08A

Letting June 12, 2026

Notice to Bidders, Specifications and Proposal

WARNING: FAA Buy American Preference provisions apply to this contract. Failure to submit a "Certification of Compliance with FAA Buy American Preference – Construction Projects" form in accordance with the bidding procedures set forth herein (Appendix A3) will result in the bid being declared non-responsive.

Illinois Department of Transportation

Springfield, Illinois 62764

Contract No. DE089
Decatur Airport
Decatur, Illinois
Macon County
Illinois Project No. DEC-5284
AIP Project No. 3-17-0033-TBD

(Printed by authority of the State of Illinois)

Illinois Department of Transportation

NOTICE TO BIDDERS

1. **TIME AND PLACE OF OPENING BIDS.** Electronic bids are to be submitted to the electronic bidding system (iCX-Integrated Contractors Exchange). All bids must be submitted to the iCX system prior to 12:00 p.m. on June 12, 2026, at which time the bids will be publicly opened from the iCX SecureVault.

2. **DESCRIPTION OF WORK**. The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

   Contract No. DE089
   Decatur Airport
   Decatur, Illinois
   Macon County
   Illinois Project No. DEC-5284
   AIP Project No. 3-17-0033-TBD

   Reconstruct Runway 6/24 Lighting, Airfield Guidance Signs & Wind Cones - Construction

   For engineering information, please contact Lindsay Hausman, P.E. of Hanson Professional Services, Inc. at 217.747.9314.

3. **INSTRUCTIONS TO BIDDERS**.

   (a) This Notice, the invitation for bids, proposal, letter of award, contract form, payment bond and performance bond, Specifications, Supplemental Specifications, Special Provisions, general and detailed plans, *Manual for Documentation of Airport Materials*, *Airport Construction Documentation Manual*, and any Agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument, shall become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.

   (b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.

4. **AWARD CRITERIA AND REJECTION OF BIDS**. This contract will be awarded within 90 calendar days to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to readvertise the proposed improvement, and to waive technicalities.

5. **PRE-BID CONFERENCE.** N/A

6. **DISADVANTAGED BUSINESS POLICY.** The DBE goal for this contract is 0.0%.

7. **SPECIFICATIONS AND DRAWINGS.** The work shall be done in accordance with the Specifications, the Special Provisions dated April 17, 2026, and the Construction Plans dated April 17, 2026 as approved by the Illinois Department of Transportation, Division of Aeronautics.

8. **BIDDING REQUIREMENTS AND BASIS OF AWARD.** When alternates are included in the proposal, the following shall apply:

   a. Additive Alternates

      (1) Bidders must submit a bid for the Base Bid and for all Additive Alternates.

      (2) Award of this contract will be made to the lowest responsible qualified bidder computed as follows:

      The lowest aggregate amount of (i) the Base Bid plus (ii) any Additive Alternate(s) which the Department elects to award based on the availability of funding.

      Award of this contract will be limited to the following bid alternate combinations:

      I. Base Bid
      II. Base Bid + Additive Alternate 1
      III. Base Bid + Additive Alternate 1 + Additive Alternate 2
      IV. Base Bid + Additive Alternate 1 + Additive Alternate 2 + Additive Alternate 3

      The Department may elect not to award any Additive Alternates. In that case, award will be to the lowest responsible qualified bidder of the Base Bid.

   b. Optional Alternates

      (1) Bidders must submit a bid for the Base Bid and for either Alternate A or Alternate B or for both Alternate A and Alternate B.

      (2) Award of this contract will be made to the lowest responsible qualified bidder computed as follows:

      The lower of the aggregate of either (i) the Base Bid plus Alternate A or (ii) the Base Bid plus Alternate B.

9. **CONTRACT TIME.** The Contractor shall complete all work within the specified contract time. Any calendar day extension beyond the specified contract time must be fully justified, requested by the Contractor in writing, and approved by the Engineer, or be subject to liquidated damages.

   The contract time for this contract is 214 calendar days.

10. **INDEPENDENT WEIGHT CHECKS.** The Department reserves the right to conduct random unannounced independent weight checks on any delivery for bituminous, aggregate or other pay item for which the method of measurement for payment is based on weight. The weight checks will be accomplished by selecting, at random, a loaded truck and obtaining a loaded and empty weight on an independent scale. In addition, the department may perform random weight checks by obtaining loaded and empty truck weights on portable scales operated by department personnel.

11. **GOOD FAITH COMPLIANCE.** The Illinois Department of Transportation has made a good faith effort to include all statements, requirements, and other language required by federal and state law and by various offices within federal and state governments whether that language is required by law or not. If anything of this nature has been left out or if additional language etc. is later required, the bidder/contractor shall cooperate fully with the Department to modify the contract or bid documents to correct the deficiency. If the change results in increased operational costs, the Department shall reimburse the contractor for such costs as it may find to be reasonable.

By Order of the
Illinois Department of Transportation

Gia Biagi,
Secretary

ILLINOIS DEPARTMENT OF TRANSPORTATION
DIVISION OF AERONAUTICS

REQUIRED CONTRACT PROVISIONS FOR STATE FUNDED AIRPORT CONSTRUCTION PROJECTS

The following provisions are State of Illinois requirements and are in addition to the REQUIRED CONTRACT PROVISIONS FOR AIRPORT IMPROVEMENT PROGRAM AND FOR OBLIGATED SPONSORS

DISADVANTAGED BUSINESS POLICY

NOTICE: This proposal contains the special provision entitled "Disadvantaged Business Participation." Inclusion of this Special Provision in this contract satisfies the obligations of the Department of Transportation under federal law as implemented by 49 CFR 23 and under the Illinois "Minority and Female Business Enterprise Act."

POLICY: It is public policy that the businesses defined in 49 CFR Part 23 shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with State or Federal funds. Consequently, the requirements of 49 CFR Part 23 apply to this contract.

OBLIGATION: The Contractor agrees to ensure that the businesses defined in 49 CFR Part 23 have the maximum opportunity to participate in the performance of this contract. In this regard, the Contractor shall take all necessary and reasonable steps, in accordance with 49 CFR Part 23, to ensure that the said businesses have the maximum opportunity to compete for and perform portions of this contract. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

The Contractor shall include the above Policy and Obligation statements of this Special Provision in every subcontract, including procurement of materials and leases of equipment.

DBE/WBE CONTRACTOR FINANCE PROGRAM: On contracts where a loan has been obtained through the DBE/WBE Contractor Finance Program, the Contractor shall cooperate with the Department by making all payments due to the DBE/WBE Contractor by means of a two-payee check payable to the Lender (Bank) and the Borrower (DBE/WBE Contractor).

BREACH OF CONTRACT: Failure to carry out the requirements set forth above and in the Special Provision shall constitute a breach of contract and may result in termination of the contract or liquidated damages as provided in the special provision.

SPECIAL PROVISION FOR SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)
Effective: November 2, 2017
Revised: April 1, 2019

To account for the preparatory work and the operations necessary for the movement of subcontractor personnel, equipment, supplies, and incidentals to the project site and for all other work or operations that must be performed or costs incurred when beginning work approved for subcontracting according to the Specifications, the Contractor shall make a mobilization payment to each subcontractor.

This mobilization payment shall be made at least seven days prior to the subcontractor starting work. The amount paid shall be at the following percentage of the amount of the subcontract reported on form AER 260A submitted for the approval of the subcontractor's work.

Value of Subcontract Reported on Form AER 260A	Mobilization Percentage
Less than $10,000	25%
$10,000 to less than $20,000	20%
$20,000 to less than $40,000	18%
$40,000 to less than $60,000	16%
$60,000 to less than $80,000	14%
$80,000 to less than $100,000	12%
$100,000 to less than $250,000	10%
$250,000 to less than $500,000	9%
$500,000 to $750,000	8%
Over $750,000	7%

The mobilization payment to the subcontractor is an advance payment of the reported amount of the subcontract and is not a payment in addition to the amount of the subcontract; therefore, the amount of the advance payment will be deducted from future progress payments.

This provision shall be incorporated directly or by reference into each subcontract approved by the Department.

SPECIAL PROVISION FOR PAYMENTS TO SUBCONTRACTORS
Effective: November 2, 2017

Federal regulations found at 49 CFR §26.29 mandate the Department to establish a contract clause to require Contractors to pay subcontractors for satisfactory performance of their subcontracts and to set the time for such payments.

State law also addresses the timing of payments to be made to subcontractors and material suppliers. Section 7 of the Prompt Payment Act, 30 ILCS 540/7, requires that when a Contractor receives any payment from the Department, the Contractor shall make corresponding, proportional payments to each subcontractor and material supplier performing work or supplying material within 15 calendar days after receipt of the Department payment. Section 7 of the Act further provides that interest in the amount of two percent per month, in addition to the payment due, shall be paid to any subcontractor or material supplier by the Contractor if the payment required by the Act is withheld or delayed without reasonable cause. The Act also provides that the time for payment required and the calculation of any interest due applies to transactions between subcontractors and lower-tier subcontractors and material suppliers throughout the contracting chain.

This Special Provision establishes the required federal contract clause, and adopts the 15 calendar day requirement of the State Prompt Payment Act for purposes of compliance with the federal regulation regarding payments to subcontractors. This contract is subject to the following payment obligations.

When progress payments are made to the Contractor according to the Specifications, the Contractor shall make a corresponding payment to each subcontractor and material supplier in proportion to the work satisfactorily completed by each subcontractor and for the material supplied to perform any work of the contract. The proportionate amount of partial payment due to each subcontractor and material supplier throughout the contracting chain shall be determined by the quantities measured or otherwise determined as eligible for payment by the Department and included in the progress payment to the Contractor. Subcontractors and material suppliers shall be paid by the Contractor within 15 calendar days after the receipt of payment from the Department. The Contractor shall not hold retainage from the subcontractors. These obligations shall also apply to any payments made by subcontractors and material suppliers to their subcontractors and material suppliers; and to all payments made to lower tier subcontractors and material suppliers throughout the contracting chain. Any payment or portion of a payment subject to this provision may only be withheld from the subcontractor or material supplier to whom it is due for reasonable cause. If reasonable cause is asserted, written notice shall be provided to the applicable subcontractor and/or material supplier and the Engineer within five days of the Contractor receiving payment. The written notice shall identify the contract number, the subcontract or material purchase agreement, a detailed reason for refusal, the value of payment being withheld, and the specific remedial actions required of the subcontractor and/or material supplier so that payment can be made.

This Special Provision does not create any rights in favor of any subcontractor or material supplier against the State or authorize any cause of action against the State on account of any payment, nonpayment, delayed payment, or interest claimed by application of the State Prompt Payment Act. The Department will not approve any delay or postponement of the 15 day requirement except for reasonable cause shown after notice and hearing pursuant to Section 7(b) of the State Prompt Payment Act. State law creates other and additional remedies available to any subcontractor or material supplier, regardless of tier, who has not been paid for work properly performed or material furnished. These remedies are a lien against public funds set forth in Section 23(c) of the Mechanics Lien Act, 770 ILCS 60/23(c), and a recovery on the Contractor's payment bond according to the Public Construction Bond Act, 30 ILCS 550.

SPECIAL PROVISION FOR SUBCONTRACTOR AND DBE PAYMENT REPORTING (BDE)
Effective: April 2, 2018

Subcontractor and Disadvantaged Business Enterprise Payment Reporting

The Contractor shall report all payments made to the following parties:

(a) first tier subcontractors;

(b) lower tier subcontractors affecting disadvantaged business enterprise (DBE) goal credit;

(c) material suppliers or trucking firms that are part of the Contractor's submitted DBE utilization plan.

The report shall be made through the Department's on-line subcontractor payment reporting system within 21 days of making the payment.

SPECIAL PROVISION FOR ADDITIONAL STATE REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION CONTRACTS
Effective: February 1, 1969
Revised: January 1, 2017

EQUAL EMPLOYMENT OPPORTUNITY

In the event of the Contractor's noncompliance with the provisions of this Equal Employment Opportunity Clause, the Illinois Human Rights Act, or the Illinois Department of Human Rights Rules and Regulations, the Contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political sub-divisions or municipal corporations, and the contract may be cancelled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation.

During the performance of this Contract, the Contractor agrees as follows:

(1) That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability

unrelated to ability, military status, or an unfavorable discharge from military service; and further that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization.

(2) That, if it hires additional employees in order to perform this contract or any portion hereof, it will determine the availability (in accordance with the Illinois Department of Human Rights Rules and Regulations) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.

(3) That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status, or an unfavorable discharge from military service.

(4) That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the Contractor's obligations under the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations. If any labor organization or representative fails or refuses to cooperate with the Contractor in its efforts to comply with such Act and Rules and Regulations, the Contractor will promptly so notify the Illinois Department of Human Rights and IDOT and will recruit employees from other sources when necessary to fulfill its obligations thereunder.

(5) That it will submit reports as required by the Illinois Department of Human Rights Rules and Regulations, furnish all relevant information as may from time to time be requested by the Illinois Department of Human Rights or IDOT, and in all respects comply with the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations.

(6) That it will permit access to all relevant books, records, accounts, and work sites by personnel of IDOT and the Illinois Department of Human Rights for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations.

(7) That it will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that the provisions will be binding upon the subcontractor. In the same manner as with other provisions of this contract, the Contractor will be liable for compliance with applicable provisions of this clause by subcontractors; and further it will promptly notify IDOT and the Illinois Department of Human Rights in the event any subcontractor fails or refuses to comply with these provisions. In addition, the Contractor will not utilize any subcontractor declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.

SUBMISSION OF PAYROLL RECORDS – FEDERAL AID CONTRACT (BDE)
Effective: April 1, 2026

If the prevailing rate of wages published by the Illinois Department of Labor (IDOL) is equal to or greater than the prevailing wage determination by the United States Secretary of Labor for the same locality for the same type of construction used to classify the federal construction project, the requirements of the Illinois Prevailing Wage Act (820 ILCS 130) shall apply, including the “ILLINOIS PREVAILING WAGE ACT” section below. If not, only the requirements of the Davis-Bacon Act shall apply, including the “DAVIS-BACON ACT” section below.

DAVIS-BACON ACT:

STATEMENTS AND PAYROLLS

The payroll records shall include the worker’s name, social security number, last known address, telephone number, email address, classification(s) of work actually performed, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof), daily and weekly number of hours actually worked in total, deductions made, and actual wages paid.

The Contractor and each subcontractor shall submit certified payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers, last known addresses, telephone numbers, and email addresses shall not be included on weekly submittals. Instead, the payrolls need only include an identification number for each employee (e.g., the last four digits of the employee’s social security number). The submittals shall be made using LCPtracker Pro software. The software is web-based and can be accessed at https://lcptracker.com/. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option (“No Work”, “Suspended”, or “Complete”) selected.

ILLINOIS PREVAILING WAGE ACT:

STATEMENTS AND PAYROLLS

(1) Prevailing Wages. All wages paid by the Contractor and each subcontractor shall be in compliance with The Prevailing Wage Act (820 ILCS 130), as amended, except where a prevailing wage violates a federal law, order, or ruling, the rate conforming to the federal law, order, or ruling shall govern. The Contractor shall be responsible to notify each subcontractor of the wage rates set forth in this

contract and any revisions thereto. If the Department of Labor revises the wage rates, the Contractor will not be allowed additional compensation on account of said revisions.

(2) Payroll Records. The Contractor and each subcontractor shall make and keep, for a period of five years from the later of the date of final payment under the contract or completion of the contract, records of the wages paid to his/her workers. The payroll records shall include the worker's name, the worker's address, the worker's telephone number when available, the worker's social security number, the worker's classification or classifications, the worker's gross and net wages paid in each pay period, the worker's number of hours worked each day, and the worker's starting and ending times of work each day. However, any Contractor or subcontractor who remits contributions to a fringe benefit fund that is not jointly maintained and jointly governed by one or more employer and one or more labor organization must additionally submit the worker's hourly wage rate, the worker's hourly overtime wage rate, the worker's hourly fringe benefit rates, the name and address of each fringe benefit fund, the plan sponsor of each fringe benefit, if applicable, and the plan administrator of each fringe benefit, if applicable. Upon seven business days' notice, these records shall be available at a location within the State, during reasonable hours, for inspection by the Department or the Department of Labor; and Federal, State, or local law enforcement agencies and prosecutors.

(3) Submission of Payroll Records. The Contractor and each subcontractor shall, no later than the 15th day of each calendar month, file a certified payroll for the immediately preceding month to the Illinois Department of Labor (IDOL) through the Certified Transcript of Payroll Portal in compliance with the State Prevailing Wage Act (820 ILCS 130). The portal can be found on the IDOL website at https://labor.illinois.gov. Payrolls shall be submitted in the format prescribed by the IDOL.

In addition to filing certified payroll(s) with the IDOL, the Contractor and each subcontractor shall certify and submit payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers shall not be included on weekly submittals. Instead, the payrolls shall include an identification number for each employee (e.g., the last four digits of the employee's social security number). In addition, starting and ending times of work each day may be omitted from the payroll records submitted. The submittals shall be made using LCPtracker Pro software. The software is web-based and can be accessed at https://lcptracker.com/. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option ("No Work", "Suspended", or "Complete") selected.

(4) Employee Interviews. The Contractor and each subcontractor shall permit his/her employees to be interviewed on the job, during working hours, by compliance investigators of the Department or the Department of Labor.

SPECIAL PROVISION FOR NPDES CERTIFICATION

In accordance with the provisions of the Illinois Environmental Protection Act, the Illinois Pollution Control Board Rules and Regulations (35 Ill. Adm. Code, Subtitle C, Chapter I), and the Clean Water Act, and the regulations thereunder, this certification is required for all construction contracts that will result in the disturbance of one or more acres total land area.

The bidder certifies under penalty of law that he/she understands the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit (ILR100000) that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

The Airport Owner or its Agent will:

1) prepare, sign and submit the Notice of Intent (NOI)

2) conduct site inspections and complete and file the inspection reports

3) submit Incidence of Non-Compliance (ION) forms

4) submit Notice of Termination (NOT) form

Prior to the issuance of the Notice-to-Proceed, for each erosion control measure identified in the Storm Water Pollution Prevention Plan, the contractor or subcontractor responsible for the control measure(s) must sign the above certification (forms to be provided by the Department).

SPECIAL PROVISION FOR COMPLETION TIME VIA CALENDAR DAYS

It being understood and agreed that the completion within the time limit is an essential part of the contract, the bidder agrees to complete the work within 214 calendar days, unless additional time is granted by the Engineer in accordance with the provisions of the specifications. In case of failure to complete the work on or before the time named herein, or within such extra time as may have been allowed by extensions, the bidder agrees that the Department of Transportation shall withhold from such sum as may be due him/her under the terms of this contract, the costs, as set forth in Section 80-08 Failure to Complete on Time of the Specifications, which costs shall be considered and treated not as a penalty but as damages due to the State from the bidder by reason of the failure of the bidder to complete the work within the time specified in the contract.

ILLINOIS WORKS APPRENTICESHIP INITIATIVE – STATE FUNDED CONTRACTS (BDE)
Effective: June 2, 2021
Revised: April 2, 2024

Illinois Works Jobs Program Act (30 ILCS 559/20-1 et seq.). For contracts having an awarded contract value of $500,000 or more, the Contractor shall comply with the Illinois Works Apprenticeship Initiative (30 ILCS 559/20-20 to 20-25) and all applicable administrative rules. The goal of the Illinois Apprenticeship Works Initiative is that apprentices will perform either 10% of the total labor hours actually worked in each prevailing wage classification or 10% of the estimated labor hours in each prevailing wage classification, whichever is less. Of this goal, at least 50% of the labor hours of each prevailing wage classification performed by apprentices shall be performed by graduates of the Illinois Works Pre-Apprenticeship Program, the Illinois Climate Works Pre-Apprenticeship Program, or the Highway Construction Careers Training Program.

The Contractor may seek from the Department of Commerce and Economic Opportunity (DCEO) a waiver or reduction of this goal in certain circumstances pursuant to 30 ILCS 559/20-20(b). The Contractor shall ensure compliance during the term of the contract and will be required to report on and certify its compliance. An apprentice use plan, apprentice hours, and a compliance certification shall be submitted to the Engineer on forms provided by the Department and/or DCEO.

SPECIAL PROVISION FOR SUBMISSION OF BIDDERS LIST INFORMATION (BDE)
Effective: January 2, 2025
Revised: March 2, 2025

In accordance with 49 CFR 26.11(c) all DBE and non-DBEs who bid as prime contractors and subcontractors shall provide bidders list information, including all DBE and non-DBE firms from whom the bidder has received a quote or bid to work as a subcontractor, whether or not the bidder has relied upon that bid in placing its bid as the prime contractor.

The bidders list information shall be submitted with the bid using the link provided within the “Integrated Contractor Exchange (iCX)” application of the Department’s “EBids System”.

State of Illinois
Department of Transportation

SPECIAL PROVISION
FOR
SECTION 80 EXECUTION AND PROGRESS

80-08 FAILURE TO COMPLETE ON TIME.

ADD:

Schedule of Deductions for Each Day of Overrun in Contract Time			
Original Contract Amount		Daily Charges	
From More Than	To and Including	Calendar Day	Work Day
$ 0	$ 100,000	$ 475	$ 675
100,000	500,000	750	1,050
500,000	1,000,000	1,025	1,425
1,000,000	3,000,000	1,275	1,725
3,000,000	6,000,000	1,425	2,000
6,000,000	12,000,000	2,300	3,450
12,000,000	And over	6,775	9,525

APPENDIX A – FEDERAL AVIATION ADMINISTRATION (FAA) REQUIRED CONTRACT PROVISIONS

A1 ACCESS TO RECORDS AND REPORTS

A1.1 CONTRACT CLAUSE

ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Owner, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

A2 BREACH OF CONTRACT TERMS

A2.1 CONTRACT CLAUSE

This provision is required for all contracts that exceed the simplified acquisition threshold as stated in 2 CFR Part 200, Appendix II (A). This threshold is occasionally adjusted for inflation and is $350,000.

BREACH OF CONTRACT TERMS

Any violation or breach of terms of this contract on the part of the Contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide Contractor written notice that describes the nature of the breach and corrective actions the Contractor must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the Contractor must correct the breach. Owner may proceed with termination of the contract if the Contractor fails to correct the breach by the deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

A3 BUY AMERICAN PREFERENCE

A3.1 SOLICITATION CLAUSES

A3.1.1 Certification of Compliance with FAA Buy American Preference Statement

FAA BUY AMERICAN PREFERENCE

The Contractor certifies that its bid/offer is in compliance with 49 U.S.C. § 50101, BABA and other related Made in America Laws[1], U.S. statutes, guidance, and FAA policies, which provide that Federal funds may not be obligated unless all iron, steel and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

The bidder or offeror must complete and submit the certification of compliance with FAA's Buy American Preference, BABA and Made in America laws included herein with their bid or offer. The Illinois Department of Transportation, Division of Aeronautics will reject as nonresponsive any bid or offer that does not include a completed certification of compliance with FAA's Buy American Preference and BABA.

The bidder or offeror certifies that all constructions materials, defined to mean an article, material, or supply other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of: non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber; or drywall used in the project are manufactured in the U.S.

