULLED BACK TO NEAREST JUNCTION BOX AND REINSTALLED TO NEW SIGN IN CASES OF SIGNS BEING INSTALLED IN SAME LOCATION. WIRING IN THIS CASE SHALL BE CONSIDERED INCIDENTAL TO THE SIGN INSTALLATION.
2. STYLE 2 SIGNS SHALL BE POWERED BY THE ASSOCIATED TAXIWAY CIRCUIT. STYLE 3 SIGNS SHALL BE POWERED FROM THE RW 17/35 CIRCUIT.

NEW SHEET ISSUED 2

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: D.R.J.
DR: F.Z.D.
CH: C.L.G.
APP: K.J.S.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

L-858 GUIDANCE SIGN TABLE

AIP PROJ. NO.
MODOT NO. 21-012A-01

JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E267

SHEET NO.
215 of 216

GRAPHIC SCALE
300 0 300 600
(IN FEET)

RUNWAY 13/31
RUNWAY 17/35
TW A
TW B
TW A1
TW A2
TW A3
TW A4
TW D
AIRPORT RD.
ROFA
RSA

ISSUED FOR BID

THESE DRAWINGS ARE FOR BIDDING PURPOSES ONLY. THEY WERE PREPARED BY OR UNDER THE SUPERVISION OF:

ZACHARY C. AMBARIANTZ PE-2021009380 06/30/2022

FOR AND ON BEHALF OF JVIATION , INC.

NEW SHEET ISSUED

JVIATION®
A WOOLPERT COMPANY

ROSECRANS MEMORIAL AIRPORT
CITY OF ST. JOSEPH, MISSOURI

DES: Z.C.A.
DR: L.D.D.
CH: Z.C.A.
APP: K.J.S.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION
1	M.J.L.	04/20/2022	ISSUED FOR REVIEW
2	M.J.L.	8/12/2022	ISSUED FOR ADDENDUM NO. 2

RUNWAY 17/35
RECONSTRUCTION

L-858 GUIDANCE SIGN LAYOUT PLAN

AIP PROJ. NO.
MODOT NO. 21-012A-01

JVIATION PROJ. NO.
2020.STJ.01

SHEET NAME
E268

SHEET NO.
216 of 216

Plotted: August 12, 2022 @ 6:46 AM by: Ambarientz, Zach
L:\STJ\21-01 Runway 17-35 Reconstruction\CAD\PLANS\PLANS\250-STJ-21-01-E268-ELEC-DETL.dwg