The bidder or offeror certifies procurement of certain rolling stock using FAA grant funds will prohibit airports from using Federal financial assistance to procure buses or rail car vehicle rolling stock from covered entities.

[1]Per Executive Order 14005 "Made in America Laws" means all statutes, regulations, rules, and Executive Orders relating to federal financial assistance awards or federal procurement, including those that refer to "Buy America" or "Buy American," that require, or provide a preference for, the purchase or acquisition of goods, products, or materials produced in the United States, including iron, steel, and manufactured products offered in the United States.

A3.1.2 Illinois Department of Transportation, Division of Aeronautics Requirements

The bidder shall submit the completed and signed "Certification of Compliance with FAA Buy American Preference – Construction Projects" form with the bid. The required form must be uploaded in the "Miscellaneous Documents" area as a single .pdf file in the "Integrated Contractor Exchange (iCX)" application within the Department's "EBids System".

The Department will not accept a "Certification of Compliance with FAA Buy American Preference – Construction Projects" form if it does not meet the bidding procedures set forth herein and the bid will be declared non-responsive. In the event the bid is declared non-responsive,

the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty and may deny authorization to bid the project if re-advertised for bids.

Any and all steel products used in the performance of this contract by the Contractor, subcontractors, producers, and suppliers are required to adhere to the Illinois Steel Products Procurement Act (30 ILCS 565/), which requires that all steel items be of 100 percent domestic origin and manufacture. Any products listed under the Federal Aviation Administration's (FAA) nationwide approved list of "Equipment Meeting Buy American Requirements" shall be deemed as meeting the requirements of the Illinois Steel Products Procurement Act.

All FAA Buy American Waivers are the responsibility of the Contractor, must be obtained prior to the Notice to Proceed, and must be submitted to the Illinois Department of Transportation, Division of Aeronautics for review and approval before being forwarded to the FAA. Any products used on the project that cannot meet the domestic requirement, and for which a waiver prior to the Notice to Proceed was not obtained, will be rejected for use and subject to removal and replacement with no additional compensation, and the contractor deemed non-responsive.

A3.1.3 Certification of Compliance with FAA Buy American Preference – Construction Projects

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with its proposal. The bidder or offeror must indicate how it intends to comply with 49 U.S.C. § 50101, BABA and other related Made in America Laws, U.S. statutes, guidance, and FAA policies, by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e., not both) by inserting a checkmark (✓) or the letter "X".

☐ Bidder or offeror hereby certifies that it will comply with 49 U.S.C. § 50101, BABA and other related U.S. statutes, guidance, and policies of the FAA by:

a) Only installing iron, steel and manufactured products produced in the United States;

b) Only installing construction materials defined as: an article, material, or supply – other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber or drywall that have been manufactured in the United States.

c) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or

d) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

a) To provide to the Illinois Department of Transportation, Division of Aeronautics and the FAA evidence that documents the source and origin of the iron, steel, and/or manufactured product.
b) To faithfully comply with providing U.S. domestic products.
c) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
d) Certify that all construction materials used in the project are manufactured in the U.S.

☐ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 U.S.C. § 50101(a) but may qualify for a Type 3 or Type 4 waiver under 49 U.S.C. § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:

a) To submit to the Illinois Department of Transportation, Division of Aeronautics and the FAA within 15 calendar days of being selected as the responsive bidder, a formal waiver request and required documentation that supports the type of waiver being requested.
b) That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination that may result in rejection of the proposal.
c) To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.
d) To furnish U.S. domestic product for any waiver request that the FAA rejects.
e) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

Required Documentation

Type 2 Waiver (Nonavailability) - The iron, steel, manufactured goods or construction materials or manufactured goods are not available in sufficient quantity or quality in the United States. The required documentation for the Nonavailability waiver is

a) Completed Content Percentage Worksheet and Final Assembly Questionnaire

b) Record of thorough market research, consideration where appropriate of qualifying alternate items, products, or materials including;

c) A description of the market research activities and methods used to identify domestically manufactured items capable of satisfying the requirement, including the timing of the research and conclusions reached on the availability of sources.

Type 3 Waiver – The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the "facility/project." The required documentation for a Type 3 waiver is:

a) Completed Content Percentage Worksheet and Final Assembly Questionnaire including;
b) Listing of all manufactured products that are not comprised of 100 percent U.S. domestic content (excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
c) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly and installation at project location.
d) Percentage of non-domestic component and subcomponent cost as compared to total "facility" component and subcomponent costs, excluding labor costs associated with final assembly and installation at project location.

Type 4 Waiver (Unreasonable Costs) - Applying this provision for iron, steel, manufactured goods or construction materials would increase the cost of the overall project by more than 25 percent. The required documentation for this waiver is:

a) A completed Content Percentage Worksheet and Final Assembly Questionnaire from
b) At minimum two comparable equal bids and/or offers;
c) Receipt or record that demonstrates that supplier scouting called for in Executive Order 14005, indicates that no domestic source exists for the project and/or component;
d) Completed waiver applications for each comparable bid and/or offer.

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

Date	Signature
Company Name	Title

A4 CIVIL RIGHTS - GENERAL

A4.1 CONTRACT CLAUSES

A4.1.1 General Clause that is used for Contracts, Lease Agreements, and Transfer Agreements

GENERAL CIVIL RIGHTS PROVISIONS

In all its activities within the scope of its airport program, the Contractor agrees to comply with pertinent statutes, Executive Orders, and such rules as identified in Title VI List of Pertinent Nondiscrimination Acts and Authorities to ensure that no person shall, on the grounds of race, color, national origin, creed, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

A4.1.2 Specific Clause that is used for General Contract Agreements

The above provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract.

A5 CIVIL RIGHTS – TITLE VI ASSURANCE

A5.1 SOLICITATION CLAUSE

A5.1.1 Title VI Solicitation Notice

Title VI Solicitation Notice:

The Illinois Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4), 28 CFR § 50.3, and 49 CFR Part 21, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, all contractors will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of the owner's race, color, national origin, sex, creed, age, or disability in consideration for an award.

A5.2 CONTRACT CLAUSES

A5.2.1 Title VI List of Pertinent Nondiscrimination Acts and Authorities

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq*., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR Partpart 21 (Non-discrimination in Federally-Assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964) including amendments thereto;
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 *et seq*.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27 (Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance);
- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 *et seq*.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (P.L. 100-259) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101, et seq) (prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities) as implemented by U.S. Department of Transportation regulations at 49 CFR Parts 37 and 38;
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. § 1681, et seq).

A5.2.2 Nondiscrimination Requirements/Title VI Clauses for Compliance

Compliance with Nondiscrimination Requirements:

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

1. **Compliance with Regulations:** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Nondiscrimination:** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin), creed, sex, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21 including amendments thereto.

3. **Solicitations for Subcontracts, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

4. **Information and Reports:** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

    a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or

    b. Cancelling, terminating, or suspending a contract, in whole or in part.

Incorporation of Provisions: The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

A6 CLEAN AIR AND WATER POLLUTION CONTROL

A6.1 CONTRACT CLAUSE

This provision is required for all contracts and lower tier contracts that exceed $150,000.

CLEAN AIR AND WATER POLLUTION CONTROL

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 U.S.C. §§ 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. §§ 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceed $150,000.

A7 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

A7.1 CONTRACT CLAUSE

This provision applies to all contracts and lower tier contracts that exceed $100,000, and employ laborers, mechanics, watchmen, and guards.

CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of $33 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract

Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

A8 COPELAND "ANTI-KICKBACK" ACT

A8.1 CONTRACT CLAUSE

This provision applies to all construction contracts and subcontracts financed under the AIP that exceed $2,000.

COPELAND "ANTI-KICKBACK" ACT

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

A9 DAVIS-BACON REQUIREMENTS

A9.1 CONTRACT CLAUSE

This provision is to be incorporated into all construction contracts and subcontracts that exceed $2,000 and include funding from the AIP.

DAVIS-BACON REQUIREMENTS

1. Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under regulations implementing the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding. The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and Basic Records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR § 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at *https://www.dol.gov/agencies/whd/government-contracts/construction/payroll-certification* or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i), and that such information is correct and complete;

(2) That each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to

make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR § 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at no less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

5. Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR §§ 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR § 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR § 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR § 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR § 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC § 1001.

A10 DEBARMENT AND SUSPENSION

A10.1 CERTIFICATION CLAUSES

A10.1.1 Bidder or Offeror Certification

CERTIFICATION OF OFFERER/BIDDER REGARDING DEBARMENT

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

A10.1.2 Lower Tier Contract Certification

CERTIFICATION OF LOWER TIER CONTRACTORS REGARDING DEBARMENT

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must confirm each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally-assisted project. The successful bidder will accomplish this by:

Checking the System for Award Management at website: https://www.sam.gov.

Collecting a certification statement similar to the Certification of Offeror /Bidder Regarding Debarment, above.

Inserting a clause or condition in the covered transaction with the lower tier contract.

If the Federal Aviation Administration later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

A11 DISADVANTAGED BUSINESS ENTERPRISE

A11.1 REQUIRED PROVISIONS

A11.1.1 Solicitation Language (Solicitations with a DBE Contract Goal)

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR § 26.53.

As a condition of responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

(1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
(2) A description of the work that each DBE firm will perform;
(3) The dollar amount of the participation of each DBE firm listed under (1);
(4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal
(5) Written confirmation from each listed DBE firm that it is participating in the contract in the kind and amount of work provided in the prime contractor's commitment; and
(6) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR Part 26 including any amendments thereto. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

A11.1.2 Solicitation Language (Solicitations with No DBE Contract Goal)

The requirements of 49 CFR Part 26 including any amendments thereto apply to this contract. It is the policy of the Illinois Department of Transportation to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. The Owner encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

A11.1.3 Prime Contracts (Projects covered by a DBE Program)

Contract Assurance (49 CFR § 26.13) –

The Contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 including any amendments thereto in the award and administration of DOT-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

1) Withholding monthly progress payments;

2) Assessing sanctions;

3) Liquidated damages; and/or

4) Disqualifying the Contractor from future bidding as non-responsible.

A12 DISTRACTED DRIVING

A12.1 CONTRACT CLAUSE

TEXTING WHEN DRIVING

In accordance with Executive Order 13513, “Federal Leadership on Reducing Text Messaging While Driving”, (10/1/2009) and DOT Order 3902.10, “Text Messaging While Driving”, (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding $15,000 that involve driving a motor vehicle in performance of work activities associated with the project.

A13 PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

A13.1 CONTRACT CLAUSE

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to use and procurement of certain telecommunications and video surveillance services or equipment in compliance with the National Defense Authorization Act P.L. 115-232, § 889(f)(1)).

A14 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

A14.1 SOLICITATION CLAUSE

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR Part 201, et seq, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The Contractor has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

A15 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

A15.1 CERTIFICATION CLAUSE

This provision is required for all contracts that equal or exceed $100,000.

CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

A16 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

A16.1 CONTRACT CLAUSE

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (29 CFR Part 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

A17 PROCUREMENT OF RECOVERED MATERIALS

A17.1 CONTRACT CLAUSE

PROCUREMENT OF RECOVERED MATERIALS

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

a) The contract requires procurement of $10,000 or more of a designated item during the fiscal year; or

b) The contractor has procured $10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products.

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;

b) Fails to meet reasonable contract performance requirements; or

c) Is only available at an unreasonable price.

A18 RIGHT TO INVENTIONS

A18.1 CONTRACT CLAUSE

RIGHTS TO INVENTIONS

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 CFR part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within 37 CFR § 401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental, or research work.

A19 SEISMIC SAFETY

A19.1 CONTRACT CLAUSE

A19.1.1 Construction Contracts

SEISMIC SAFETY

The Contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

A20 TAX DELINQUENCY AND FELONY CONVICTIONS

A20.1 CERTIFICATION CLAUSE

CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

Certifications

1) The applicant represents that it is not a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

2) The applicant represents that it is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note

If an applicant cannot comply with the two (2) above-listed certifications, the applicant is ineligible to receive an award unless the Sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

Term Definitions

Felony conviction: Felony conviction means a conviction within the preceding twenty four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. Code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 USC § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

A21 TERMINATION OF CONTRACT

A21.1 CONTRACT CLAUSE

A21.1.1 Termination for Convenience

TERMINATION FOR CONVENIENCE (CONSTRUCTION & EQUIPMENT CONTRACTS)

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1. Contractor must immediately discontinue work as specified in the written notice.
2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
3. Discontinue orders for materials and services except as directed by the written notice.
4. Deliver to the Owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work, and as directed in the written notice.
5. Complete performance of the work not terminated by the notice.
6. Take action as directed by the Owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

1. Completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
2. Documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
3. Reasonable and substantiated claims, costs, and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
4. Reasonable and substantiated expenses to the Contractor directly attributable to Owner's termination action.

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

A21.1.2 Termination for Default

TERMINATION FOR CAUSE (CONSTRUCTION)

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes standard language for conditions, rights, and remedies associated with Owner termination of this contract for cause due to default of the Contractor.

A22 TRADE RESTRICTION CERTIFICATION

A22.1 SOLICITATION CLAUSE

TRADE RESTRICTION CERTIFICATION

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);

2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and

3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC § 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR § 30.17, no contract shall be awarded to an Offeror or subcontractor:

1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR; or
2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list; or
3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

A23 VETERAN'S PREFERENCE

A23.1 CONTRACT CLAUSE

VETERAN'S PREFERENCE

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within 49 U.S.C. § 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 U.S.C. § 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

A24 DOMESTIC PREFERENCES FOR PROCUREMENTS

A24.1 CERTIFICATION CLAUSE

CERTIFICATION REGARDING DOMESTIC PREFERENCES FOR PROCUREMENTS

The Bidder or Offeror certifies by signing and submitting this bid or proposal that, to the greatest extent practicable, the Bidder or Offeror has provided a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including, but not limited to, iron, aluminum, steel, cement, and other manufactured products) in compliance with 2 CFR § 200.322.

A25 PROHIBITION OF COVERED UNMANNED AIRCRAFT SYSTEMS (UAS)

A25.1 CONTRACT CLAUSE

The Bidder or Offeror certifies that they are aware of and comply with relevant Federal statutes and regulations, including those from the Federal Aviation Administration (FAA), for operating unmanned aircraft systems (UAS) in accordance, and in compliance with all related requirements in the FAA Reauthorization Act of 2024 (Public Law 118-63), section 936 (49 U.S.C. § 44801 note).

Contractor warrants that all UAS operations will be conducted in full compliance with all applicable Federal Aviation Administration (FAA) regulations, including but not limited to 14 CFR Part 107, and any other applicable local, state, or Federal laws and regulations.

Sponsors and subgrant recipients cannot use AIP grant funds to enter into, extend, or renew a contract related to covered unmanned aircraft systems (UAS). This includes both procurement and operational contracts, as well as contracts with entities that operate such systems.

ITEM 08A **DE089**

SECTION III
SPECIAL PROVISIONS

RECONSTRUCT RUNWAY 6/24 LIGHTING, AIRFIELD GUIDANCE SIGNS & WIND CONES - CONSTRUCTION

DECATUR AIRPORT
DECATUR, ILLINOIS

COVERING ELECTRICAL DESIGN
LICENSED PROFESSIONAL ENGINEER
KEVIN N. LIGHTFOOT
062-047643
STATE OF ILLINOIS

DATE: 4/17/2026
EXPIRES: 11/30/2027

_ PROJECT NO: DEC-5284
PROJECT NO. 3-17-0033-TBD

0%, ISSUED: APRIL17, 2026
OT LETTING: JUNE 12, 2026

LICENSED PROFESSIONAL ENGINEER
LINDSAY DENET HAUSMAN
062-059464
STATE OF ILLINOIS

Exp 11/30/27

PREPARED BY

HANSON PROFESSIONAL SERVICES INC.
1525 SOUTH SIXTH STREET
SPRINGFIELD, ILLINOIS 62703-2886

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FORWARD

These special provisions, together with applicable standard specifications, manuals, policies, memorandums, worksheets, rules and regulations, contract requirements for airport improvement projects (AIP), payroll requirements, and minimum wage rates, which are hereto attached or which by reference are herein incorporated, cover the requirements of the State of Illinois, Department of Transportation (IDOT), Division of Aeronautics (Division) and the Federal Aviation Administration (FAA) for the following improvement project at Decatur Airport, Macon Conty, Decatur, Illinois: **Reconstruct Runway 6/24 Lighting, Airfield Guidance Signs & Wind Cones - Construction**. This project includes removing and replacing cabling, conduits, duct work, junction structures, guidance signs, supplemental wind cones, and associated vault work. A dedicated homerun is being proposed to accommodate the new system and future airfield electrical improvements.

END OF FORWARD

GOVERNING SPECIFICATIONS AND RULES AND REGULATIONS

Advisory Circular (AC) No. 150/5370-10H Standard Speciation's for Construction of Airports, Dated December 21, 2018, shall govern this project.

The Federal Aviation Administration Advisory Circulars are referenced on the Plans, Special Provisions, and/or Specifications regarding safety on airports. These Advisory Circulars are available on the FAA web site at http://www.faa.gov/regulations_policies/advisory_circulars

END OF GOVERNING SPECIFICATIONS AND RULES AND REGULATIONS

PART 1 – GENERAL CONTRACT PROVISIONS

SECTION 10 DEFINITION OF TERMS

When the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be defined as follows:

Paragraph Number	Term	Definition
10-01	**AASHTO**	The American Association of State Highway and Transportation Officials.
10-02	**Access Road**	The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.
10-02.1	**Administrator**	Administrator of the Federal Aviation Administration of the U.S. Department of Transportation, or their duly authorized representative.
10-03	**Advertisement**	A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.
10-04	**Airport**	Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; airport buildings and facilities located in any of these areas, and a heliport.
10-05	**Airport Improvement Program (AIP)**	A grant-in-aid program, administered by the Federal Aviation Administration (FAA).
10-06	**Air Operations Area (AOA)**	The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.
10-07	**Apron**	Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.
10-08	**ASTM International (ASTM)**	Formerly known as the American Society for Testing and Materials (ASTM).
10-09	**Award**	The Department's notice to the lowest responsible and responsive bidder of the acceptance of the submitted bid subject to the approval and execution of a satisfactory contract, receipt of a payment and performance bond and compliance with such other conditions as may be specified or otherwise required by law.
10-10	**Bidder**	Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who

Paragraph Number	Term	Definition
		submits a proposal for the work contemplated.
10-11	**Building Area**	An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.
10-12	**Calendar Day**	Every day shown on the calendar.
10-13	**Certificate of Analysis (COA)**	The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.
10-14	**Certificate of Compliance (COC)**	The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.
10-15	**Change Order**	Formal, written directive issued to a contractor or an agreement that amends a contract in order to address contingencies affecting the performance and completion of the contract, including but not limited to such matters as extra work, design changes or alterations to plans or special provisions or specifications for which no provision is included in the original contract. The work covered by a change order must be within the general scope of the contract. For work that would increase or decrease the total amount of the award contact, or any major contract item, by more than 25%, reference 10-59 Supplemental Agreement.
10-16	**Contract**	A written agreement between the Department or Owner and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of work, the furnishing of labor, equipment and materials, and the basis of payment. The awarded contract includes but may not be limited to: Advertisement, Contract form, Proposal, Performance bond, payment bond, Letter of Award, any required insurance certificates, Specifications, General provisions, Supplemental specifications, special provisions, plans, Manual for Documentation of Airport Materials, Airport Construction Documentation Manual, and addenda issued to bidders and any Agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one (1) instrument.
10-17	**Contract Item (Pay Item)**	A specific unit of work for which a price is provided in the contract.
10-18	**Contract Time**	The number of calendar days ~~or working days~~, stated in the proposal allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a

Paragraph Number	Term	Definition
		number of calendar ~~or working~~ days, the contract shall be completed by that date.
10-19	**Contractor**	The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.
10-20	**Contractors Quality Control (QC) Facilities**	The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).
10-21	**Contractor Quality Control Program (CQCP)**	Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.
10-22	**Control Strip**	A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.
10-23	**Construction Safety and Phasing Plan (CSPP)**	The overall plan for safety and phasing of a construction project developed by the airport operator or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
10-24	**Drainage System**	The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.
10-25	**Engineer**	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.
10-25.5	**IDOT**	The Illinois Department of Transportation
10-26	**Equipment**	All machinery, together with the necessary supplies for upkeep and maintenance; and all tools and apparatus necessary for the proper construction and acceptable completion of the work.
10-27	**Extra Work**	An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Owner's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.
10-28	**FAA**	The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.
10-29	**Federal Specifications**	The federal specifications and standards, commercial item descriptions, and supplements, amendments, and

Paragraph Number	Term	Definition
		indices prepared and issued by the General Services Administration.
10-30	**Force Account**	**a.** Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis. **b.** Owner Force Account - Work performed for the project by the Owner's employees.
10-30.1	**Inspector**	The authorized representative of the Engineer assigned to make all necessary inspections, observations, tests and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.
10-31	**Intention of Terms**	Whenever, in these specifications or on the plans, the words “directed,” “required,” “permitted,” “ordered,” “designated,” “prescribed,” or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words “approved,” “acceptable,” “satisfactory,” or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Owner. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.
10-32	**Lighting**	A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.
10-33	**Major and Minor Contract Items**	A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.
10-34	**Materials**	Any substance specified for use in the construction of the contract work.
10-35	**Modification of Standards (MOS)**	Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.
10-36	**Notice to Proceed (NTP)**	A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If

Paragraph Number	Term	Definition
		applicable, the Notice to Proceed shall state the date on which the contract time begins.
10-37	**Owner**	The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only. The Owner for this project is **Decatur Park District.**
10-38	**Passenger Facility Charge (PFC)**	Per 14 Code of Federal Regulations (CFR) Part 158 and 49 United States Code (USC) § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.
10-39	**Pavement Structure**	The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.
10-40	**Payment bond**	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.
10-41	**Performance bond**	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.
10-42	**Plans**	The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications. Plans may also be referred to as 'contract drawings.'
10-43	**Project**	The agreed scope of work for accomplishing specific airport development with respect to a particular airport.
10-44	**Proposal**	The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.
10-45	**Proposal guaranty**	The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Department.
10-46	**Quality Assurance (QA)**	Department's responsibility to assure that construction work completed complies with specifications for payment.
10-47	**Quality Control (QC)**	Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.
10-48	**Quality Assurance (QA) Inspector**	An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being

Paragraph Number	Term	Definition
		furnished by the Contractor.
10-49	**Quality Assurance (QA) Laboratory**	The official quality assurance testing laboratories of the Owner or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Owner's, or QA Laboratory.
10-50	**Resident Project Representative (RPR)**	The individual, partnership, firm, or corporation duly authorized by the Department to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor and acting directly or through an authorized representative. The Resident Engineer must meet the approval and qualification requirements set forth by the Department and reside on the construction site at all times the Contractor is working
10-51	**Runway**	The area on the airport prepared for the landing and takeoff of aircraft.
10-52	**Runway Safety Area (RSA)**	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.
10-53	**Safety Plan Compliance Document (SPCD)**	Details how the Contractor will comply with the CSPP.
10-54	**Specifications**	A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.
10-55	**Sponsor**	A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.
10-56	**Structures**	Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.
10-57	**Subgrade**	The soil that forms the pavement foundation.
10-58	**Superintendent**	The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the RPR, and who shall supervise and direct the construction.

Paragraph Number	Term	Definition
10-59	**Supplemental Agreement**	A written agreement between the Contractor and the Owner that establishes the basis of payment and contract time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%: (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3) work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.
10-60	**Surety**	The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.
10-61	**Taxilane**	A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.
10-62	**Taxiway**	The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.
10-63	**Taxiway/Taxilane Safety Area (TSA)**	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.
10-64	**Work**	The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.
~~**10-65**~~	~~**Working day**~~	~~A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.~~
10-66	**Owner Defined terms**	None

END OF SECTION 10

SECTION 20 PROPOSAL REQUIREMENTS AND CONDITIONS

20-01 Advertisement (Notice to Bidders). The Illinois Department of Transportation (IDOT) Transportation Procurement Bulletin (Bulletin) is the published source for this procurement action including the time and place of bidding, invitation to bids, notices, prequalification requirements, contract forms, bonds, plans, specifications, addendums and any other information necessary to prepare the bid.

20-02 Qualification of bidders. Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to IDOT at the time of bid opening.

Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.

Each bidder shall furnish IDOT satisfactory evidence of their financial responsibility. Evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether their financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to IDOT.

Unless otherwise specified, a bidder may submit evidence that they are prequalified with the Illinois Department of Transportation (IDOT). Evidence of IDOT prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

20-03 Contents of proposal forms. IDOT's proposal forms state the location and description of the proposed construction; the place, date, and time of opening of the proposals; and the estimated quantities of the various items of work to be performed and materials to be furnished for which unit bid prices are asked. The proposal form states the time in which the work must be completed, and the amount of the proposal guaranty that must accompany the proposal. IDOT will accept only those Proposals properly executed on physical forms or electronic forms provided by IDOT. Bidder actions that may cause IDOT to deem a proposal irregular are given in paragraph 20-09 *Irregular proposals*.

The bid opening time is 12:00 PM.

Mobilization is limited to 10 percent of the total project cost.

20-04 Issuance of proposal forms. The Owner and IDOT reserves the right to refuse to issue a proposal form to a prospective bidder if the bidder is in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner and IDOT, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner or IDOT at the time the Owner or IDOT issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner or IDOT.

d. Documented record of unsatisfactory work on previous contracts with the Owner or IDOT.

20-05 Interpretation of estimated proposal quantities. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as provided in the Section 40, paragraph 40-02, Alteration of Work and Quantities, without in any way invalidating the unit bid prices.

20-06 Examination of plans, specifications, and site. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves to the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied to the conditions to be encountered in performing the work and the requirements of the proposed contract, plans, and specifications.

20-07 Preparation of proposal. The bidder shall submit their proposal on the forms furnished by IDOT. All blank spaces in the proposal forms, unless explicitly stated otherwise, must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price within the electronic bid forms which they propose for each pay item furnished in the proposal.

The bidder shall correctly execute the electronic proposal correctly and in accordance with the instructions. Anyone executing a proposal as an agent shall be prepared to file evidence of their authority to do so and that the signature is binding upon the firm or corporation.

20-08 Responsive and responsible bidder. A responsive bid conforms to all significant terms and conditions contained in the Owner's invitation for bid. It is the Owner's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 2 CFR § 200.318(h). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-09 Irregular proposals. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by IDOT, or if IDOT's form is altered, or if any part of the proposal form is detached.
b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.
c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.
d. If the proposal contains unit prices that are obviously unbalanced.
e. If the proposal is not accompanied by the proposal guaranty specified by IDOT.
f. If the applicable Disadvantaged Business Enterprise information is incomplete.

The Owner or IDOT reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 Bid guarantee. Each bid shall be accompanied by a bid bond in the form provided by the Department with the bid form package. The bid bond shall be made and tendered by a surety acceptable to IDOT in the amount stated in the Invitation for Bids.

20-11 Delivery of proposal. Bids shall be sealed and submitted in the manner specified or allowed by the Invitation for Bids. All bids shall be delivered and received by IDOT prior to the time and at the place specified in the Invitation for Bids. The date and time of receipt will be recorded. Bids will remain sealed and will be stored in a secure place until the date and time established for bid opening. The Department will not accept bids after the time stated in the Invitation for Bids.

20-12 Withdrawal or revision of proposals. An authorized agent of a bidder may change or withdraw a bid if written or in-person notice of the change or withdrawal is received by IDOT before the time specified for submission of bids.

20-13 Public opening of proposals. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 Disqualification of bidders. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.
b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.
c. If the bidder is considered to be in "default" for any reason specified in paragraph 20-04, *Issuance of Proposal Forms*, of this section.

20-15 Discrepancies and Omissions. A Bidder who discovers discrepancies or omissions with the project bid documents shall immediately notify the Owner's Engineer of the matter. A bidder

that has doubt as to the true meaning of a project requirement may submit to the Owner's Engineer a written request for interpretation no later than **10** days prior to bid opening.

Any interpretation of the project bid documents by the Owner's Engineer will be by written addendum issued by the Owner. The Owner will not consider any instructions, clarifications or interpretations of the bidding documents in any manner other than written addendum.

END OF SECTION 20

SECTION 30 AWARD AND EXECUTION OF CONTRACT

30-01 Consideration of proposals. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit bid price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

- **a.** If the proposal is irregular as specified in Section 20, paragraph 20-09, *Irregular Proposals*.
- **b.** If the bidder is disqualified for any of the reasons specified Section 20, paragraph 20-14, *Disqualification of Bidders*.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-02 Award of contract. The award of a contract, if it is to be awarded, shall be made within 90 calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

If the Owner elects to proceed with an award of contract, IDOT will make award to the responsible bidder whose bid, conforming with all the material terms and conditions of the bid documents, is the lowest in price.

30-03 Cancellation of award. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by IDOT in accordance with paragraph 30-07 *Approval of Contract*.

30-04 Return of proposal guaranty. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after IDOT has made a comparison of bids as specified in the paragraph 30-01, *Consideration of Proposals*. Proposal guaranties of the two lowest bidders will be retained by IDOT until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as IDOT receives the contract bonds as specified in paragraph 30-05, *Requirements of Contract Bonds*.

30-05 Requirements of contract bonds. At the time of the execution of the contract, the successful bidder shall furnish IDOT a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to IDOT. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-06 Execution of contract. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in paragraph 30-05, *Requirements of Contract Bonds*, of this section, within 15 calendar days from the date mailed or otherwise delivered to the successful bidder.

30-07 Approval of contract. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, IDOT shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-08 Failure to execute contract. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the period specified in paragraph 30-06, *Execution of Contract*, of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidated damages to the Owner.

END OF SECTION 30

SECTION 40 SCOPE OF WORK

40-01 Intent of contract. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-02 Alteration of work and quantities. The Owner reserves the right to make such changes in quantities and work as may be necessary or desirable to complete, in a satisfactory manner, the original intended work. Unless otherwise specified in the Contract, the Owner's Engineer or RPR shall be and is hereby authorized to make, in writing, such in-scope alterations in the work and variation of quantities as may be necessary to complete the work, provided such action does not represent a significant change in the character of the work.

For purpose of this section, a significant change in character of work means: any change that is outside the current contract scope of work; any change (increase or decrease) in the total contract cost by more than 25%; or any change in the total cost of a major contract item by more than 25%.

Work alterations and quantity variances that do not meet the definition of significant change in character of work shall not invalidate the contract nor release the surety. Contractor agrees to accept payment for such work alterations and quantity variances in accordance with Section 90, paragraph 90-03, *Compensation for Altered Quantities*.

Should the value of altered work or quantity variance meet the criteria for significant change in character of work, such altered work and quantity variance shall be covered by a supplemental agreement. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

40-03 Omitted items. The Owner, the Owner's Engineer or the RPR may provide written notice to the Contractor to omit from the work any contract item that does not meet the definition of major contract item. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with Section 90, paragraph 90-04, *Payment for Omitted Items*.

40-04 Extra work. Should acceptable completion of the contract require the Contractor to perform an item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, Owner may issue a Change Order to cover the necessary extra work. Change orders for extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the RPR's opinion, is necessary for completion of the extra work.

When determined by the RPR to be in the Owner's best interest, the RPR may order the Contractor to proceed with extra work as provided in Section 90, paragraph 90-05, *Payment for Extra Work*. Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a supplemental agreement as defined in Section 10, paragraph 10-59, *Supplemental Agreement*.

If extra work is essential to maintaining the project critical path, RPR may order the Contractor to commence the extra work under a Time and Material contract method. Once sufficient detail is available to establish the level of effort necessary for the extra work, the Owner shall initiate a change order or supplemental agreement to cover the extra work.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-05 Maintenance of traffic. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. The Contractor shall maintain traffic in the manner detailed in the Construction Safety and Phasing Plan (CSPP).

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to their own operations and the operations of all subcontractors as specified in Section 80, paragraph 80-04, Limitation of Operations. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in Section 70, paragraph 70-15, Contractor's Responsibility for Utility Service and Facilities of Others.

b. With respect to their own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport in accordance with the construction safety and phasing plan (CSPP) and the safety plan compliance document (SPCD).

c. When the contract requires the maintenance of an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep the road, street, or highway open to all traffic and shall provide maintenance as may be required to accommodate traffic. The Contractor, at their expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-06 Removal of existing structures. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Resident Project Representative (RPR) shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the RPR in accordance with the provisions of the contract.

Except as provided in Section 40, paragraph 40-07, *Rights in and Use of Materials Found in the Work*, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-07 Rights in and use of materials found in the work. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be embankment, the Contractor may at their own option either:

- **a.** Use such material in another contract item, providing such use is approved by the RPR and is in conformance with the contract specifications applicable to such use; or,
- **b.** Remove such material from the site, upon written approval of the RPR; or
- **c.** Use such material for the Contractor's own temporary construction on site; or,
- **d.** Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the RPR's approval in advance of such use.

Should the RPR approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at their expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the RPR approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of their own exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-08 Final cleanup. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of the property Owner.

END OF SECTION 40

SECTION 50 CONTROL OF WORK

50-01 Authority of the Resident Project Representative (RPR). The RPR has final authority regarding the interpretation of project specification requirements. The RPR shall determine acceptability of the quality of materials furnished, method of performance of work performed, and the manner and rate of performance of the work. The RPR does not have the authority to accept work that does not conform to specification requirements.

50-02 Conformity with plans and specifications. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the RPR finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in their opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the RPR will advise the Owner of their determination that the affected work be accepted and remain in place. The RPR will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. Changes in the contract price must be covered by contract change order or supplemental agreement as applicable.

If the RPR finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the RPR's written orders.

The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the RPR's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the RPR's opinion, such compliance is essential to provide an acceptable finished portion of the work.

The term "reasonably close conformity" is also intended to provide the RPR with the authority, after consultation with the Sponsor and FAA, to use sound engineering judgment in their determinations to accept work that is not in strict conformity, but will provide a finished product equal to or better than that required by the requirements of the contract, plans and specifications. The RPR will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. If electronic files are provided and used on the project and there is a conflict between the electronic files and hard copy plans, the hard copy plans shall govern. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled

dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the RPR for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, Contractor shall immediately notify the Owner or the designated representative in writing requesting their written interpretation and decision.

50-04 List of Special Provisions.

- **a.** Item C-105 Mobilization
- **b.** Item P-610 Concrete for Miscellaneous Structures
- **c.** Item T-901 Seeding
- **d.** Item T-905 Topsoiling
- **e.** Item T-908 Mulching
- **f.** Item L-100 Electrical Definitions and Requirements
- **g.** Item L-107 Airport Wind Cones
- **h.** Item L-108 Underground Power Cable for Airports
- **i.** Item L-109 Airport Transformer Vault and Vault Equipment
- **j.** Item L-110 Airport Underground Electrical Duct Banks and Conduits
- **k.** Item L-115 Electrical Manholes and Junction Structures
- **l.** Item L-125 Installation of Airport Lighting Systems

50-05 Cooperation of Contractor. The Contractor shall be supplied with five hard copies or an electronic PDF of the plans and specifications. The Contractor shall have available on the construction site at all times one hardcopy each of the plans and specifications. Additional hard copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the RPR and their inspectors and with other Contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as their agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the RPR or their authorized representative.

50-06 Cooperation between Contractors. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work not to interfere with or hinder the progress of completion of the work being performed by

other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with their own contract and shall protect and hold harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange their work and shall place and dispose of the materials being used to not interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join their work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-07 Construction layout and stakes. The Engineer/RPR shall establish necessary horizontal and vertical control. The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor. Contractor is responsible for preserving integrity of horizontal and vertical controls established by Engineer/RPR. In case of negligence on the part of the Contractor or their employees, resulting in the destruction of any horizontal and vertical control, the resulting costs will be deducted as a liquidated damage against the Contractor.

Prior to the start of construction, the Contractor will check all control points for horizontal and vertical accuracy and certify in writing to the RPR that the Contractor concurs with survey control established for the project. All lines, grades and measurements from control points necessary for the proper execution and control of the work on this project will be provided to the RPR. The Contractor is responsible to establish all layout required for the construction of the project.

Copies of survey notes will be provided to the RPR for each area of construction and for each placement of material as specified to allow the RPR to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. Surveys will be provided to the RPR prior to commencing work items that cover or disturb the survey staking. Survey(s) and notes shall be provided in the following format(s): Land XML file compatible with Autodesk AutoCAD and Autodesk Civil 3D.

Laser, GPS, String line, or other automatic control shall be checked with temporary control as necessary. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner. No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

50-08 Authority and duties of Quality Assurance (QA) inspectors. QA inspectors shall be authorized to inspect all work done and all material furnished. Such QA inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. QA inspectors are not authorized to revoke, alter, or waive any provision of the contract. QA inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

QA Inspectors are authorized to notify the Contractor or their representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the RPR for a decision.

50-08 Inspection of the work. All materials and each part or detail of the work shall be subject to inspection. The RPR shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the RPR requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Provide advance written notice to the RPR of work the Contractor plans to perform each week and each day. Any work done or materials used without written notice and allowing opportunity for inspection by the RPR may be ordered removed and replaced at the Contractor's expense.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the RPR as provided in paragraph 50-02, *Conformity with Plans and Specifications*.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of Section 70, paragraph 70-14, *Contractor's Responsibility for Work*.

No removal work made under provision of this paragraph shall be done without lines and grades having been established by the RPR. Work done contrary to the instructions of the RPR, work done beyond the lines shown on the plans or as established by the RPR, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the RPR made under the provisions of this subsection, the RPR will have authority to cause unacceptable work to be remedied or removed and replaced; and unauthorized work to be removed and recover the resulting costs as a liquidated damage against the Contractor.

50-11 Load restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor, at their own expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel.

50-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in paragraph 50-12, *Maintenance during Construction*, the RPR shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the RPR's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be recovered as a liquidated damage against the Contractor.

50-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the RPR to make final inspection of that unit. If the RPR finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the RPR may accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 Final acceptance. Upon due notice from the Contractor of presumptive completion of the entire project, the RPR and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The RPR shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the RPR will notify the Contractor and the Contractor shall correct the unsatisfactory work. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the RPR will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the RPR in writing of their intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the RPR is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the RPR has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the RPR who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor’s right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

SECTION 60 CONTROL OF MATERIALS

60-01 Source of supply and quality requirements. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish documentation to the RPR as to the origin, composition, and manufacture of all materials to be used in the work. Documentation shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the RPR's option, materials may be approved at the source of supply before delivery. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that meets the requirements of the specifications; and is listed in AC 150/5345-53, *Airport Lighting Equipment Certification Program and Addendum*, that is in effect on the date of advertisement.

60-02 Samples, tests, and cited specifications. All materials used in the work shall be inspected, tested, and approved by the RPR before incorporation in the work unless otherwise designated. Any work in which untested materials are used without approval or written permission of the RPR shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the RPR, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests will be made by and at the expense of the Owner in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), federal specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the RPR. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the RPR.

A copy of all Contractor QC test data shall be provided to the RPR daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the RPR showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

The Contractor shall employ a Quality Control (QC) testing organization to perform all Contractor required QC tests in accordance with Item C-100 Contractor Quality Control Program (CQCP).

60-03 Certification of compliance/analysis (COC/COA). The RPR may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's COC stating that such materials or assemblies fully comply with the requirements of the contract.

The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified. The COA is the manufacturer's COC and includes all applicable test results.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the RPR.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "or equal," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,
b. Suitability of the material or assembly for the use intended in the contract work.

The RPR shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The RPR reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-04 Plant inspection. The RPR or their authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the RPR conduct plant inspections, the following conditions shall exist:

a. The RPR shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.
b. The RPR shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.
c. If required by the RPR, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Place office or working space in a convenient location with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The RPR shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-05 Engineer/Resident Project Representative (RPR) field office. The Contractor shall provide dedicated space for the use of the engineer, RPR, and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity.

60-06 Storage of materials. Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the RPR. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans and/or CSPP, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the RPR. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the RPR a copy of the property Owner's permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at their expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-07 Unacceptable materials. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the RPR.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the RPR has approved its use in the work.

60-08 Owner furnished materials. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

SECTION 70 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-01 Laws to be observed. The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all their officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-02 Permits, licenses, and taxes. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-03 Patented devices, materials, and processes. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-04 Restoration of surfaces disturbed by others. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) must be shown on the plans.

The Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the RPR.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the RPR, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-05 Federal Participation. The United States Government has agreed to reimburse the Owner for some portion of the contract costs. The contract work is subject to the inspection and approval

of duly authorized representatives of the FAA Administrator. No requirement of this contract shall be construed as making the United States a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-06 Sanitary, health, and safety provisions. The Contractor's worksite and facilities shall comply with applicable federal, state, and local requirements for health, safety and sanitary provisions.

70-07 Public convenience and safety. The Contractor shall control their operations and those of their subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to their own operations and those of their own subcontractors and all suppliers in accordance with Section 40, paragraph 40-05, *Maintenance of Traffic*, and shall limit such operations for the convenience and safety of the traveling public as specified in Section 80, paragraph 80-04, *Limitation of Operations*.

The Contractor shall remove or control debris and rubbish resulting from its work operations at frequent intervals, and upon the order of the RPR. If the RPR determines the existence of Contractor debris in the work site represents a hazard to airport operations and the Contractor is unable to respond in a prompt and reasonable manner, the RPR reserves the right to assign the task of debris removal to a third party and recover the resulting costs as a liquidated damage against the Contractor.

70-08 Construction Safety and Phasing Plan (CSPP). The Contractor shall complete the work in accordance with the approved Construction Safety and Phasing Plan (CSPP) developed in accordance with AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP is on sheets 4 through 9 of the project plans.

70-09 Use of explosives. The use of explosives is not permitted on this project.

70-10 Protection and restoration of property and landscape. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer/RPR has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at their expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 Responsibility for damage claims. The Contractor shall indemnify and hold harmless the Engineer/RPR and the Owner and their officers, agents, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of their own contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, their own surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 Third party beneficiary clause. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third-party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 Opening sections of the work to traffic. If it is necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work must be specified below and indicated on the approved Construction Safety and Phasing Plan (CSPP) and the project plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified.

Upon completion of any portion of work listed above, such portion shall be accepted by the Owner in accordance with Section 50, paragraph 50-14, *Partial Acceptance*.

No portion of the work may be opened by the Contractor until directed by the Owner in writing. Should it become necessary to open a portion of the work to traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the RPR, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at their expense.

The Contractor shall make their own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

The Contractor must conform to safety standards contained AC 150/5370-2 and the approved CSPP.

Contractor shall refer to the plans, specifications, and the approved CSPP to identify barricade requirements, temporary and/or permanent markings, airfield lighting, guidance signs and other safety requirements prior to opening up sections of work to traffic.

70-14 Contractor's responsibility for work. Until the RPR's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with Section 50, paragraph 50-14, *Partial Acceptance*, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at their own expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 Contractor's responsibility for utility service and facilities of others. As provided in paragraph 70-04, Restoration of Surfaces Disturbed by Others, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and/or in the contract documents.

Utility Service or Facility	Contact Information	Phone Number
For Airside work contact the Decatur Airport	Tim Wright Airport Director 910 S. Airport Road Decatur, Il 62521	217-428-2423 or twright@decparks.com
JULIE		811
Electrical & Other Utilities	Tim Wright Airport Director 910 S. Airport Road Decatur, Il 62521	217-428-2423 (The Airport will assist with providing utility contacts)
Water	City of Decatur	217-424-2841
Sanitary	Decatur Sanitary District	217-422-6931

The plans shall show the approximate location of the utilities or facilities known to exist within the limits of the contract work. The proposed contract plans and specifications shall be coordinated with the various Owners at the earliest possible time to avoid overlooking utility conflicts in the design and to obtain the best possible information needed to protect such utility services or facilities from damage resulting from the Contractor's operations. Where conflicts are indicated during the coordination, they shall be resolved by the airport Owner and the utility owner, in accordance with existing legal agreements, by providing for work in the proposed contract or by the utility owner. In such cases of conflict, regardless of how the conflict is resolved, the airport Owner and utility owner should also be advised of the need to furnish the best information possible as to location of the utility service or facility to ensure protection during the proposed contract work.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of their plan of operations. Such notification shall be in writing addressed to "The Person to Contact" as provided in this paragraph and paragraph 70-04, *Restoration of Surfaces Disturbed By Others*. A copy of each notification shall be given to the RPR.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's "Person to Contact" no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the RPR.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the RPR and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the RPR continuously until

such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or their own surety.

70-15.1 FAA facilities and cable runs. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

- **a.** The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.
- **b.** The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport director minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.
- **c.** If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.
- **d.** Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.
- **e.** If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 Furnishing rights-of-way. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 Personal liability of public officials. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, RPR, their authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 No waiver of legal rights. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate

made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or their surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill their obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 Environmental protection. The Contractor shall comply with all federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, asphalts, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 Archaeological and historical findings. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during their operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the RPR. The RPR will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in Section 40, paragraph 40-04, *Extra Work*, and Section 90, paragraph 90-05, *Payment for Extra Work*. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with Section 80, paragraph 80-07, *Determination and Extension of Contract Time*.

70-21 Insurance Requirements. At the time of filing their contract and bonds, the Contractor shall notify the Department, in writing, as to whether or not they propose to sublet any of the work under the terms of their contract. The Contractor, with respect to the operations performed for them by subcontractors, will be required to carry Contractors' Protective Public Liability and Property Damage Liability Insurance, including automobile coverage, in the same limits as prescribed in the paragraph 70-23 titled CONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE LIABILITY INSURANCE of this section, and shall furnish copies of policies of such insurance and certificates as above required. If no part of the work is to be sublet, this article will not apply.

Insurance coverage as required above shall be kept in force until all work to be performed under the terms of the contract has been accepted by the Department and it is clearly understood that the upkeep of these insurance policies until acceptance of the work by the Department is a part of the contract. The Contractor shall include the cost of all such insurance in their unit bid prices and

no extra compensation will be granted to them, nor will any deduction be made by the Department due to extra work and/or decreased quantities of work and/or elimination of items.

Such insurance or other means of protection as herein provided shall be kept in force until all work to be performed under the terms of the contract has been completed and accepted in accordance with the specifications and it is hereby understood and agreed that the maintenance of such insurance or other protection, until acceptance of the work by the Department, is a part of the contract. Failure to maintain such insurance, cancellation by the Industrial Commission of its approval of such other means of protection as might have been elected, or any other act which results in lack of protection under the said "Workers' Compensation Act" may be considered as a breach of the contract.

END OF SECTION 70

SECTION 80 EXECUTION AND PROGRESS

80-01 Subletting of contract. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Resident Project Representative (RPR).

The Contractor shall perform, with his organization, an amount of work equal to at least 51 percent of the total contract cost.

Should the Contractor elect to assign their contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

The Contractor shall provide copies of all subcontracts to the RPR 14 days prior to being utilized on the project. As a minimum, the information shall include the following:

- Subcontractor's legal company name.
- Subcontractor's legal company address, including County name.
- Principal contact person's name, telephone and fax number.
- Complete narrative description, and dollar value of the work to be performed by the subcontractor.
- Copies of required insurance certificates in accordance with the specifications.
- Minority/ non-minority status.

80-02 Notice to proceed (NTP). The Owners notice to proceed will state the date on which contract time commences. The Contractor is expected to commence project operations within 10 days of the NTP date. The Contractor shall notify the RPR at least 24 hours in advance of the time contract operations begins. The Contractor shall not commence any actual operations prior to the date on which the notice to proceed is issued by the Owner.

80-03 Prosecution and progress. Unless otherwise specified, the Contractor shall submit their coordinated construction schedule showing all work activities for the RPR’s review and acceptance at least 10 days prior to the start of work. The Contractor’s progress schedule, once accepted by the RPR, will represent the Contractor's baseline plan to accomplish the project in accordance with the terms and conditions of the Contract. The RPR will compare actual Contractor progress against the baseline schedule to determine that status of the Contractor's performance. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the RPR’s request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the RPR at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the NTP is issued by the Owner.

The project schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified. It shall include information on the sequence of work activities, milestone dates, and activity duration. The schedule shall show all work items identified in the project proposal for each work area and shall include the project start date and end date.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

80-04 Limitation of operations. The Contractor shall control their operations and the operations of their subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct their operations within an AOA of the airport, the work shall be coordinated with airport operations (through the RPR) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the RPR and until the necessary temporary marking, signage and associated lighting is in place as provided in Section 70, paragraph 70-08, *Construction Safety and Phasing Plan (CSPP)*.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; and immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until satisfactory conditions are provided. The areas of the AOA identified in the Construction Safety Phasing Plan (CSPP) cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently. The Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction and the approved CSPP.

80-04.1 Operational safety on airport during construction. All Contractors' operations shall be conducted in accordance with the approved project Construction Safety and Phasing Plan (CSPP) and the Safety Plan Compliance Document (SPCD) and the provisions set forth within the current version of AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a SPCD that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and SPCD and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP and SPCD unless approved in writing by the Owner. The necessary coordination actions to review Contractor proposed modifications to an approved CSPP or approved SPCD can require a significant amount of time.

80-05 Character of workers, methods, and equipment. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the RPR, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the RPR, be removed immediately by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the RPR.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the RPR may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall not cause injury to previously completed work, adjacent property, or existing airport facilities due to its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless otherwise authorized by the RPR. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the RPR to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the RPR determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the RPR may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this paragraph.

80-06 Temporary suspension of the work. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods the Owner may deem necessary, due to unsuitable weather, or other conditions considered unfavorable for the execution of the work, or for

such time necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the written order to suspend work to the effective date of the written order to resume the work. Claims for such compensation shall be filed with the RPR within the time period stated in the RPR's order to resume work. The Contractor shall submit with their own claim information substantiating the amount shown on the claim. The RPR will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather or for any other delay provided for in the contract, plans, or specifications.

If it becomes necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-07 Determination and extension of contract time. The number of calendar days shall be stated in the proposal and contract and shall be known as the Contract Time.

If the contract time requires extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

> Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.
>
> At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

80-08 Failure to complete on time. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in paragraph 80-07, Determination and Extension of Contract Time) the sum specified in the contract and proposal as liquidated damages (LD) will be deducted from any money due or to become due the Contractor or their own surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule of Deductions for Each Day of Overrun in Contract Time			
Original Contract Amount		Daily Charges	
From More Than	To and Including	Calendar Day	Work Day
$ 0	$ 100,000	$ 475	$ 675
100,000	500,000	750	1,050
500,000	1,000,000	1,025	1,425
1,000,000	3,000,000	1,275	1,725
3,000,000	6,000,000	1,425	2,000
6,000,000	12,000,000	2,300	3,450
12,000,000	And Over	6,775	9,525

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-09 Default and termination of contract. The Contractor shall be considered in default of their contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons, if the Contractor:

- **a.** Fails to begin the work under the contract within the time specified in the Notice to Proceed, or
- **b.** Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or
- **c.** Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or
- **d.** Discontinues the execution of the work, or
- **e.** Fails to resume work which has been discontinued within a reasonable time after notice to do so, or
- **f.** Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or
- **g.** Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or
- **h.** Makes an assignment for the benefit of creditors, or
- **i.** For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Owner consider the Contractor in default of the contract for any reason above, the Owner shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the RPR of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other

methods as in the opinion of the RPR will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

80-10 Termination for national emergencies. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the RPR.

Termination of the contract or a portion thereof shall neither relieve the Contractor of their responsibilities for the completed work nor shall it relieve their surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 Work area, storage area and sequence of operations. The Contractor shall obtain approval from the RPR prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate work in accordance with the approved CSPP and SPCD.

END OF SECTION 80

SECTION 90 MEASUREMENT AND PAYMENT

90-01 Measurement of quantities. All work completed under the contract will be measured by the RPR, or their authorized representatives, using United States Customary Units of Measurement.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the RPR.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

The term “lump sum” when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure or structural unit (in effect, “lump sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When requested by the Contractor and approved by the RPR in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the RPR and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Measurement and Payment Terms

Term	Description
Excavation and Embankment Volume	In computing volumes of excavation, the average end area method will be used unless otherwise specified.
Measurement and Proportion by Weight	The term “ton” will mean the short ton consisting of 2,000 pounds (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, independently certified scales by competent, qualified personnel at locations designated by the RPR. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the RPR directs, and each truck shall bear a plainly legible identification mark.
Measurement by Volume	Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of

Term	Description
	delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.
Asphalt Material	Asphalt materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, will be used for computing quantities.
Cement	Cement will be measured by the ton (kg) or hundredweight (km).
Structure	Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
Timber	Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.
Plates and Sheets	The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.
Miscellaneous Items	When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.
Scales	Scales must be tested for accuracy and serviced before use. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end. Scales shall be accurate within 0.5% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the RPR before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 0.1% of the nominal rated capacity of the scale, but not less than one pound (454 grams). The use of spring balances will not be permitted. In the event inspection reveals the scales have been “overweighing” (indicating more than correct weight) they will be immediately adjusted. All materials received subsequent to the last previous correct weighting-

Term	Description
	accuracy test will be reduced by the percentage of error in excess of 0.5%. In the event inspection reveals the scales have been under-weighing (indicating less than correct weight), they shall be immediately adjusted. No additional payment to the Contractor will be allowed for materials previously weighed and recorded. Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the RPR can safely and conveniently view them. Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment. All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.
Rental Equipment	Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered in connection with extra work will be measured as agreed in the change order or supplemental agreement authorizing such work as provided in paragraph 90-05 *Payment for Extra Work*.
Pay Quantities	When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the RPR. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-02 Scope of payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of Section 70, paragraph 70-18, *No Waiver of Legal Rights*.

When the “basis of payment” subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-03 Compensation for altered quantities. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items

are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in Section 40, paragraph 40-02, *Alteration of Work and Quantities*, will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from their own unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 Payment for omitted items. As specified in Section 40, paragraph 40-03, *Omitted Items*, the RPR shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the RPR omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the RPR's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the RPR's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the RPR's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-05 Payment for extra work and force account. Extra work, performed in accordance with Section 40, paragraph 40-04, *Extra Work*, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-06 Partial payments. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the RPR, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with paragraph 90-07, Payment for Materials on Hand. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

a. From the total of the amount determined to be payable on a partial payment, 0 percent of such total amount will be deducted and retained by the Owner for protection of the Owner's interests. Unless otherwise instructed by the Owner, the amount retained by the Owner will be in effect until the final payment is made except as follows:
    (1) Contractor may request release of retainage on work that has been partially accepted by the Owner in accordance with Section 50-14. Contractor must provide a certified invoice to the RPR that supports the value of retainage held by the Owner for partially accepted work.
    (2) In lieu of retainage, the Contractor may exercise at its option the establishment of an escrow account per paragraph 90-08.
b. The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment.

Contractor must provide the Owner evidence of prompt and full payment of retainage held by the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

c. When at least 95% of the work has been completed to the satisfaction of the RPR, the RPR shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done. The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the RPR to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in paragraph 90-09, *Acceptance and Final Payment*.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-07 Payment for materials on hand. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the RPR at or on an approved site.
b. The Contractor has furnished the RPR with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
c. The Contractor has furnished the RPR with satisfactory evidence that the material and transportation costs have been paid.
d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.
e. The Contractor has furnished the Owner evidence that the material stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of their responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this paragraph.

90-08 Payment of withheld funds. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in paragraph 90-06 Partial Payments, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

- **a.** The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.
- **b.** The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.
- **c.** The Contractor shall enter into an escrow agreement satisfactory to the Owner.
- **d.** The Contractor shall obtain the written consent of the surety to such agreement.

90-09 Acceptance and final payment. When the contract work has been accepted in accordance with the requirements of Section 50, paragraph 50-15, *Final Acceptance*, the RPR will prepare the final estimate of the items of work actually performed. The Contractor shall approve the RPR's final estimate or advise the RPR of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the RPR shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the RPR's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the RPR's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with Section 50, paragraph 50-16, *Claims for Adjustment and Disputes*.

After the Contractor has approved, or approved under protest, the RPR's final estimate, and after the RPR's receipt of the project closeout documentation required in paragraph 90-11, *Contractor Final Project Documentation*, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Section 50, paragraph 50-16, *Claims for Adjustments and Disputes*, or under the provisions of this paragraph, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon

final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 Construction warranty.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work, except as noted. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work. Light Emitting Diode emitting diode (LED) light fixtures with the exception of obstruction lighting, must be warranted by the manufacturer for a minimum of four (4) years after date of installation inclusive of all electronics.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements; or any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within seven (7) days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 14 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 Contractor Final Project Documentation. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the RPR approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with Section 40, paragraph 40-08, Final Cleanup.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.
f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.
g. When applicable per state requirements, return copies of sales tax completion forms.
h. Manufacturer's certifications for all items incorporated in the work.
i. All required record drawings, as-built drawings or as-constructed drawings.
j. Project Operation and Maintenance (O&M) Manual(s).
k. Security for Construction Warranty.
l. Equipment commissioning documentation submitted, if required.

END OF SECTION 90

PART 2 – GENERAL CONSTRUCTION ITEMS

ITEM C-105 MOBILIZATION

105-1 Description. This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

This items shall also consist of the provision of dedicated field office space for the RPR for the duration of the project.

105-2 Mobilization limit. Mobilization shall be limited to 10 percent of the total project cost. Should the bid for mobilization exceed 10%, the amount over 10% will not be paid until final acceptance of the project by the Engineer.

105-3 Posted notices. Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster “Equal Employment Opportunity is the Law” in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL “Notice to All Employees” Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-4 Engineer/RPR field office. The Contractor shall provide dedicated space for the use of the field RPR and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity in accordance with local building codes. The contractor will supply the following:

a. Two (2) desks and two (2) non-folding chairs with upholstered seats and backs.

b. Two (2) free standing four (4) drawer legal size file cabinets with lock and an Underwriters Laboratories insulated file device 350 degrees one (1) hour rating.

c. Four (4) folding chairs

d. One (1) equipment cabinet of minimum inside dimension of 44 inches high by 24 inches wide by 30 inches deep with lock. The walls shall be of steel with a 3/32” minimum thickness with concealed hinges and enclosed lock constructed in such a manner as to prevent entry by force. The cabinet assembly shall be permanently attached to a structural element of the field office in a manner to prevent theft of the entire cabinet.

e. One (1) carbon dioxide fire extinguisher (ten (10) pound rated capacity)

f. One (1) electric water cooler dispenser with water supply as needed, or bottled water

g. One (1) telephone, with touch tone, where available, and a digital telephone answering machine or a cellular telephone with voicemail, for exclusive use by the Resident Engineer. One (1) additional dedicated telephone line for a computer shall also be provided or a

functional internet Wi-Fi device such as a mobile hot spot providing hi-speed broadband internet access to the field office for the exclusive use of the Resident Engineer.

h. One (1) dry process copy machine (including maintenance and operating supplies) capable of both collating and reproducing prints up to a legal size (8.5 inches by 14 inches) and capable of copying field books

i. For projects requiring PCC flexural strength testing, the Contractor shall provide beam tanks and a beam tank shed as part of this item. This shed shall be large enough to hold all the necessary beam tanks. The Contractor shall make provisions in this shed to heat/cool as necessary to keep beam tank water temperature between 70°F to 76°F. The Contractor shall be required to provide water to the beam shed as required to protect the beams. If the beam tank is not located at the Resident Engineer's Field Office, the shed shall be large enough to store the beam breaker. The shed shall be locked, and the Resident Engineer given all keys.

j. One (1) refrigerator with a minimum size of eight (8) cubic feet with a freezer unit.

k. One (1) electric desk tape calculator and adding machine with tape or one (1) tape printing calculator.

l. One (1) lockable cabinet or closet that is large enough in which a nuclear density machine may be stored.

m. High-speed internet access shall be provided to the field office by the Contractor via modem if phone or cable connections are available. If not, the Contractor shall provide a wireless air card, or a similar internet access method, which shall be approved by the Resident Engineer. Dial up, or equivalent, internet service will not be acceptable.

METHOD OF MEASUREMENT

105-5 Basis of measurement and payment.

Based upon the contract lump sum price for “Mobilization” partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, Contractor Final Project Documentation, the final 10%.

Payment for providing the field office fully equipped as specified shall be made at the contract lump sum price.

BASIS OF PAYMENT

105-6 Payment will be made under:

AW150510	Engineer's Field Office – per lump sum
AW150520	Mobilization -- 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.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

PART 9– MISCELLANEOUS

ITEM P-610 CONCRETE FOR MISCELLANEOUS STRUCTURES

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

COARSE AGGREGATE GRADING REQUIREMENTS

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
¾ inch (19 mm)	67
½ inch (12.5 mm)	7

610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking. Not used.

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150 Type I or ASTM C595 Type IL.

610-2.5 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1752.

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. Reinforcing shall consist of steel conforming to the requirements below.

Steel Reinforcement

Reinforcing Steel	ASTM A706
Welded Steel Wire Fabric	ASTM A1064
Bar Mats	ASTM A184

610-2.11 Materials for curing concrete. Curing materials shall conform to the requirements below.

MATERIALS FOR CURING

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete Mixture. The concrete shall develop a compressive strength of 4000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard (280 kg per cubic meter). The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches (100 mm) as determined by ASTM C143.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete Consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of

more than 5 feet (1.5 m). Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F (4°C), follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85ºF (30 ºC), follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Concrete for miscellaneous structures shall be considered incidental to the contract and no separate measurement shall be made.

BASIS OF PAYMENT

610-6.1 Concrete shall be considered incidental, and no separate payment shall be made.

REFERENCES

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

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete

ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)

ASTM D1752 Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R Hot Weather Concreting

ACI 306R Cold Weather Concreting

ACI 308R Guide to External Curing of Concrete

ACI 309R Guide for Consolidation of Concrete

END OF ITEM P-610

PART 12 – TURFING

ITEM T-901 SEEDING

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding, fertilizing and/or liming for all areas within the limits specified in the contract documents or as required by the Resident Engineer.

MATERIALS

901-2.1 Seed. The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ- S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Resident Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed Properties and Rate of Application

Seed	Minimum Seed Purity	Minimum Germination	Application Rate (lb/acre)
*Tall Fescue	98%	90%	60
Annual Rye	98%	90%	20
*Red Fescue	98%	85%	30
*Hard Fescue	96%	85%	30

*Seed shall be of a variety bred to contain high levels of endophyte.

In locations where poor soil conditions exist, the Resident Engineer may require that Perennial Ryegrass be substituted for the Annual Ryegrass.

Seeding shall be performed during the period between April 1 and June 1 or September 1 and November 1 provided that the ground is not frozen or in any way detrimental to the seed.

If the Contractor elects to use their own seed mixture, the Contractor shall ensure seed recommended is not a hazardous wildlife attractant (high endophyte variety).

901-2.2 Lime. Lime shall be ground limestone containing not less than 85% of total carbonates and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two (2) sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of 2 tons per acre. All liming materials shall conform to the requirements of ASTM C602.

All agricultural lime sources must be listed on the Illinois Department of Agriculture's *Limestone Program Producer Information* booklet listed on the Department website.

The Contractor has the option to perform a soil test, at their expense, to determine if lime is not necessary, based upon the existing pH level of the soil. The pH level of the soil must be between 5.5 and 7.6 for the application of lime to be eliminated. The soil test results must be reviewed and approved by the Engineer before the application of lime can be waived.

901-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one (1) of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

During project Design, the fertilizer mix was analyzed for suitability for on-site or plan specified topsoil sources. The Contractor shall carefully check the plans and specifications to confirm the following mix was not changed. Unless modified elsewhere in the plans and specifications, the Contractor shall apply 270 lb of fertilizer nutrients per acre at a 1:1:1 ratio as follows:

Fertilizer Nutrients	Rate (lb/acre)
Nitrogen	90
Phosphorus	90
Potassium	90

901-2.4 Soil for repairs. The soil for fill and top soiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Resident Engineer before being placed.

CONSTRUCTION METHODS

901-3.1 Advance preparation and cleanup. After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than two (2) inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than five (5) inches as a result of grading operations and, if immediately prior to seeding, the top three (3) inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than five (5) inches. Clods shall be broken and the top three (3) inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 Dry application method.

a. **Liming.** If required, lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top three (3) inches of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.

b. **Fertilizing.** Following advance preparations and cleanup, and liming if required, fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3 titled FERTILIZER.

c. **Seeding.** Grass seed shall be sown at the rate specified in paragraph 901-2.1 titled SEED immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons specified in the contract documents, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. **Rolling.** After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

901-3.3 Wet application method.

a. **General.** The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. **Spraying equipment.** The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

   The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 pounds per square inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe-lines shall be capable of providing clearance for five-eighths (5/8) inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

   The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three (3) different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One (1) shall be a close-range ribbon nozzle, one (1) a medium-range ribbon nozzle, and one (1) a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

   In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. **Mixtures.** If required, lime shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

   All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. The Contractor shall identify to the Resident Engineer all sources of water at least two (2) weeks prior to use. The Resident Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Resident Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed, or they shall be wasted and disposed of at approved locations.

d. Spraying. If required, lime shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top three (3) inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as specified in the contract documents or designated by the Resident Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 Maintenance of seeded areas. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Resident Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Resident Engineer. A grass stand shall be considered adequate when bare spots are one (1) square foot or less, randomly dispersed, and do not exceed 3% of the area seeded. The turf shall not contain ruts, gullies or undulations. If, at the time of final inspection, it is not possible to determine if a good stand of grass has been established, payment for the unaccepted portions of the areas seeded out of season will be withheld until such time as these requirements have been met.

METHOD OF MEASUREMENT

901-4.1 Seeding shall be considered incidental to the contract and no separate measurement will be made.

BASIS OF PAYMENT

901-5.1 S Seeding shall be considered incidental, and no separate payment shall be made.

REFERENCES

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

ASTM International (ASTM)

ASTM C602	Standard Specification for Agricultural Liming Materials

Federal Specifications (FED SPEC)

FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural

END OF ITEM T-901

ITEM T-905 TOPSOILING

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas at the locations specified in the contract documents or as directed by the Resident Engineer.

Topsoil shall be stripped from cut areas and below proposed pavements and stockpiled outside of the grading limits. Topsoil shall be utilized in shoulders adjacent to the proposed pavements. Additionally, the surface of all disturbed areas shall be covered with a layer of topsoil, as needed, to facilitate drainage and the growth of turf.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (two (2) inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200-mesh sieve as determined by the wash test in accordance with the current Illinois Department of Transportation, Bureau of Materials Policy Memorandum (PM) 11-08, Aggregate Gradation Control System (AGCS).

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications. For contractor sourced off-site topsoil, any amendments needed are at the Contractor’s expense. For on-site topsoil or plan specified offsite sources, it is assumed the needed amendments were determined in the design phase and included in the quantities specified in the contract documents.

905-2.2 Inspection and tests. For Contractor sourced topsoil, the Resident Engineer shall be notified of the source of topsoil to be furnished 21 days prior to use. The topsoil shall be inspected by the Contractor and the Resident Engineer to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1 titled TOPSOIL.

CONSTRUCTION METHODS

905-3.1 General. Areas to be top soiled shall be specified in the contract documents. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 Preparing the ground surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of two (2) inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be top soiled shall be cleared of all stones larger than two (2) inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as specified in the contract documents, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be top soiled, which have been established by others as specified in the contract documents, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded, and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 Obtaining topsoil. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Resident Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Resident Engineer. The topsoil shall be spread on areas already tilled and smooth-graded or stockpiled in areas approved by the Resident Engineer. Any topsoil stockpiled by the Contractor shall be re-handled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Resident Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be re-handled and placed without additional compensation.

905-3.4 Placing topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of two (2) inches after compaction, unless otherwise specified in the contract documents. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (two (2) inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Resident Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

Rutted or damaged areas due to construction and other areas graded as a part of this contract shall have topsoil spread as required to facilitate drainage and turfing.

METHOD OF MEASUREMENT

905-4.1 The quantity of topsoil obtained on the site or off the site shall be considered incidental to the contract. No separate measurements will be made.

BASIS OF PAYMENT

905-5.1 Topsoil shall be considered incidental to the contract and no separate payment shall be made.

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.

Illinois Department of Transportation, Bureau of Materials Policy Memoranda (PM)

PM 11-08 Aggregate Gradation Control System (AGCS)

END OF ITEM T-905

ITEM T-908 MULCHING

DESCRIPTION

908-1.1 This item shall consist of furnishing, hauling, placing, and securing mulch on all seeded areas and surfaces specified in the contract documents or designated by the Resident Engineer.

MATERIALS

908-2.1 Mulch material. Hydraulic mulch shall be used. Mulch shall be free from noxious weeds, mold, and other deleterious materials. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farmland, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

a. Hydraulic mulch. The mulch component shall be comprised of a minimum of 70% biodegradable material such as wood cellulose, paper fibers, straw or cotton and shall contain no growth or germination inhibiting factors. The remainder of the components shall consist of the manufacturer's choice of tackifiers and/or strengthening fibers needed to meet the performance specifications. Tackifiers shall be non-toxic and LC 50 test results shall be provided along with the certificate of analysis (COA). Hydraulic mulch shall disperse evenly and rapidly and remain in slurry when agitated with water. When uniformly applied, the slurry shall form an absorbent cover allowing percolation of water to the underlying surface. Hydraulic mulch shall be packaged in UV and moisture resistant factory labeled packages or bags with the net quantity of the packaged material plainly shown on each package. The biodegradable material shall be relatively free of glossy papers and shall not be water soluble. The hydraulic mulches shall be according to the following.

Light-Duty Hydraulic Mulch

Property [1]	Value
Functional Longevity[2]	3 months
Minimum Application Rates	2,000 lb/acre
Typical Maximum Slope Gradient (V:H)	≤ 1:3
Maximum Uninterrupted Slope Length	50 feet
Maximum C Factor	0.15
Minimum Vegetation Establishment[5]	200%

1. This table sets minimum requirements only. Refer to manufacturer recommendations for application rates, instructions, gradients, maximum continuous slope lengths and other site-specific recommendations.

2. Manufacturer's estimated time period, based upon field observations, that a material can be anticipated to provide erosion control as influenced by its composition and site-specific conditions.
3. "C" Factor calculated as ratio of soil loss from Hydraulic Erosion Control Product (HECP) protected slope (tested at specified or greater gradient, h:v) to soil loss from unprotected (control) plot based on large-scale testing.
4. Large-scale test methods shall be according to ASTM D6459.
5. Minimum vegetation establishment shall be calculated according to ASTM D7322.

The certificate of analysis (COA) shall be provided with each shipment of hydraulic mulch stating the number of packages or bags furnished and that the material complies with these requirements.

b. Asphalt binder. Not allowed.

908-2.2 Inspection. The Resident Engineer shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish the Resident Engineer with representative samples of the materials to be used 30 days before delivery to the project. These samples may be used as standards with the approval of the Engineer and any materials brought on the site that do not meet these standards shall be rejected.

CONSTRUCTION METHODS

908-3.1 Mulching. Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the areas specified in the contract documents or designated by the Resident Engineer. Hydraulic mulch shall be applied within 24 hours of the time seeding has been performed

Hydraulic mulch of the type specified shall be applied uniformly at the rate specified. On slopes equal to or steeper than 3-to-1, hydraulic mulch shall be applied the same day as seeded or planted.

When light-duty hydraulic mulch is specified, the method shall consist of the machine application of a light-duty hydraulic mulch. Seeding shall be conducted as a separate operation and shall not be added to the hydraulic mulch slurry. Hydraulic mulch shall not be applied when the ambient temperature is at or below freezing. To achieve full and even coverage, the hydraulic mulch shall be applied from two (2) opposing directions. Mixing and application rates shall be according to the manufacturer's recommendations and meet the minimum application rates specified.

Following all mulching operation, every precaution shall be taken to prohibit foot or vehicular traffic, or the movement of equipment over the mulched area. At any location where mulching has been displaced by any Contractor's equipment or personnel, the seeding or other work damaged as a result of that displacement shall immediately be replaced to the satisfaction of the Resident Engineer at the Contractor's expense.

It shall be the Contractor's responsibility to make certain that the rate of mulch application is maintained constant throughout the seeding operations.

908-3.3 Care and repair.

a. The Contractor shall care for the mulched areas until final acceptance of the project. Care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the Resident Engineer, and erecting any barricades that may be specified in the contract documents before or immediately after mulching has been completed on the designated areas.

b. The Contractor shall be required to repair or replace any mulch that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the Resident Engineer, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor.

METHOD OF MEASUREMENT

908-4.1 Mulching shall be considered incidental to the contract and no separate measurement will be made.

BASIS OF PAYMENT

908-5.1 Mulching shall be considered incidental to the contract and no separate payment shall be made.

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 Association of State Highway and Transportation Officials (AASHTO)

AASHTO M 140 Standard Specification for Emulsified Asphalt

END OF ITEM T-908

PART 13 – LIGHTING INSTALLATION

ITEM L-100 ELECTRICAL DEFINITIONS AND REQUIREMENTS

DESCRIPTION

100-1.1 GENERAL. See Part I, General Provisions for other definitions, requirements and for scope and control of work.

100-1.2 DEFINITIONS.

a. Contractor: The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

b. Engineer: The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.

c. Engineer of Record: A Florida professional engineer who is in responsible charge for the preparation, signing, dating, sealing and issuing of any engineering document(s) for any engineering service or creative work. Engineer of Record may be abbreviated as “EOR”.

d. Provide: As used herein shall mean “furnish, install, and connect complete.”

e. Resident Project Representative (RPR): The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor and acting directly or through an authorized representative. Where the term “Inspector” is used in these specifications it shall have the meaning and definition of Resident Project Representative.

f. Wiring: As used herein shall mean “wire or cable, installed in raceway or underground with all boxes, fittings, connectors, and accessories installed.”

GENERAL REQUIREMENTS

100-2.1 ELECTRICAL INSTALLATION. The Contractor shall furnish and install all electrical materials necessary for complete and operational installation of the airfield lighting systems as shown on the Plans and detailed herein. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of the NFPA 70 - National Electrical Code (NEC) most current issue in force and the applicable Federal Aviation Administration standards, orders, and advisory circulars (current issues in effect). Equipment shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

100-2.2 ELECTRICAL SAFETY. The Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace. Verify respective circuits and power sources prior to removing, disconnecting, relocating, installing, connecting, or working on the respective airfield lighting, taxi sign, NAVAID, vault equipment, or other device. Identify each respective circuit prior to performing work on that circuit. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. National Electrical Code defines a Qualified Person as “One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has revied safety training to recognize and avoid the hazards involved.” NFPA 70E - Standard for Electrical Safety in the Workplace defines a Qualified Person as “One who has demonstrated skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk.” OSHA (Occupational Safety and Health Administration), Part Number 1910 Occupational Safety and Health Standards, Subpart S, Electrical, Standard Number 1910.399 defines Qualified person as follows: “Qualified person. One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.” Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel should be permitted to work on airfield lighting series circuits.

The Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

Verify respective circuits and power sources prior to removing, disconnecting, relocating, installing, connecting, or working on the respective airfield lighting, taxi sign, NAVAID, vault equipment, or other device. Identify each respective circuit prior to performing work on that circuit. All work, power outages, and/or shutdown of existing systems coordinated with the Airport Manager and the Resident Project Representative. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

100-2.3 LOCATING OF EXISTING UNDERGROUND UTILITIES AND CABLES. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the plans are not represented as being accurate, sufficient, or complete. Neither the owner nor the Engineer assumes any responsibility whatsoever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the contractor’s responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior

to construction, the contractor shall notify the utility companies of his operational plans and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the contractor shall immediately notify the utility company of jurisdiction. The owner's representative and/or the Resident Project Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the contractor at no additional cost to the contract. All utility cables and lines shall be located by the respective utility. Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123. Contact the FAA (Federal Aviation Administration) for assistance in locating FAA cables and utilities. Location of FAA power, control, and communication cables shall be coordinated with and/or located by the FAA. Also contact airport director/manager and airport personnel for assistance in locating underground airport cables and/or utilities. Also coordinate work with all aboveground utilities.

100-2.4 AIRPORT LIGHTING EQUIPMENT. All airport lighting equipment shall be provided in accordance with FAA AC No. 150/5345-53D "AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM" (most current issue in effect) and AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum.

100-2.5 DRAWINGS. The electrical drawings are diagrammatic design drawings, and not intended to indicate all the details of the work to be performed. The equipment, conduit and device locations are approximate. Any changes necessary to clear obstructions shall be made as approved by the Engineer and at no additional cost to the Owner.

If explanatory drawings are issued later, they shall supplement these drawings, unless specifically designated otherwise. These drawings indicate the electrical system to be installed.

100-2.4 OPERATION AND MAINTENANCE DATA. At time of final construction review, furnish and deliver three complete copies of Operation and Maintenance (O&M) Manuals for all electrical equipment furnished under this Contract. The information included shall consist of all data prepared by the manufacturers detailing operation and maintenance instructions on equipment requiring maintenance.

100-2.5 SHOP DRAWINGS. The Contractor shall submit copies of all shop drawings required. Items marked "Revise and Resubmit" does not give authority to proceed with any portion of the work shown thereon. Corrected copies must be resubmitted for final review inasmuch as only shop drawings marked "No Exceptions" shall be used for erection of the work in the field. Items marked "Furnish as Corrected" gives authority to proceed with fabrication in accordance with the notations.

Within 10 days after the Notice to Proceed is issued, submit materials list of all manufactured equipment Contractor proposes to use in project. The list shall indicate Specifications paragraph identification number, name of item, manufacturer, catalog number(s), and estimated date of arrival at the site.

The Contractor shall be responsible for all dimensions and quantities.

100-2.6 RECORD DRAWINGS. Two (2) complete sets of prints of electrical drawings will be furnished by the Contractor for indication in red pencil the changes made in installation.

The Contractor shall indicate the actual location of cables, manholes, handholes, junction structures, duct banks, lighting fixtures, cable markers, and other equipment installed by him so as to enable the Owner to properly operate, maintain and repair both exposed and concealed work. The marked prints shall be turned over to the Engineer at the completion of the job.

FINAL TESTS AND ACCEPTANCE

100-3.1 Tests shall be conducted as detailed on the Plans and as specified herein. See the respective Spec sections for details on testing requirements.

100-3.2 Prior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits, all existing series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the respective vault. All existing series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. Contractor shall provide a True RMS Ammeter for current measurements. Copies of test results shall be provided to the Resident Project Representative and the respective Engineer within five business days of conducting the respective set of tests. See the testing forms included in Appendix A. These tests are required to protect the Owner and the Contractor and to identify existing conditions and any defective cables, circuits, and/or constant current regulators. Failure to comply with this requirement will result in the Contractor being responsible for defective cable and circuit conditions (where previously not identified) and the associated corrective work at no additional cost to the Contract.

100-3.3 After airfield lighting modifications, additions, and/or upgrades have been completed, series circuit cables shall be Megger tested an insulation resistance tester and recorded at the vault. All series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. Copies of test results shall be provided to the Resident Project Representative and the respective Engineer of Record.

100-3.4 Upon completion of the work, test the individual systems, including all services, feeders, branch circuits, airfield lighting series circuits, airport electrical vault equipment, airfield lighting systems and fixtures, Navaids, and other equipment, for proper operation. Submit test results to the Engineer.

100-3.5 Provide all instruments, tools, labor and materials required by the Engineer for any essential intermediate and final test designated. Tests shall indicate compliance with Specifications and Drawings.

100-3.6 All tests will be observed by the Engineer’s representative. Furnish written notice as to when equipment or systems requiring field testing will be tested so that the Engineer’s representative may be present to witness the test. At least seven (7) calendar days notice of the test(s) shall be given. At the Contractor’s option, a representative of the manufacturer may be present to witness test(s) and verify results.

100-3.7 These tests shall not alter the Contractor's guarantee of the equipment. All work and materials found to be in non-compliance with the Contract Documents shall be replaced and retested by the Contractor at no additional cost to the Owner.

END OF ITEM L-100

ITEM L-107 AIRPORT WIND CONES

DESCRIPTION

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

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.

The L-806(L) supplemental wind cone(s) will be furnished by the Airport and installed by the Contractor. Contractor will be responsible for the new foundations, L-867 transformer cans, series isolation transformers, extension cords, frangible couplings and mounting hardware, wiring, connections, grounding, and associated incidentals to replace the existing wind cones and install new wind cone(s).

The L-807(L) primary wind cone(s) will be furnished by the Airport and installed by the Contractor. Contractor will be responsible for the new foundations, L-867 splice cans, extension cords, mounting hardware, wiring, connections, grounding, and associated incidentals to replace the existing wind cone and install a new primary wind cone.

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 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 furnish shop drawings for approval before ordering equipment and/or materials. **Shop drawings shall be clear and legible. Copies that are illegible will be rejected.** Shop drawings shall include the following information:

1. Certification of compliance with the AIP (Airport Improvement Program) Buy American Preferences for all materials and equipment. Do not submit ARRA (American Recovery and Reinvestment Act) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Do not submit NAFTA (North American Free Trade Agreement) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Shop drawings submitted without certification of compliance with the Airport Improvement Program Buy American Preferences or without certification of manufacture in the United States of America in accordance with the AIP Buy American Requirements will be rejected. See the FAA website at: http://www.faa.gov/airports/aip/buy_american/ for more information on the AIP Buy American Preferences requirements. FAA approved equipment that is on the FAA Buy American Conformance List or the list of Nationwide Buy American Waivers Issued by the FAA complies with the AIP Buy American Preferences and will not require additional waiver paperwork for AIP projects. See the FAA website at: http://www.faa.gov/airports/aip/buy_american/ for a list of Nationwide Buy American Waivers Issued by the FAA.

2. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

3. Concrete mix design.

4. Reinforcing steel for wind cone foundation with certification of made in the USA from domestic steel.

5. Provide cut sheets with manufacturer's name, catalog number, dimensions, material and UL listing for each type and size ground rod. Include certification of 100% domestic steel for ground rods.

107-2.2 Wind cones. The L-806(L) supplemental wind cone(s) will be furnished by the Airport and installed by the Contractor. The supplemental L-806(L) wind cones shall be

manufactured to Federal Aviation Administration (FAA) Specification AC 150/5345-27 (most current issue in effect) and shall be FAA approved (ETL/Intertek Testing Services - Certified). Wind cone shall be a Type L-806(L), Style I-B (internally lighted) with lighting emitting diode illumination, Size 1 (18 inches diameter by 8 feet long) orange nylon windsock, 6.6 Amp series circuit power, mounted on a frangible base pole. The pole and support structure shall be factory-painted "Aviation Orange". Wind cone shall be equipped with an L-810(L) obstruction light mounted on the top of the mast. Overall height of wind cone and support assembly shall not exceed 10 feet. Wind cone lighting shall provide constant-brightness series circuit power adapter suitable for operation on a five step (2.8 Amp. 3.4 Amp, 4.1 Amp, 5.2 Amp, and 6.6 Amp) series circuit or a three step (4.8 Amp, 5.5 Amp, and 6.6 Amp) series circuit. Include a series circuit isolation transformer rated for the respective wind cone and compatible with the respective series circuit power. The Contractor shall confirm part number and special options with the respective manufacturer for compliance with these Special Provisions. Include sufficient slack cable with the wind cone to allow connection to the respective series transformer in an adjacent splice can. Include manufacturer's specified anchor bolts.

"**The L-807(L) Primary wind cone(s) will be furnished by the Airport and installed by the Contractor.** The primary L-807(L) wind cone shall be manufactured to Federal Aviation Administration (FAA) Specification AC 150/5345-27 (most current issue in effect) and shall be FAA approved (ETL/Intertek Testing Services - Certified). Wind cone shall be a Type L-807(L), Style I-B (internally lighted) with lighting emitting diode illumination, Size 2 (36 inches diameter by 12 feet long) orange nylon windsock, 120 VAC circuit power, mounted on a tilt-down pole. The pole and support structure shall be factory-painted "Aviation Orange". Wind cone shall be equipped with an L-810(L) obstruction light mounted on the top of the mast. The Contractor shall confirm part number and special options with the respective manufacturer for compliance with these Special Provisions. Include sufficient slack cable with the wind cone to allow connection to the respective series transformer in an adjacent splice can. Include manufacturer's specified anchor bolts.

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. Rigid Steel Conduit and fittings shall be hot-dipped, galvanized, UL-listed, and produced in accordance with UL Standard 6 – Rigid Metal Conduit and ANSI C80.1 – Rigid Steel Conduit, Zinc Coated. Couplings, connectors, and fittings for rigid steel conduit shall be threaded, galvanized steel or galvanized, malleable iron, specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4 – Fittings Rigid Metal Conduit and EMT and UL 514B – Conduit, Tubing, and Cable Fittings. Set screw type fittings are not acceptable. The steel used to manufacture conduits shall be 100 percent domestic steel. The Contractor shall provide certification that the respective steel conduits used on this project are manufactured from 100 percent domestic steel.

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.

Conduit for grounding electrode conductors shall be Schedule 80 PVC conduit and shall comply with Item 110 and the following: Conduit shall be Schedule 80 PVC, 90□C, UL-rated, or approved equal. Material shall comply with NEMA Specification TC-2 (Conduit), (Fittings UL-514), and UL-651 (Standard for rigid, non-metallic conduit).

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).

107-2.8 Splice cans. Splice cans shall conform to the requirements of FAA AC 150/5345-42 (current issue in effect) for Type L-867, Class IA, Size B (12-in. nominal diameter), 24 inches deep, and shall be FAA approved and/or listed in the current AC150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum. Splice cans shall have galvanized steel covers, 3/8-in. minimum thick, with stainless steel bolts. Splice cans shall include internal and external ground lugs. A splice can shall be provided to accommodate cable connections and/or series circuit isolation transformers and shall be located adjacent to the wind cone foundation. Larger size splice cans shall be provided, where necessary, to accommodate the respective cable connections. This splice can shall be bonded to the respective ground rod located at the wind cone foundation with a #4 AWG bare copper conductor. Splice cans shall not be used as a base for the wind cone.

107-2.9 Ground rods. Ground rods shall be 3/4-inch diameter by 10-feet long UL listed copper clad with 10 mils (minimum) copper coating. Two 3/4-inch diameter by 10-feet long ground rods spaced a minimum of one rod length apart (10 feet for a ground rod that is 10 feet in length) shall be furnished and installed for the wind cone. Ground rods shall be manufactured in the United

States of America. Steel used to manufacture ground rods shall be 100 percent domestic steel to comply with the Airport Improvement Program Buy American Requirements.

CONSTRUCTION METHODS

107-3.1 Installation. The support pole shall be installed on a concrete foundation, per the Plans. The Contractor shall furnish and install all electrical materials necessary for complete and operational installation of each wind cone, as detailed herein and in accordance with the manufacturer's instructions. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC), most current issue in force. Wind cones shall be installed in conformance with the respective manufacturer's directions and recommendations for the respective application. Any installations which void the UL listing, ETL/Intertek Testing Services verification/listing (or other third-party listing), and/or the manufacturer's warranty of a device will not be permitted.

Contractor shall coordinate work and any power outages to airfield lighting systems, buildings or facilities located on the Airport with the Airport Manager. Where FAA facilities are affected, the Contractor shall coordinate work and any power outages with the Airport Manager and the respective FAA personnel. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow OSHA 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures, including, but not limited to, 29 CFR Section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment, the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

The Contractor shall be responsible for furnishing and setting all anchor bolts required to install the equipment.

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 herein ~~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. 4** 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 compression type 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/or UL listed pipe grounding clamp with corrosion resistant hardware 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. Not used.

107-3.9 Segmented circle. Not used.

107-3.10 Restoration. All turf areas disturbed by the installation of the wind cone and associated work shall be restored, graded, and seeded to establish a stand of grass to the satisfaction of the Resident Engineer and will be considered as incidental to the installation of each wind cone.

107-3.11 Instruction of airport staff. Contractor shall provide instruction to airport staff in regard to the operation and maintenance of the wind cones and associated equipment. Contractor shall demonstrate operating procedures, lamp changing procedures, and items requiring maintenance. Contractor shall furnish operation and maintenance manuals for wind cones and associated equipment.

107-3.12 Locating existing underground utilities and cables. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor's responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner's Representative and/or the Resident Engineer shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract.

All utility cables and lines shall be located by the respective utility. Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123. Contact the FAA (Federal Aviation Administration) for assistance in locating FAA cables and utilities. Location of FAA power, control, and communication cables shall be coordinated with and/or located by the FAA. Also contact Airport Director/Manager and Airport Personnel for assistance in locating underground Airport cables and/or utilities. Also coordinate work with all aboveground utilities.

Contractor shall locate and mark all existing cables within 10 ft of proposed excavating/trenching area. Any cables found interfering with proposed excavation or cable/trenching shall be hand dug and exposed. Any damaged cables shall be immediately repaired to the satisfaction of the Resident Engineer at the Contractor's expense. The Resident Engineer and Owner shall be notified immediately if any cables are damaged.

Payment for locating and marking underground utilities and cables will not be paid for separately but shall be considered incidental to the respective wind cone, cable, and/or duct installation.

107-3.13 Separation of High-Voltage and Low-Voltage Wiring. High-voltage series circuit wiring (such as airfield lighting 5000 Volt series circuits that may operate at output voltages up to 4,550 Volts or more under normal operating conditions) and low-voltage circuit wiring (such as 120 VAC, 208 VAC, 240 VAC, 480 VAC circuits using conductors with 600 Volt rated insulation) shall maintain separation from each other, to comply with 2023 National Electrical Code 300.3 "Conductors", (C) "Conductors of Different Systems", (2) "Over 1000 Volts ac, 1500 Volts dc, Nominal", and 2023 NEC 305.4 "Conductors of Different Systems". This is also required by "Airport Lighting Engineering Regional Supplement" issued by Great Lakes Region. High-voltage wiring and low-voltage wiring shall not be installed in the same wireway, conduit, duct, raceway, handhole, or junction box.

107-3.14 Remove Wind Cone.

a. The Contractor shall examine the site to determine the extent of the work. Contractor shall field verify existing site conditions. Contractor shall field verify the respective circuits and power sources prior to removing, disconnecting, relocating, working on, or connecting the respective Wind Tee unit, NAVAID, circuit, Vault equipment, or other device. Power for the Wind Cone system shall be disconnected at the respective power source prior to removing the unit. Power for the existing Wind Cones is from multiple power sources.

b. Contractor shall coordinate work and any power outages with the Airport Manager, the respective Airport personnel, and the Resident Engineer/Resident Technician. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures, including, but not limited to, 29 CFR Section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment, the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

c. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

d. Removal of the Wind Cone shall include the removal of the Wind Cone, foundation, associated conduits, wiring, associated step-up transformers, step-down transformers and/or boost transformers, circuit breakers, and associated equipment and materials at the respective power source location Vault. The Airport shall retain the salvage rights for the Wind Cone. In the event the Airport does not want the Wind Cone the Contractor shall remove and dispose of the Wind Cone off the Airport site in a legal manner. The Contractor shall coordinate with and notify the Airport Manager/Director and the RPR and provide a schedule for Wind Cone removal and installation of the wind cone(s). The Contractor shall remove the existing Wind Cone foundation and dispose of it off the airport site in a legal manner. The existing electrical cables from the respective power source shall be disconnected, removed where accessible or in conflict with new work and abandoned in place elsewhere. The holes left from the removal of the concrete bases will be filled with earth material. The earth material will be compacted to prevent any future settlement. The earth material will be obtained from off the Airport site. The disturbed area will be restored, graded, and seeded to the satisfaction of the Engineer, and will be considered as an incidental item to the removal of the Wind Cone.

e. All turf areas disturbed by the removal of Wind Cone and associated work shall be restored, graded, and seeded to establish a stand of grass to the satisfaction of the Engineer. All areas disturbed by work shall be restored to their original condition. The hole left from the removal of each base/foundation shall be filled with earth material. The earth material shall be compacted to prevent any future settlement. The earth material shall be obtained from off the Airport site. The restoration shall include any necessary topsoiling, fertilizing, liming, seeding, or mulching, as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. Restoration shall be considered incidental to the pay item of which it is a component part.

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.

The L-806(L) supplemental wind cone(s) will be furnished by the Airport and installed by the Contractor. The contractor will be responsible for the concrete foundation, concrete pad, reinforcing steel, L-867 transformer can, series isolation transformer, conduits, wiring, connections, grounding, and associated incidentals to install the wind cone(s).

The L-807(L) primary wind cone(s) will be furnished by the Airport and installed by the Contractor. The contractor will be responsible for the concrete foundation, concrete pad, reinforcing steel, L-867 splice, conduits, wiring, connections, grounding, and associated incidentals to install the wind cone(s).

Ground resistance tests for the made electrode ground system at each wind cone will be considered incidental to the respective wind cone pay item and no additional compensation will be allowed.

Testing the airfield lighting systems and the associated cable tests will be considered incidental to the Contract and no additional compensation will be allowed.

Conduits, conduit nipples, conduit couplings, and other conduit fittings included with splice cans, transformer cans, junction structures, wind cones and/or other Navaid installations, will be considered incidental to the respective item for which they are installed, and no additional compensation will be made.

Ground rods, grounding electrode conductors, connections, and associated grounding work included with airfield lights, taxi guidance signs, and/or splice cans will be considered incidental to the respective item for which they are installed, and no additional compensation will be made.

L-867 splice/transformer cans associated with the wind cone installations shall be incidental to the respective wind cone pay item and no additional compensation will be made.

The concrete pad around the wind cone foundation will be considered incidental to this item and no additional compensation will be made.

All lockout/tagout procedures to ensure and maintain safety of personnel will be considered incidental to the respective item of work for which it applies, and no additional compensation will be allowed.

107-4.2 Not used.

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 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.

107-5.2 Not used.

107-5.3 Payment for removal of each wind cone will be paid for at the Contract unit price bid price per each. This price and payment shall constitute full compensation for field verification of existing site conditions and power sources, disconnecting the respective power sources, removing the wind cone and support structure, removal of splice cans, removal of junction structures, removal of associated mounting hardware, bases, foundations, cables, ducts, conduits; for all excavating and backfilling; for furnishing all earth material; for all restoration work; and for furnishing all coordination, labor, tools, equipment, and incidentals necessary to complete this item of work. Salvageable materials shall be turned over to the Airport. Any materials not salvaged by the Airport shall be legally disposed of off the Airport site by the Contractor at no additional cost to the Contract.

Payment will be made under:

Item AW107508	L-806 W C 8’ Internally Lit -- per EACH
Item AW107812	L-807 W C 12’ Internally Lit -- per EACH
Item AW107900	Remove Wind Cone -- 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

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. Shop drawings are required for each wire, conductor, and/or cable type to be used on the project. **Shop drawings shall be clear and legible. Copies that are illegible will be rejected.** The preferred shop drawing submittal format shall be electronic (PDF) copies. Shop drawings shall include the following information:

(1) Only Third Party certified manufacturers, listed in AC 150/5345-53, Appendix 3 Addendum (as required) and meeting the BUY AMERICAN preference requirements can provide equipment and materials specified in the Contract Documents. Documentation certifying compliance with the BUY AMERICAN

preference rules for Airport Improvement Program (AIP) cited in 49 USC §50101) shall be included with each equipment and material submittal.

(2) **Certification of compliance with the AIP (Airport Improvement Program) Buy American Preferences for all materials and equipment. Do not submit ARRA (American Recovery and Reinvestment Act) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Do not submit NAFTA (North American Free Trade Agreement) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Shop drawings submitted without certification of compliance with the Airport Improvement Program Buy American Preferences or without certification of manufacture in the United States of America in accordance with the AIP Buy American Requirements will be rejected. Documentation certifying compliance with the BUY AMERICAN preference rules for Airport Improvement Program (AIP) cited in 49 USC §50101) shall be included with each equipment and material submittal. See the FAA website at: http://www.faa.gov/airports/aip/buy_american/ for more information on the AIP Buy American Preferences requirements. FAA approved equipment that is on the FAA Buy American Conformance List or the list of Nationwide Buy American Waivers Issued by the FAA complies with the AIP Buy American Preferences and will not require additional waiver paperwork.**

(3) In order to expedite the shop drawing review, inspection and/or testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacturer of all material to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

(4) Indicate the pay item number for each respective cable.

(5) Shop drawings shall include wire/conductor/cable cut sheets with type, size, specifications, ETL or UL listing, manufacturer, and catalog or part number.

e. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. 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.

g. All cable shall be FAA approved or UL-listed as suitable for installed application. Cable furnished on this project shall comply with the requirements of the "Airport Improvement Program Buy American preference" requirements. All conductors shall be Copper.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 cable shall be FAA approved and listed in the current AC150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum. Cable shall comply with the BUY AMERICAN preference rules for Airport Improvement Program (AIP) cited in 49 USC §50101. Documentation certifying compliance with the BUY AMERICAN preference rules for Airport Improvement Program (AIP) cited in 49 USC §50101) shall be included with each equipment and material submittal. 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.

Item AW108108, 1/C #8 5KV UG Cable shall be one conductor No. 8 AWG, 5,000-Volt, FAA L-824, Type C, stranded copper cable installed in trench, duct bank or conduit. Conductors for the use with the Runway 6-24 lighting series circuit shall have yellow colored insulation. Conductors for the use with the Runway 12-30 lighting series circuit shall have red colored insulation. Conductors for use with the other airfield lighting series circuits shall have black colored insulation.

Item AW108088, 1C #8 XLP-USE shall consist of #8 AWG, XLP-USE, 600 Volt cable or #8 AWG, FAA L-824, Type C, 5,000 Volt or 600 Volt cables. Conductor insulation for 120 VAC, 1 phase, 2-wire with ground circuits shall be color-coded: Phase A – Black, Neutral - White, and Ground – Green.

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 tinned solid copper wire per ASTM B3 and ASTM B33. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be 3/4-inch in diameter by 10 feet long (minimum) UL listed sectional copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 20 feet long and 3/4 inch (19 mm) in diameter. Provide appropriate couplers to form ground rods that are 20 feet or longer in length.

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. Cast Splices shall be used for low voltage cable applications. Cast splices shall not be used for high voltage series circuit cables.

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.

Taped or heat-shrinked type splices will not be permitted on this project for Series Circuit 5000 Volt L-824 Type Cables.

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 for cable markers shall be per Specification Item P-610, Structural Portland Cement Concrete.

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. Provide identification tags rated suitable for the respective locations with permanent markings. Field printable, double sided, corrosion resistant, color coded, reflective cable tags shall be provided. Coordinate cable tag identification with the Airport Maintenance Staff.

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. See Part "108-3.10 Testing" for testing requirements. See the testing forms included in Appendix A.

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.

Keep all work, power outages, and/or shut down of existing systems coordinated with the Airport Manager and the Resident Project Representative. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

Examine the site to determine the extent of the work. Contractor shall field verify existing site conditions.

Verify respective circuits and power sources prior to removing, disconnecting, relocating, installing, connecting, or working on the respective airfield lighting, taxi sign, NAVAID, or other device. Identify each respective circuit prior to performing work on that circuit.

If the Contractor wishes to lay cable on a line other than that shown on the Plans, he shall obtain approval of the Project Engineer of record before doing so and coordinate with the Resident Project Representative. Any additional cable needed because of such change will be at the Contractor's expense.

New airfield lighting series circuit cables shall be installed a minimum of 18 inches below grade to comply with NEC 300.5 Underground Installations. Deeper depths might be required to avoid obstructions or where detailed herein.

Locate and identify all existing underground utilities located within the area where the proposed cables are being installed, and take all precautions to protect these utilities from damage. Care shall be taken so as not to damage any existing circuits. Any existing circuits damaged shall be immediately repaired to the satisfaction of the Engineer and/or the respective utility or owner where applicable. Any underground utility damaged will be repaired or replaced at the Contractor's own expense. Any repairs of existing cables will be considered incidental to the contract, and no additional compensation will be allowed.

In areas where there is a congestion of buried cables or where the proposed cable crosses an existing cable, the Contractor will be required to had dig and/or carefully excavate the trench necessary for the proposed cable. At other locations the proposed cable may be trenched or plowed into place. Hand digging, trenching, and/or plowing will be considered incidental to the proposed cables and no additional compensation will be allowed.

Grounding work and modifications shall not be performed during a thunderstorm or when a thunderstorm is predicted in the area. Grounding for airfield lights and taxi signs shall be as detailed on the Plans and as specified herein.

Homerun cables for a respective circuit that are installed in conduit or duct shall be run together in the same raceway or duct.

The respective personnel performing airfield lighting work, vault work, and/or tests shall be familiar with, and qualified to work on 5000-volt airfield lighting series circuits, constant current regulators and associated airport electrical vault equipment. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. NFPA 70 - National Electrical Code defines a Qualified Person as "***One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has revied safety training to recognize and avoid the hazards involved."*** NFPA 70E Standard for Electrical Safety in the Workplace defines a Qualified Person as "***One who has demonstrated skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk."*** OSHA (Occupational Safety and Health Administration), Part Number 1910 Occupational Safety and Health Standards, Subpart S, Electrical, Standard Number 1910.399 defines Qualified person as follows: ***"Qualified person. One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved."*** Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel should be permitted to work on airfield lighting series circuits.

FAA requires that every airfield lighting cable splicer shall be qualified in making cable splices and terminations on cables rated at and/or above 5000 Volts AC and shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

Only cable in unit duct may be plowed or directional-bored.

Obey and comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

The Contractor shall comply with the requirements of FAA AC No. 150/5370-2 (current issue in effect) "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION".

In the event a conflict is determined with respect to manufacturer installation instructions, National Electrical Code, and/or the Contract Documents, contact the Project Engineer for further direction.

Secure, identify and place any above ground temporary wiring in conduit to prevent electrocution and fire ignition sources in conformance with the requirements of FAA AC 150/5370-2G, Part 2.18.3 “Lighting and Visual NAVAIDs”. All temporary installations shall comply with National Electrical Code Article 590 – “Temporary Installations.”

Existing ducts and cables associated with removal work shall be abandoned in place unless it conflicts with the installation of the airfield light, sign, duct, cable, handhole, manhole, site work, pavement or other work, then it shall be disconnected, removed, and disposed of off the site at no additional cost to the Contract. Contractor may remove abandoned cables at no additional cost to the Contract and shall have the salvage rights to abandoned cables.

Other construction projects might be in progress on the Airport at the same time as this project. The Contractor will be required to cooperate with all other contractors and the Airport Manager in the coordination of the work.

Relocation of existing cables and/or cable in unit duct will require careful excavation of the cables to prevent damage to them. The cables and/or cable in unit duct shall be excavated and exposed and then relocated to a different depth and/or route to accommodate the respective site work.

The cable quantities as shown on the Construction plans are based on straight-line measurement. All other cable lengths, such as slack or waste, will not be measured for payment.

All cables installed by the Contractor shall be properly labeled and tagged at all points of access (handholes, manholes, terminal panels, control panels, and the respective wireway in the vault).

All changes to the airfield lighting system shall be documented by the Contractor and provided to the Resident Project Representative.

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 66 ~~42~~ inches unless otherwise specified. Crossing depths under railroad tracks shall be in accordance with the requirements of the respective Railroad Authority.
- Minimum cable depth when installed in a field subject to farming shall be 42 inches.

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 to a minimum of 100 percent of ASTM D1557 **or** backfill with controlled low strength material (CLSM) in accordance with P-153. Backfill with CLSM is recommended under pavements.

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 sodding**,** topsoiling, fertilizing**,** liming**,** seeding, sprigging, and/or mulching as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be to a minimum of 100 percent of ASTM D1557 or 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.

f. The Contractor shall use a cable stripper/penciller whenever cable connections are made.

g. All below grade splices shall be installed in light bases, splice cans, handholes, or manholes. Splice cans shall be L-867, Class IA, Size B (12 inches diameter minimum), or Size D (16 inches dimeter where shown on the Plans), 24 inches deep, with 3/8- inch thick, galvanized steel cover and stainless steel bolts. Larger size splice cans shall be provided, as applicable, for specific equipment applications or manufacturer's recommendations, and/or where detailed on the Plans. Splice cans located in areas subject to heavy aircraft or vehicle loading shall be L-868 type. The Engineer shall approve all splice locations before work commences.

h. Cast Splice Kits for Emergency Repairs. In-line connections for existing low voltage cables cut during construction shall be repaired with the cast splice kit. The Contractor shall have a minimum of two (2) splice kits on the job site at all times for emergency repairs. Splice markers shall be installed over each splice in cables not to be abandoned. Cast splice kits shall be as specified in paragraph "a." of Item 108-2.4.

i. Factory-Molded Plug In Splice Kits for Emergency Repairs. In-line connections for existing high voltage series circuit cables cut during construction shall be repaired with the Factory-Molded Plug In Splice Kits. The Contractor shall have a minimum of two (2) splice kits on the job site at all times for emergency repairs. Splice markers shall be installed over each splice in cables not to be abandoned. Factory-molded plug in splice kits shall be as specified in paragraph "c." of Item 108-2.4."

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. If shown on the plans or included in the job specifications, bare solid **6 AWG tinned** copper counterpoise wire shall be installed for lightning protection of the underground cables.

a. Equipotential. – The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc. – all components - are bonded together and bonded to the vault power system ground loop/electrode, where detailed on the Plans. Where shown on the Plans the counterpoise shall terminate at a ground rod located approximately 400 feet (or possibly more) from the Vault.

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

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

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

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

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

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

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

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

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

b. Isolation [not used]

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 tinned 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 tinned 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 respective ground rod(s) as detailed on the plans ~~the transformer vault or at the power source~~. Counterpoise wire shall be installed in the same trench for the respective length of buried homerun cable(s), conduits and duct banks that are installed to contain airfield cables. **The counterpoise shall not be extended to the vault. The counterpoise for each homerun circuit shall be terminated at a ground rod (3/4-inch diameter by 20-feet long minimum) in a manhole or handhole recommended to be not less than 200 feet or greater than 400 feet from the vault, unless detailed otherwise on the Plans.** It shall be securely attached to the ~~vault or equipment external ground ring or other~~ respective 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 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the 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 and/or for the respective pay item. 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:

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

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

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than **500** megohms. Verify continuity of all series airfield lighting circuits prior to energization.

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

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

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

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

j. Follow safety procedures for all tests. Prior to operating each CCR (Constant Current Regulator), confirm each CCR frame is grounded to the Vault grounding electrode system/ground bus with a minimum #6 AWG copper conductor and UL listed grounding connector with secure and tight connections. Correct where missing, for safety of personnel. Furnish and install #6 green insulated equipment ground wire with output series circuit conductors from each CCR frame to the respective cutout/disconnect enclosure frame. Cutout enclosures are required to be grounded and bonded per NEC Article 250.4 “General Requirements for Grounding and Bonding”.

k. Prior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits, all existing series circuit lighting cables in the areas of work shall be Megger tested with an insulation resistance tester and recorded at the respective airport electrical vault. The respective series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. The Contractor is responsible to employ the services of personnel qualified, familiar with, and trained to perform the respective tests, and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. NFPA 70 - National Electrical Code defines a Qualified Person as ***“One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.”*** NFPA 70E - Standard for Electrical Safety in the Workplace defines a Qualified Person as “***One who has demonstrated skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk.”*** OSHA (Occupational Safety and Health Administration), Part Number 1910 Occupational Safety and Health Standards, Subpart S, Electrical, Standard Number 1910.399 defines Qualified person as follows: ***“Qualified person. One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.”*** Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel are permitted to work on airfield lighting series circuits.

Contractor shall provide a True RMS Ammeter for current measurements. Copies of test results shall be provided to the Resident Engineer and the respective Project Engineer of Record within five business days of conducting the respective set of tests. See the testing forms included in the Appendix. **These tests are required to protect the Owner and the Contractor and to identify existing conditions and any defective cables, circuits, and/or constant current regulators. Failure to comply with this requirement might result in the Contractor being responsible for defective cable and circuit conditions (where previously not identified) and the associated corrective work at no additional cost to the Contract. The Contractor is responsible to perform the tests, record the test results and submit the test results to the Engineer of Record.**

l. Personnel shall coordinate work and any power outages with the Owner's Designated Representative(s). Any shutdown of existing systems should be scheduled with and approved by the Owner's Designated Representative(s) prior to shut down. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on this system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

m. Personnel are recommended to comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

n. Provide personnel protective equipment for all personnel working on or testing electrical systems suitable for the respective application. Provide protective equipment for personnel to keep them safe in the event of an arc flash or other electrical accident. Refer to NFPA 70E "Standard for Electrical Safety in the Workplace", Article 250 "Personal Safety and Protective Equipment" and "Informative Annex H Guidance on Selection of Protective Clothing and Other Personal Protective Equipment (PPE)" for additional information on personal protective equipment.

o. Demonstrate all features and functions of all systems and instruct the Owner's personnel in the proper and safe operation of the systems.

p. Insulation resistance testing equipment for use with 5,000 Volt series circuit cables shall use an insulation resistance tester capable of testing the cables at 5,000 Volts. New 5,000 Volt rated airfield lighting series circuit cables shall be tested at not less than 5,000 Volts. Existing older series circuit cables and/or cables in poor condition may require the test voltage to be performed at a voltage lower than 5,000 Volts to obtain an insulation resistance reading (Example 1,000 Volts, 500 Volts, or less than 500 Volts). Insulation resistance testing equipment often has the feature to adjust the test voltage corresponding to the condition of the cable. The respective test voltages shall be recorded for each cable insulation resistance test result. Measuring the cable insulation resistance of existing conductors/cables is important to document the condition of existing conductors/cables and help determine if there are existing hazards and/or unsafe conditions that will need to be addressed for protection of personnel.

q. Insulation resistance testing equipment for use with 600 Volt rated cables shall use a 500 Volt insulation resistance tester. The respective test voltage shall be recorded for each cable insulation resistance test result.

r. It is recommended to use the same insulation resistance test equipment throughout the project to ensure reliable comparative readings at the beginning of the project and at the completion of the project.

s. Disconnect the airfield lighting series circuit cables from the constant current regulator when performing cable insulation resistance tests (Megger Tests). Test the cables that go to the airfield for the respective airfield lighting series circuit. Connect the cable insulation resistance tester to one of the airfield lighting series circuit cables and to a good ground in the airport electrical vault such as the airport vault ground bus. Conduct the cable insulation resistance test on each respective cable for not less than 90 seconds. Record the test results at the end of the time duration for the test.

t. FAA Advisory Circular 150/5340-26C Maintenance of Airport Visual Aid Facilities provides guidance on Insulation Resistance Tests. Also refer to the user manual for the respective cable insulation resistance tester. Reasonably new series circuit cables and transformers with good connections should read 500 Mega-Ohms to 1,000 Mega-Ohms or higher. The readings should decrease with age. The resistance value declines over the service life of the circuit; a 10-20 percent decline per year may be considered normal. A yearly decline of 50 percent (4 percent monthly) or greater indicates the existence of a problem, such as a high resistance ground, serious deterioration of the circuit insulation, lightning damage, bad connections, bad splices, cable insulation damage, or other failure. FAA Advisory Circular 150/5340-26C notes ***"Generally speaking, any circuit that measures less than 1 megohm is certainly destined for rapid failure."*** Airfield lighting series circuits with cable insulation readings of less than 1 megohm are not uncommon for older circuits that are 20 years or more of age.

u. Based on information in FAA AC No. 150/5340-26C Maintenance of Airport Visual Aid Facilities, the cable insulation resistance value inevitably declines of the service life of the circuit; a 10-20 percent decline per year may be considered normal. In the event that the cable insulation resistance readings have declined more than 2 percent per month it might indicate cable damage due to lightning or damage as a result of Contractor operations. Where the cable insulation resistance readings have declined more than 2 percent per month over the project construction duration as a result of Contractor operations, Contractor will need to investigate, address, and repair the respective cable circuits.

v. Please beware, where the respective series circuit cable insulation resistance test voltage is less than the operating voltage of the circuit, the cable needs to be replaced and is considered very poor to dangerous condition. For example, if a 30 KW, 6.6 Amp circuit cable insulation resistance tests less than 1 Mega-ohm at 400 volts, this cable is considered very poor to dangerous condition. A 30 KW, 6.6 Amp constant current regulator may output 4500 Volts where it is loaded near capacity. A cable that tests less than the operating voltage is considered dangerous and in need of replacement. Where the cable insulation resistance test voltage is less than the cable insulation rating it is unacceptable for continued use. A 5,000 Volt rated series circuit conductor that needs to be suitable to operate and be tested at 5,000 Volts, also needs to be capable of being tested at 5,000 Volts. Anything less indicates the cable insulation is starting to fail and/or is in dangerous condition. Dangerous condition indicates lighting failures, ground faults, transformer failures, bad connections, unsafe conditions, risk of electric shock, injury and/or death, and other failure conditions can be expected or presently exist. Personnel are at risk of electric shock, injury, and death when on the airfield areas that contain the lighting systems, when the lighting systems are in operation. The airfield lighting series circuit cables are unsafe, and that being near them with standing water on the ground could be life-threatening. Caution needs to be exercised when working on or around these circuits. The airfield lighting series circuits are considered to be in such bad condition that they are a safety hazard to personnel working on the

airfield, and safety measures need to be performed when working around these circuits. These circuits need immediate replacement. The respective lighting system can be expected to fail at any time. **THE SAFETY OF PERSONNEL MUST BE AND IS THE PRIORITY. When the airfield lighting circuits become dangerous, they need to be replaced immediately to help protect the pilots, airport staff, maintenance personnel, contractors, the public, and others that use or visit the airport.**

w. All existing series circuit cable loops shall also have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. The resistance of the series circuit loop with connections using #8 AWG copper conductor should be approximately 0.8 to 1 Ohm per thousand feet of cable length. The resistance of the series circuit loop with connections using #6 AWG copper conductor should be approximately 0.5 to 0.7 Ohm per thousand feet of cable length. The number of series circuit transformers and connections will affect the overall resistance of the series circuit loop and therefore the measurements might be slightly higher than the calculated resistance for the respective length of cable.

x. When test results for constant current regulators indicate readings that are outside the acceptable tolerances calibrate and adjust the regulator to be within acceptable output current levels. Adjustments and calibrations shall be in accordance with the respective regulator manufacturer recommendations and instructions. Provide a true RMS Ammeter for measuring input and output currents on constant current regulators.

y. After airfield lighting modifications, additions, and/or upgrades have been completed, series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the respective vault. Megger tests results shall include insulation resistance for each cable under test, the test voltage, and testing duration in minutes. All series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the respective vault. Each constant current regulator shall be tested with results recorded. Contractor shall provide a True RMS Ammeter for current measurements. Copies of test results shall be provided to the Resident Engineer and the respective Engineer of Record. See the testing forms included in the Appendix. The Contractor is responsible to perform the tests, record the test results and submit the test results to the Engineer of Record.

z. The Contractor is responsible for employing qualified personnel that are capable of properly conducting the required tests to the satisfaction of the Project Engineer of Record. Tests that provide unsatisfactory results shall be reviewed to determine the possible cause of unsatisfactory results, corrections shall be made, and the tests shall be conducted again.

aa. See Appendix A – “Cable and Constant Current Regulator Testing Forms” for additional information on testing requirements for airfield lighting systems. All testing will be considered incidental to the respective work items for which they ae required and no additional compensation will be allowed.”

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.

108-3.11 Locating of existing underground utilities and cables. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the plans are not

represented as being accurate, sufficient, or complete. Neither the owner nor the Engineer assumes any responsibility whatsoever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the contractor's responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the contractor shall notify the utility companies of his operational plans, and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the contractor shall immediately notify the utility company of jurisdiction. The owner's representative and/or the Resident Project Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the contractor at no additional cost to the contract.

All utility cables and lines shall be located by the respective utility. **Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123.** Contact the FAA (Federal Aviation Administration) for assistance in locating FAA cables and utilities. Location of FAA power, control, and communication cables shall be coordinated with and/or located by the FAA. Also contact airport director/manager and airport personnel for assistance in locating underground airport cables and/or utilities. Also coordinate work with all aboveground utilities.

Contractor shall locate and mark all existing cables within ten (10) feet of proposed excavating/trenching area. Any cables found interfering with proposed excavation or cable/trenching shall be hand dug and exposed. Any damaged cables shall be immediately repaired to the satisfaction of the Resident Project Representative at the contractor's expense. The Resident Project Representative and Owner shall be notified immediately if any cables are damaged.

Payment for locating and marking underground utilities and cables will not be paid for separately, but shall be considered incidental to the installation of the respective cable or duct.

108-3.12 Separation of high-voltage and low-voltage wiring. High-voltage series circuit wiring (such as airfield lighting 5000 Volt series circuits that may operate at output voltages up to 4,550 Volts or more under normal operating conditions) and low-voltage circuit wiring (such as 120 VAC, 208 VAC, 240 VAC, 480 VAC circuits using conductors with 600 Volt rated insulation) shall maintain separation from each other, to comply with 2023 National Electrical Code 300.3 "Conductors", (C) "Conductors of Different Systems", (2) "Over 1000 Volts ac, 1500 Volts dc, Nominal", and 2023 NEC 305.4 "Conductors of Different Systems". This is also required by "Airport Lighting Engineering Regional Supplement" issued by Great Lakes Region. High-voltage wiring and low-voltage wiring shall not be installed in the same wireway, conduit, duct, raceway, handhole, or junction box.

108-3.13 Identification of cables. At electrical handholes and manholes, identify and label each cable originating in the vault with respect to the system or device served. Provide identification tags rated suitable for the respective locations with permanent markings.

METHOD OF MEASUREMENT

108-4.1 Trenching including the excavation, backfill, dewatering and restoration shall not be measured for payment, but shall be considered incidental to the respective cable pay item for which it is required.

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 will be measured for payment up to the vault or the designated termination point in the field. Cable 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.

Coring and interface to handholes, manholes, or junction structures shall be incidental to the respective cable pay item and no additional measurement for payment will be made.

The relocation, interface, and/or adjustment of existing cable and/or cable in unit duct will be considered incidental to the work for which it is required, and no additional compensation will be allowed.

Removal of existing cable to accommodate new work will be considered incidental to the respective item of work for which it applies, and no additional compensation will be allowed.

All lockout/tagout procedures to ensure and maintain safety of personnel will be considered incidental to the respective item of work for which it applies, and no additional compensation will be allowed.

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

108-4.4 Testing the airfield lighting systems and associated constant current regulator tests and cable tests will be paid for under L-109.

108-4.5 Removal of cable, conductors, wiring and associated work will be paid for under AW800476 Remove Airfield Lighting per L. SUM. Said price and payment shall constitute full compensation for field verification of existing site conditions and power sources, disconnecting the respective power sources, removing existing airfield signs, runway signs, taxiway signs, airfield lights, transformers, light bases, transformer cans, splice cans, junction structures, junction boxes, handholes, and other electrical equipment enclosures, and associated bases, foundations, concrete pads, and support structures; for removal of conduits, ducts, and wiring associated with the respective items designated for removal; for removal of concrete and cleaning mounting stakes for light fixtures; for all excavating and backfilling; for furnishing all earth material; for all restoration work; and for furnishing all coordination, labor, tools, equipment, and incidentals necessary to complete this item of work.

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.

Item AW108088	#8 XLP-USE - per FOOT
Item AW108108	1/C #8 5KV UG Cable - per FOOT
Item AW108706	1/C #6 Counterpoise - per 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). Note: where FAA Advisory circulars are referenced that shall be the current issue or issues in effect.

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 and AC150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM, Appendix 3 Addendum (current issue in effect).
AC 150/5370-2	OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

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
MIL-S-23586C	Sealing Compound, Electrical, Silicone Rubber

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
NFPA 70E	Standard for Electrical Safety in the Workplace.
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
FAA STD-019f	Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment

Federal Specifications

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

Occupational Safety and Health Administration

OSHA 29 CFR Part 1910	Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures.

Underwriters Laboratories (UL)

UL Standard 44	Thermoset-Insulated Wires and Cables.
UL Standard 83	Thermoplastic-Insulated Wires and Cables.
UL Standard 854	Service Entrance Cables.

END OF ITEM L-108

ITEM L-109 AIRPORT TRANSFORMER VAULT AND VAULT EQUIPMENT

109-1.1 ~~This item shall consist of constructing an airport transformer vault or a prefabricated metal housing per these specifications and per the design and dimensions shown in the plans. This work shall also include the installation of conduits in the floor and foundation, painting and lighting of the vault or metal housing, and the furnishing of all incidentals that are necessary to produce a completed unit.~~ Included as a separate part under this item or as a separate item where an existing vault is to be used shall be the furnishing of all vault equipment, wiring, electrical buses, cable, conduit, potheads, and grounding systems. This work shall also include the painting of equipment and conduit; the marking and labeling of equipment and the labeling or tagging of wires; the testing of the installation; and the furnishing of all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the RPR.

"Installation of Equipment within existing vault in Place" shall consist of furnishing and installing electrical equipment and materials inside the vault as detailed on the Plans and specified herein. This item shall include all labor, materials, transportation, equipment, wiring, raceways, grounding, warranties, tools, coordination, relocations, operational instructions, labeling, testing, and all incidentals required to place the vault and associated equipment into proper working order as a completed unit to the satisfaction of the Owner and Resident Project Representative.

Included under this item shall be the following:

a. Field verification of existing site conditions to determine the complexity of the proposed work.

b. Coordinating all work with the Airport Director and/or designated Airport Maintenance Staff, the respective FAA personnel and the Resident Project Representative.

c. All building permits as required for the respective work by the respective authority of jurisdiction.

d. Furnishing and installing all associated electrical equipment, materials, and support hardware in the vault as detailed on the Plans and specified herein.

e. Replacements, relocations, and rewiring of constant current regulator and series plug cutouts.

f. Furnishing and installing all raceways, conduits, pull boxes, and ducts in, beneath, and adjacent to the vault. Conduits and ducts from the vault to handholes or junction structures near the vault will be included with this item.

g. Furnishing and installing all necessary cable and wiring at the vault as detailed on the Plans and specified herein.

h. Furnishing and installing all grounding and surge protection as detailed on the Plans and specified herein.

i. Locating, identifying, relocating, and/or replacing existing airfield lighting cables, power cables, and/or control wiring, as necessary to disconnect these respective cables and wiring from the existing equipment and reconnect, replace and/or interface these respective cables to the new or relocated equipment. All work shall be coordinated with the Airport Manager and shall be coordinated to minimize down time to the respective airfield systems.

j. Lockout/tagout kits and all coordination with the Airport Manager, Airport Staff, FAA personnel, Contractor staff, and the Resident Project Representative, and associated labor, transportation, equipment, tools to comply with U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

k. Removal and/or relocation of existing equipment and/or materials.

l. Furnishing and installing UL listed fire stop material at each conduit entry to the high voltage wireway from a constant current regulator.

m. Furnishing shop drawings for new equipment and materials.

n. Testing, adjusting, and retesting, where applicable, all new equipment and modifications to existing systems for proper operation.

o. Labeling all electrical equipment and incidentals necessary to place all of the equipment in operation as a complete unit acceptable to the Owner and Engineer.

p. Furnishing operation, maintenance, and installation manuals for all new equipment.

109-1.2 Item L-109-7.5; Cable and Constant Current Regulator Testing and Calibration Procedures - per lump sum shall consist of testing the airfield lighting systems and the associated cable tests, constant current regulator tests and calibration.

EQUIPMENT AND MATERIALS

109-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) 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). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals. Shop drawings are required for vault equipment and materials to be used on the project. **Shop drawings shall be clear and legible. Copies that are illegible will be rejected.** The preferred shop drawing submittal format shall be electronic (PDF) copies. Shop Drawings shall clearly indicate proposed items, capacities, characteristics, and details in conformance with the Plans and Specifications. The respective manufacturer shall certify capacities, dimensions, special features, etc. When a submittal is marked "Revise and Resubmit", "Rejected", and/or "Not Approved", do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations, resubmit, and repeat if necessary to obtain a different action mark such as "No Exceptions Taken" or "Furnish as Corrected". Contractor is responsible for compliance with the specified characteristics. Contractor's responsibility for error and omissions in submittals is not relieved by the Engineer's review of submittals. Accompany each submittal with a transmittal letter that includes the date, project title and number, Contractor's name and address, the number of Shop Drawings, product data and/or samples submitted, notification of any deviations from the Contract, and any other pertinent information. Shop drawings shall include the following information:

(1) **Certification of compliance with the AIP (Airport Improvement Program) Buy American Preferences for all materials and equipment. Do not submit ARRA (American Recovery and Reinvestment Act) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Shop drawings submitted without certification of compliance with the Airport Improvement Program Buy American Preferences or without certification of manufacture in the United States of America in accordance with the AIP Buy American Requirements will be rejected. See the FAA website at: http://www.faa.gov/airports/aip/buy_american/ for more information on the AIP Buy American Preferences requirements. FAA approved equipment that is on the FAA Buy American Conformance List or the list of Nationwide Buy American Waivers Issued by the FAA complies with the AIP Buy American Preferences and will not require additional waiver paperwork.**

(2) In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

(3) Cut sheets with specifications, manufacturer, part number, options, and list of spare parts for each constant current regulator

(4) Conduit and wiring

e. The data submitted shall be sufficient, in the opinion of the Engineer and/or RPR, to determine compliance with the plans and specifications. The Engineer and/or 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 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.

CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING

109-3.1 Electrical vault building. [Not used]

109-3.2 Concrete. [Not used]

109-3.3 Precast concrete structures. [Not used]

109-3.4 Reinforcing steel. [Not used]

109-3.5 Brick. [Not used]

109-3.6 Rigid steel conduit. Rigid steel conduit and fittings shall be hot-dipped, galvanized, UL-listed, produced in accordance with Underwriters Laboratories Standard 6 – Rigid Metal Conduit and ANSI C80.1 – Rigid Steel Conduit, Zinc Coated. Couplings, connectors, and fittings for rigid steel conduit shall be threaded galvanized steel or galvanized malleable iron specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4 – Fittings Rigid Metal Conduit and EMT. Set screw type fittings are not acceptable. Steel used to manufacture conduits shall be 100 percent domestic steel. Contractor shall provide certification that the respective steel conduits used on this project are manufactured from 100 percent domestic steel. ~~per Underwriters Laboratories Standards 6 and 514B.~~

109-3.7 Plastic Conduit and fittings. Plastic Conduit and fittings shall conform to the requirements of UL-651 and UL-654 schedule 40 polyvinyl chloride (PVC) suitable for use above or below ground.

109-3.8 Lighting. [Not used]

109-3.9 Outlets. [Not used]

109-3.10 Switches. [Not used]

109-3.11 Paint. [Not used]

109-3.12 Ground bus. [Not used]

109-3.13 Square duct. Duct shall be square similar to that manufactured by the Square D Company (or equivalent), or the Trumbull Electric Manufacturing Company (or equivalent). The

entire front of the duct on each section shall consist of hinged or removable cover for ready access to the interior. The cross-section of the duct shall be not less than ~~4 × 4 inch (100 × 100 mm)~~ 6 x 6 inch except where otherwise shown in the plans.

109-3.14 Ground rods. [Not used]

109-3.15 Vault prefabricated metal housing. [Not used]

109-3.16 FAA-approved equipment. Certain items of airport lighting equipment installed in vaults are covered by individual ACs listed below:

AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.
AC 150/5345-49	Specification for L-854, Radio Control Equipment
AC 150/5345-56	Specification for L-890 Airport Lighting Control and Monitoring System (ALCMS)

FAA approved equipment shall also comply with the requirements of the Airport Improvement Program Buy American Requirement. Proposed FAA approved equipment shall be as follows:

a. Constant Current Regulator #1 for Runway 6-24. Constant Current Regulator #1 for Runway shall be a Type L-828 or Type L-829 constant current regulator, Class 1 - 6.6 Amps output current, Style 2 - five brightness steps (2.8, 3.4, 4.1, 5.2, and 6.6-Amps), **15 KW**, 240 VAC, single-phase, 60 Hertz input. Constant current regulator shall comply with FAA AC 150/5345-10G for Type L-828 regulator and shall be FAA Approved. Constant current regulator shall properly operate the respective airfield lighting system it is powering. Constant current regulator shall be suitable for use and capable of properly operating pulsing load such as a pair of L-849I Xenon REILS with the runway lighting system. Constant current regulator must cause the minimum possible radiated or conducted electromagnetic interference (EMI) to airport and FAA Equipment (example; computers, radars, instrument landing systems, radio receivers, VHF Omni-directional Range, etc.) that may be located on or near an airport. Constant current regulator shall include open circuit protection, over current protection, output current ammeter, output voltmeter, and arresters of the proper rating to protect the CCR from lightning induced voltage and current surges installed at both the input and output terminals of the CCR. Constant current regulators shall also include a remote/local control feature with selections for “Remote, Off, 10% Brightness, 30% Brightness, and 100% Brightness”. Control voltage shall be 120 VAC (internal/external). Constant current regulator must be compatible with the existing airfield lighting control system. Constant current regulators shall be dry-type ferro-resonant regulator, dry-type ferromagnetic reactor regulator or approved equal. Include the following spare components:

1. One spare control circuit board for each type in the constant current regulator

2. Primary switch contactor
3. Lightning arresters (input and two output)
4. Control circuit fuses or breaker

Note the requirement for spare parts is based on FAA AC 150/5340-26C Maintenance of Airport Visual Aid Facilities, Part 5.2 Constant Current Regulators (CCRs) which notes the following in regard to a backup regulator and/or spare parts: "*Most constant current regulators manufactured today are reliable and reasonably trouble-free. However, do not be lulled into complacency when considering preventative maintenance of the vital components in the airport lighting electrical system. A regulator failure without a spare backup regulator or spare parts on hand can shut down a vital runway or taxiway indefinitely. Many times otherwise conscientious electricians have been surprised by a sudden failure or lack of spare parts for a piece of equipment. Unlike other elements of the electrical system that use commonly available parts, when a failure in a CCR, it is most likely that a printed circuit (PC) board will need to be replaced. The CCR manufacturer may not have replacement parts readily available."*

109-3.17 Other electrical equipment. Distribution transformers, oil switches, cutouts, relays, terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of electrical equipment not covered by FAA equipment specifications and ACs shall conform to the applicable rulings and standards of the Institute of Electrical and Electronic Engineers (IEEE) or the National Electrical Manufacturers Association (NEMA). When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first-grade product. This equipment shall be supplied in the quantities required for the specific project and shall incorporate the electrical and mechanical characteristics specified in the proposal and plans. Equipment selected and installed by the Contractor shall maintain the interrupting current rating of the existing systems or specified rating whichever is greater.

Proposed electrical equipment and materials for the vault shall be as follows:

a. Circuit Breakers. Circuit breakers, to be installed in the existing vault panelboards, shall be compatible with the respective panelboards and by the same manufacturer as the panelboard. Circuit breakers shall be bolt-on type with an amp interrupting capacity greater than the available fault current or shall have two-tier series rating suitable for the application and respective available fault current. Circuit breaker amperage trip settings and number of poles shall be as detailed on the Plans.

b. Junction and Pull Boxes. Junction and pull boxes shall be sized, as required for conductors and splices and per 2023 NEC Article 314. Boxes shall be UL-listed. Pull boxes shall be as detailed on the Plans. Exterior pull boxes (located in non-hazardous areas) shall be NEMA 4X stainless steel enclosures with hinger cover and pad lock feature, sized as detailed on the Plans and manufactured by Hoffman, E-Box, Saginaw Control & Engineering, or approved equal.

c. Schedule 40 PVC and Schedule 80 PVC Conduit. Schedule 40 PVC and Schedule 80 PVC conduit shall comply with Item 110 and the following: Conduit shall be Schedule 40 PVC or Schedule 80 PVC (as detailed on the Plans), UL-listed, rated for 90°C cable-conforming to NEMA Standard TC-2 and UL 651. Fittings shall conform to NEMA Standard TC-3 and UL 514B.

Conduits shall be suitable for underground applications encased in concrete or direct burial, and suitable for exposed applications aboveground.

d. Liquid-Tight Flexible Metal Conduit. Liquid-tight, flexible metal conduit shall consist of polyvinyl jacket over flexible hot dip galvanized steel tubing. The flexible conduit shall be completely sealed from liquids, dust, dirt, and fumes and be resistant to oil, gasoline, grease, and abrasion. Jacket shall also be sunlight-resistant. Liquid-tight flexible metal conduit shall be UL-listed, suitable for use as a grounding conductor, and comply with Article 350 of the NEC. Liquid-tight flexible metal conduit and associated fittings shall be UL-listed to meet the requirements of NEC 350.6. Liquid-tight flexible metal conduit shall be Anaconda Sealtite Type UA as manufactured by Anamet Electrical Inc., Liquatite Type LA as manufactured by Electri-Flex Company, Liquid-Tuff Type LFMC as manufactured by Atkore International AFC Cable Systems, or approved equal. **Do not install liquid-tight, flexible metal conduit that is not UL listed. Confirm liquid-tight, flexible metal conduit bears the UL label prior to installation. Liquid-tight, flexible metal conduit that is not UL listed and is installed on this project shall be removed and replaced with UL listed liquid-tight, flexible metal conduit, to comply with the requirements of National Electrical Code**

e. Fire Barrier Moldable Material. Provide UL listed fire barrier moldable putty suitable for use with electrical box protection at electrical conduit penetrations. The fire stop material shall be designed to prevent the spread of fire, smoke and noxious gasses. The fire stop material shall be pliable, conformable, and shapeable to accommodate the respective coverage and application. Fire stop material shall be manufactured by 3M, Hilti, or approved equal.

f. Other equipment. Other equipment not listed herein the Special Provisions shall be as detailed on the Plans."

109-3.18 Wire. Wire (in conduit) rated up to 5,000 volts shall be per AC 150/5345-7, Specification for L-824 Underground Electrical Cables 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.

a. Control circuits. Unless otherwise indicated on the plans, wire shall be not less than No. 12 American wire gauge (AWG) and shall be insulated for 600 volts. If telephone control cable is specified, No. 19 AWG telephone cable per ANSI/Insulated Cable Engineers Association (ICEA) S-85-625 specifications shall be used.

b. Power circuits.

~~**(1)** 600 volts maximum – Wire shall be No. 6 AWG or larger and insulated for at least 600 volts.~~

~~**(2)** 3,000 volts maximum – Wire shall be No. 6 AWG or larger and insulated for at least 3,000 volts.~~

~~**(3)** Over 3,000 volts-Wire shall be No. 6 AWG or larger and insulated for at least the circuit voltage.~~

All power wiring, 600-Volts and below, shall be the type, size, and number of conductors, as noted on the Plans. Cable types shall include the following:

(1) THWN Wire. Cable shall comply with Underwriters' Laboratories Standard UL-83 and Federal Specification A-A-59544. Conductor shall be soft-annealed, uncoated copper and shall comply with ASTM B3 and B8. Insulation shall be rated for 600-Volts. Insulation shall be polyvinyl-chloride conforming to Underwriters' Laboratories requirements for Type THW. The outer covering shall be nylon-conforming to Underwriters' Laboratories for type THHN or THWN. Cable shall be UL-listed and marked THWN.

(2) XHHW Wire. Cable shall comply with UL Standard 44, ICEA S-95-658/NEMA WC70 and Federal Specification A-A-59544. Conductors shall be Class B, stranded-annealed, uncoated copper per UL Standard 44. Insulation shall be rated for 600-Volts. Insulation shall be cross-linked polyethylene complying with the physical and electrical requirements of UL Standard 44 for Type XHHW-2. Cable shall be UL-listed and marked XHHW-2.

(3) XLP-USE Wire. Cable shall comply with UL Standard 44, UL Standard 854, and Federal Specification A-A-59544. Conductor shall be concentric-strand, soft Copper, conforming to ASTM B8 and Underwriters' Laboratories Standard UL44 for Rubber-Insulated Wires. Insulation shall be rated for 600-Volts. Insulation shall be cross-linked polyethylene conforming to Underwriter's Laboratories Requirements for Type USE-2 insulation. Cable shall be UL-listed and marked USE-2.

(4) Series Circuit 5000-Volt Cable. Cable for use with series circuit airfield lighting shall be FAA-L-824, Type C cable complying with Item L-108. L-824 cable shall be FAA approved and listed in the current AC150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum. Circuits for use with constant current regulator outputs (runway or taxiway lighting circuits) shall use 5000-Volt rated cable.

(5) Grounding electrode conductors and/or bonding jumpers shall be copper of the size and type, as detailed on the Plans.

109-3.19 Short circuit / coordination / device evaluation / arc flash analysis. [Not used]

CONSTRUCTION METHODS

CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING

109-4.1 General. [Not used]

109-4.2 Foundation and walls. [Not used]

109-4.3 Roof. [Not used]

109-4.4 Floor. [Not used]

109-4.5 Floor drain. [Not used]

109-4.6 Conduits in floor and foundation. [Not used]

109-4.7 Doors. [Not used]

109-4.8 Painting. [Not used]

109-4.9 Lights and switches. [Not used]

INSTALLATION OF EQUIPMENT IN VAULT OR PREFABRICATED METAL HOUSING

109-5.1 General. The Contractor shall furnish, install, and connect all equipment, equipment accessories, conduit, cables, wires, buses, grounds, and support necessary to ensure a complete and operable electrical distribution center for the airport lighting system as specified herein and shown in the plans. When specified, an emergency power supply and transfer switch shall be provided and installed.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction. All electrical work shall comply with the NEC and local code agency having jurisdiction including the separation of under 600V work from 5,000V work."

The Contractor shall furnish and install all equipment and materials necessary for complete and operational installation of all vault equipment, as specified herein and as shown on the Plans. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC) most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment shall be installed in conformance with the respective manufacturer's directions and recommendations for the respective application. Any installations, which void the UL listing, Intertek Testing Services verification/ETL listing, (or other third-party listing) and/or the manufacturer's warranty of a device, will not be permitted.

a. Keep a copy of the latest NEC in force on site at all times during construction for use as a reference. Contractor shall keep a copy of the Plans, Special Provision Specifications including any addenda, and copies of any change orders on site at all times during construction.

b. Examine the site to determine the extent of the work. Contractor shall field verify existing site conditions.

c. Verify respective circuits and power sources prior to removing, disconnecting, relocating, installing, connecting, or working on the respective service, feeder, branch circuit, airfield lighting system, Navaid, or other device.

d. Identify each respective circuit prior to performing work on that circuit.

e. New work shall be coordinated with the Airport Manager and to minimize downtime to existing systems. Contractor shall coordinate work and any power outages with the Airport Manager and the Resident Project Representative. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and

lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

f. Locate Existing Underground Utilities and Cables. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor's responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans, and shall obtain, from the respective utility companies, detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner's Representative and/or the Resident Project Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract. All utility cables and lines shall be located by the respective utility. **Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123.** Contact the FAA (Federal Aviation Administration) for assistance in locating FAA cables and utilities. Location of FAA power, control, and communication cables shall be coordinated with and/or located by the FAA. Also contact Airport Director/Manager and Airport Personnel for assistance in locating underground Airport cables and/or utilities. Also coordinate work with all aboveground utilities.

g. In areas where there is a congestion of buried cables or where the proposed duct, cable, or work crosses an existing cable, the Contractor will be required to hand dig and/or carefully excavate the trench necessary for the proposed duct, cable, or other work.

h. Grounding work and modifications shall not be performed during a thunderstorm or when a thunderstorm is predicted in the area.

i. Homerun cables for a respective circuit that are installed in conduit, duct, or raceway shall be run together in the same conduit, duct or raceway.

j. The respective personnel performing airfield lighting work, vault work, and/or tests shall be familiar with and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on

them and safety procedures need to be followed. National Electrical Code defines a Qualified Person as "***One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has revied safety training to recognize and avoid the hazards involved."*** Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel should be permitted to work on airfield lighting series circuits.

k. Feeder circuit conductors, branch circuit conductors, power wiring, control wiring, airfield lighting series circuit conductors, and other wiring at the Vault shall be installed in conduit, duct, wireways, pull boxes, junction boxes, or raceways. No exposed power or control wiring will be permitted.

l. Obey and comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

m. Other construction projects might be in progress on the Airport at the same time as this project. The Contractor will be required to cooperate with all other contractors and the Airport Manager in the coordination of the work.

n. The Contractor shall comply with the requirements of FAA AC No. 150/5370-2G (or most current issue) "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION".

o. In the event a conflict is determined with respect to manufacturer installation instructions, National Electrical Code, and/or the Contract Documents, contact the Project Engineer for further direction.

p. Secure, identify, and place temporary exposed wiring in conduit, duct, or unit duct to prevent electrocution and fire ignition sources in conformance with the requirements of FAA AC 150/5370-2G, Part 2.18.3 "Lighting and Visual NAVAIDs" All temporary installations shall comply with National Electrical Code Article 590 – "Temporary Installations".

q. Equipment installed by the Contractor shall be properly labeled, and all cables must be tagged.

r. Obtain approval from the Airport Manager prior to shutting down a runway or taxiway. When a respective Runway is closed the respective runway lighting and NAVAIDS for the runway shall be shut off. Keep respective Navaids active during times when the runway is open. Navaids receiving maintenance shall be shut off until operating properly. When a respective taxiway is closed the respective taxiway lighting for that taxiway shall be shut off.

s. Record and document all changes to the airfield lighting system and provide this information to the Resident Project Representative.

109-5.2 Power supply equipment. Transformers, regulators, booster transformers, and other power supply equipment items shall be furnished and installed at the location shown in the plans or as directed by the RPR. The power supply equipment shall be set on steel "H" sections, "I" beams, channels, or concrete blocks to provide a minimum space of 1-1/2 inch (38 mm) between

the equipment and the floor. The equipment shall be placed so as not to obstruct the oil-sampling plugs of the oil-filled units; and name-plates shall, so far as possible, not be obscured.

If specified in the plans and specifications, equipment for an alternate power source or an emergency power generator shall be furnished and installed. The alternate power supply installation shall include all equipment, accessories, an automatic changeover switch, and all necessary wiring and connections. The emergency power generator set shall be the size and type specified.

Constant Current Regulators. Install constant current regulators in conformance with the manufacturer's recommendations, as detailed on the Plans and as specified herein. Maintain working clearances in front of constant current regulators per the requirements of NEC 110.26 and 110.34. Maintain clearance around constant current regulators for air flow and cooling per the respective manufacturer's recommendations. Confirm circuit breaker sizes for constant current regulators are sized in conformance with the respective manufacturer's recommendations and/or requirements and NEC. Where necessary to accommodate the respective constant current regulator input amperage requirements, circuit breakers, conductors, and conduits shall be adjusted (increased in size) to meet the manufacturer's recommendations and/or requirements and the NEC. High-voltage wiring shall enter each respective regulator at the high-voltage/series circuit output section of the regulator. 208 VAC or 240 VAC input power wiring shall enter each respective regulator at the low-voltage/input power section of the regulator. Control wiring shall enter each respective regulator at the control section of the regulator. Conduit connections to constant current regulators shall be with UL-listed, liquid-tight, flexible metal conduit. Include an external bonding jumper or internal equipment ground wire with each piece of liquid-tight, flexible metal conduit that is connected to a constant current regulator to comply with NEC 350.60. Bond each constant current regulator enclosure frame, to the vault ground bus with a #6 AWG (minimum), bare-stranded, copper-bonding jumper. Confirm the constant current regulator has a good frame ground prior to energizing and operating the unit. Your safety may depend on the regulator having a good frame ground.

109-5.3 Switchgear and panels. Oil switches, fused cutouts, relays, cutouts, transfer switches, panels, panel boards, and other similar items shall be furnished and installed at the location shown in the plans in accordance with the respective equipment manufacturers recommendations, in accordance with the requirements of National Electrical Code, and/or as directed by the RPR. Wall or ceiling mounted items shall be attached to the wall or ceiling with galvanized bolts of not less than 3/8-inch (9 mm) diameter engaging metal expansion shields or anchors in masonry or concrete vaults.

a. Installation of Series Plug Cutouts. Make sure the cutout contacts are aligned properly and correct where applicable. Make sure all wiring connections are tight and secure. Install series circuit plug cutouts in conformance with the manufacturer's recommendations, as detailed on the Plans and as specified herein. Series circuit plug cutouts/disconnects shall only be used on airfield lighting series circuits in accordance with the respective manufacturer's instructions. Verify ratings and applications with each respective series plug cutout manufacturer. Make sure the cutout contacts are in good condition and aligned properly. Where contacts have become weak or have high resistance connections replace the cutout with a new cutout. For Type S-1 cutouts the normal resistance across the cutout contacts with the handle removed is 0.1 to 0.2 Ohms measured with an Ohmmeter. Also observe the cable lugs to determine if there is apparent heat damage, arcing damage, lightning damage, or deterioration. Where the cutout is observed to have deterioration or damage replace it immediately. Consult with the respective cutout

manufacturer regarding maintenance and testing. Provide NEMA 12 painted steel enclosures adequately sized for the cutouts and cables with hinged cover and back panel to mount the plug cutouts. Cutout enclosures shall be pad lockable to comply with OSHA 29 CFR, section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where existing cutout enclosures are used, provide pad lock kits for each existing enclosure. The installation of series circuit cutouts is required to accommodate lockout/tagout to help address safety hazards and for protection of personnel. Provide adequate working space in front of each cutout enclosure to meet National Electrical Code working space requirements. Refer to National Electrical Code Article 110.34 "Work Space and Guarding" and Table 110.34(A) "Minimum Depth of Clear Working Space at Electrical Equipment". Cutout enclosures are required to be grounded and bonded per 2023 National Electrical Code Article 250.4 "General Requirements for Grounding and Bonding" and 2023 NEC Article 250.190 (C)(1) "General". Include an equipment ground wire (#6 AWG minimum for 6.6 Amp series circuits and/or 20 Amp series circuits) with the output series circuit conductors from the respective constant current regulator frame to the cutout enclosure frame. Provide UL listed firestop material at each conduit entry or exit to a cutout enclosure, to help reduce spread of fire in the event of a cutout fire or constant current regulator fire.

b. Installation of Circuit Breakers in Panelboards. Install circuit breakers in panelboards in conformance with the respective manufacturer's directions. Connect only one wire/cable to each breaker terminal. Update circuit directory to identify the respective device fed by each new circuit breaker.

109-5.4 Duct and conduit. The Contractor shall furnish and install square-type exposed metallic ducts with hinged covers for the control circuits in the vault. These shall be mounted along the walls behind all floor-mounted equipment and immediately below all wall-mounted equipment. The hinged covers shall be placed to open from the front side with the hinges at the front bottom.

Wall brackets for square ducts shall be installed at all joints 2 feet (60 cm) or more apart with intermediate brackets as specified. Conduit shall be used between square ducts and equipment or between different items of equipment when the equipment is designed for conduit connection. When the equipment is not designed for conduit connection, conductors shall enter the square-type control duct through insulating bushings in the duct or on the conduit risers.

109-5.5 Wiring and connections. The Contractor shall make all necessary electrical connections in the vault per the wiring diagrams furnished and as directed by the RPR. In wiring to the terminal blocks, the Contractor shall leave sufficient extra length on each control lead to make future changes in connections at the terminal block. This shall be accomplished by running each control lead the longest way around the box to the proper terminal. Leads shall be neatly laced in place.

High-voltage series circuit wiring (such as airfield lighting 5000 Volt series circuits that may operate at output voltages up to 4,550 Volts or more under normal operating conditions) and low-voltage circuit wiring (such as 120 VAC, 208 VAC, 240 VAC, 480 VAC circuits using conductors with 600 Volt rated insulation) shall maintain separation from each other, to comply with 2023 National Electrical Code 300.3 "Conductors", (C) "Conductors of Different Systems", (2) "Over 1000 Volts ac, 1500 Volts dc, Nominal", and 2023 NEC 305.4 "Conductors of Different Systems". High-voltage wiring and low-voltage wiring shall not be installed in the same wireway, conduit, duct, raceway, handhole, or junction box.

109-5.6 Marking and labeling. All equipment, control wires, terminal blocks, etc., shall be tagged, marked, or labeled as specified below:

a. Wire identification. The Contractor shall furnish and install self-sticking wire labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks. Wire labels, if used, shall be of the self-sticking preprinted type and of the manufacturer's recommended size for the wire involved. Identification -markings designated in the plans shall be followed. Tags, if used, shall be of fiber not less than 3/4 inch (19 mm) in diameter and not less than 1/32 inch (1 mm) thick. Identification markings designated in the plans shall be stamped on tags by means of small tool dies. Each tag shall be securely tied to the proper wire by a nonmetallic cord.

b. Labels. The Contractor shall stencil identifying labels on the cases of regulators, breakers, and distribution and control relay cases with white oil paint as designated by the RPR. The letters and numerals shall be not less than one inch (25 mm) in height and shall be of proportionate width. The Contractor shall also mark the correct circuit designations per the wiring diagram on the terminal marking strips, which are a part of each terminal block.

c. Legend plates shall be provided for all equipment. Legend plates shall be provided to identify the equipment controlled, the power source, and the function of each device. Legend plates shall be weatherproof and abrasion-resistant phenolic/plastic engraved material and fastened with contact type permanent adhesive, screws, or rivets. Installation shall not break, crack, or deform the legend plate. Lettering shall be ¼ in. high, black on a white background, unless noted otherwise.

d. Identify control wiring. Identify control wiring at each termination point and in junction/terminal boxes with wire number corresponding to the respective control wiring diagram or respective terminal numbering arrangement. Each individual control wire shall have unique identification and shall maintain that same identification from its point of origin to its final termination point. Wire markers shall be permanent pressure sensitive label with suitable numbers or letters for easy recognition. Where new control wiring is interfaced to existing control wiring it shall also match the color coding of the existing control wiring.

e. Danger high voltage keep out labels, markings, and/or signs. Furnish and install "DANGER – HIGH VOLTAGE KEEP OUT" signs or labels for equipment rated over 1000 Volts AC, (this applies to airfield lighting series circuit wiring and the respective enclosures, equipment and raceways including but not limited to airport electrical vaults, high voltage sections of constant current regulators, series circuit disconnects/cutout enclosures, high voltage wireways, high voltage pull boxes, high voltage junction boxes, high voltage electrical handholes, and high voltage electrical manholes). Place signs in a conspicuous location, usually on the outside of equipment. "DANGER – HIGH VOLTAGE KEEP OUT" signs and labels are required in accordance with the following:

- 2020/2023 NEC 110.34 "Work Space and Guarding", (C) "Locked Rooms or Enclosures"
- 2020 NEC 300.45 "Danger Signs"
- 2023 NEC 305.12 "Danger Signs"

- 2020/2023 NEC 314.72 “Construction and Installation Requirements”, (E) “Suitable Covers”
- 2020 NEC 490.35 “Accessibility of Energized Parts”, (A) “High Voltage Equipment”
- 2023 NEC 495.35 “Accessibility of Energized Parts”, (A) “High Voltage Equipment”
- 2023 NEC 495.63 “Enclosures”
- FAA AC No. 150/5340-26C “MAINTENANCE OF AIRPORT VISUAL AID FACILITIES”,

f. Furnish and install “DANGER – HIGH VOLTAGE UNAUTHORIZED PERSONNEL KEEP OUT” signs on each door to the Airport Electrical Vault to comply with the requirements of 2023 National Electrical Code Article 110.34 “Work Space and Guarding”, Paragraph (C) “Locked Rooms or Enclosures”.

g. Label series circuit cutouts. Each plug cutout cabinet shall be furnished with a phenolic-engraved legend plate that identifies the respective circuit or regulator and the voltage system (5000-Volts). Label the input side connection and the output side connection for each series circuit plug cutout.

h. CCR’s. Each constant current regulator shall be furnished with a phenolic-engraved legend plate that identifies the regulator number designation, the runway or taxiway served, and the power source and circuit number. Each CCR shall include a legend plate labeled “NOTICE THIS CCR HAS AN ADDITIONAL 120 VAC CONTROL POWER CIRCUIT FEEDING IT. DISCONNECT ALL POWER SOURCES TO CCR BEFORE SERVING.” Each CCR shall also include a legend plate installed on the top of the unit labeled “KEEP CLEAR – DO NOT STORE MATERIALS ON TOP OF CCR.”

i. **Label equipment**. Each individual circuit breaker, control panel, terminal panel, safety switch, panelboard, etc. shall be furnished with a phenolic-engraved legend plate that identifies the respective device, the power source, and the respective voltage, phase, and wire. Furnish additional phenolic-engraved legend plates as detailed on the Plans and/or where required by code.

j. **Cable tags.** At electrical handholes and manholes, identify each cable originating in the vault with respect to the system or device served. Provide identification tags rated suitable for the respective locations with permanent markings. Field printable, double sided, corrosion resistant, color coded, reflective cable tags shall be provided. Coordinate cable tag identification with the Airport Maintenance Staff.

k. **Color code power conductors.** Color code phase and neutral conductor insulation for No. 6 AWG or smaller. Provide colored marking tape for phase and neutral conductors for No. 4 AWG and larger. **Insulated ground conductors shall have green colored insulation for all conductor sizes (AWG and/or KCMIL) to comply with NEC 250.119. Neutral conductors shall have white colored insulation for No. 6 AWG and smaller to meet the requirements of NEC 200.6.** Standard colors for power wiring and branch circuits shall be as follows:

120/240 VAC, 1 PH, 3-Wire with Ground
Phase A – Black
Phase B – Red
Neutral – White
Ground – Green

l. Workspace Clearance Warning. "CAUTION - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 IN." The 36 inches clearance requirement applies to equipment with nominal voltage to ground of 0 to 150 Volts, per 2023 NEC Table 110.26(A)(1) "Working Spaces". Adjust/increase clearance requirements for higher voltages in accordance with National Electrical Code and the respective application.

m. Workspace Clearance Warning for Cutout Enclosures. "CAUTION - AREA IN FRONT OF THIS ELECTRICAL PANEL MUST BE KEPT CLEAR FOR 60 INCHES – OSHA-NEC REGULATIONS." This is required for series circuit disconnect/cutout enclosures.

n. Warning Label for Cutout Operation. "CAUTION – ONLY OPERATE CUTOUTS WITH CCR's SHUT OFF." This is required for series circuit disconnect/cutout enclosures.

o. Per 2023 NEC 110.22 "Identification of Disconnecting Means" each disconnection means shall be legibly marked to indicate its purpose and identify the power source that supplies the disconnection means.

p. Per 2023 NEC 408.4 "Field Marking Required", Part (B) "Source of Supply", all switchboards, switchgear, and panelboards supplied by a feeder(s) shall be permanently marked to indicate each device of equipment where the power originates.

109-5.7 Electrical Testing. The installation shall be tested in operation and as a completed unit prior to acceptance. Contractor shall furnish all equipment, meters, instruments, cable connections, tools, manpower, and labor to perform the respective tests. Test all new equipment and all existing equipment where modifications take place and confirm proper operation. Coordinate tests with the respective airport personnel and the Resident Project Representative. Tests shall include resistance, voltage, and current reading, as applicable for the respective equipment. When tests disclose any unsatisfactory workmanship or equipment furnished under this contract, correct defects and retest. Repeat tests until satisfactory results are obtained. When any wiring or equipment is damaged by tests, the wiring or equipment shall be repaired or replaced at no additional cost to the contract. Test repaired or replaced items to ensure satisfactory operation. Submit three copies of all test reports to the Resident Project

Representative. All test reports shall be assembled and bound in a folder or binder. Each test report shall include the following information:

- Project number,
- Project title and location,
- Device or system tested,
- Test performed,
- Date performed,
- Test equipment used,
- Respective Contractor's name, address, and telephone number,
- Testing firm's name, address, and telephone number if other than the Contractor,
- Names of individuals performing tests,
- Names of individuals observing tests,
- Statement verifying each test,
- Nameplate data from respective equipment tested,
- Test results, and
- Retest results after correction of defective components or systems (where applicable).

109-5.8 Cable and Constant Current Regulator Testing and Calibration. Cable and constant current regulator testing and calibration shall include the following:

a. Follow safety procedures for all tests. Make sure each constant current regulator has a good and secured frame ground connection from the regulator housing to the respective vault ground bus and grounding electrode system, prior to operation and testing of each regulator. Make sure each constant current regulator has a good and secured frame ground connection from the regulator housing to the respective cutout enclosure. Cutout enclosures are required to be grounded and bonded per National Electrical Code Article 250.4 "General Requirements for Grounding and Bonding". Where cutout enclosures do not have an equipment ground wire, the Contractor is required to furnish and install and equipment ground wire (Number 6 AWG minimum copper) from the constant current regulator metal frame to the cutout enclosure metal frame. **PLEASE BE AWARE THAT GROUNDING DOES NOT GUARANTEE YOU WILL NOT RECEIVE A SHOCK, BE INJURED, OR KILLED FROM DEFECTIVE EQUIPMENT OR MATERIALS. PROPER GROUNDING WILL HOWEVER SIGNIFICANTLY REDUCE THE POSSIBILITY OF SHOCK, INJURY, OR DEATH. PLEASE FOCUS ON SAFETY OF PERSONNEL AT ALL TIMES.**

b. The respective personnel performing tests shall be familiar with the respective test equipment and the use and operation of the test equipment. The Contractor is responsible to employ the services of personnel qualified to perform the respective tests and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment. The Contractor is required to employ qualified personnel that are familiar with and capable of properly conducting the required tests and calibrations for the respective cables and equipment.

c. rior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits, all existing series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the respective vault. All existing series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. Contractor shall provide a True RMS Ammeter for current measurements. The Contractor is responsible to employ the services of personnel qualified, familiar with, and trained to perform the respective tests, and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. National Electrical Code defines a Qualified Person as "***One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved."*** Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel are permitted to work on airfield lighting series circuits. Coordinate testing with the Engineer of Record. The Engineer of Record shall be on site to observe tests.

d. Personnel shall coordinate work and any power outages with the Owner's Designated Representative(s). Any shutdown of existing systems should be scheduled with and approved by the Owner's Designated Representative(s) prior to shut down. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on this system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

e. Personnel are recommended to comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

f. Provide personnel protective equipment for all personnel working on or testing electrical systems suitable for the respective application. Provide protective equipment for personnel to keep them safe in the event of an arc flash or other electrical accident. Refer to NFPA 70E "Standard for Electrical Safety in the Workplace", Article 250 "Personal Safety and Protective Equipment" and "Informative Annex H Guidance on Selection of Protective Clothing and Other Personal Protective Equipment (PPE)" for additional information on personal protective equipment.

g. Insulation resistance testing equipment for use with 5,000 Volt series circuit cables shall use an insulation resistance tester capable of testing the cables at 5,000 Volts. New 5,000 Volt rated airfield lighting series circuit cables shall be tested at not less than 5,000 Volts. Existing older series circuit cables and/or cables in poor condition may require the test voltage to be performed at a voltage lower than 5,000 Volts to obtain an insulation resistance reading (Example 1,000 Volts, 500 Volts, or less than 500 Volts). Insulation resistance testing

equipment often has the feature to adjust the test voltage corresponding to the condition of the cable. The respective test voltages shall be recorded for each cable insulation resistance test result. Measuring the cable insulation resistance of existing conductors/cables is important to document the condition of existing conductors/cables and help determine if there are existing hazards and/or unsafe conditions that will need to be addressed for protection of personnel.

h. Insulation resistance testing equipment for use with 600 Volt rated cables shall use a 500 Volt insulation resistance tester. The respective test voltage shall be recorded for each cable insulation resistance test result.

i. It is recommended to use the same insulation resistance test equipment throughout the project to ensure reliable comparative readings at the beginning of the project and at the completion of the project.

j. Disconnect the airfield lighting series circuit cables from the constant current regulator when performing cable insulation resistance tests (Megger Tests). Test the cables that go to the airfield for the respective airfield lighting series circuit. Connect the cable insulation resistance tester to one of the airfield lighting series circuit cables and to a good ground in the airport electrical vault such as the airport vault ground bus. Conduct the cable insulation resistance test on each respective cable for not less than 90 seconds. Record the test results at the end of the time duration for the test.

k. FAA Advisory Circular 150/5340-26C Maintenance of Airport Visual Aid Facilities provides guidance on Insulation Resistance Tests. Also refer to the user manual for the respective cable insulation resistance tester. Reasonably new series circuit cables and transformers with good connections should read 500 Mega-Ohms to 1,000 Mega-Ohms or higher. The readings should decrease with age. The resistance value declines over the service life of the circuit; a 10-20 percent decline per year may be considered normal. A yearly decline of 50 percent (4 percent monthly) or greater indicates the existence of a problem, such as a high resistance ground, serious deterioration of the circuit insulation, lightning damage, bad connections, bad splices, cable insulation damage, or other failure. FAA Advisory Circular 150/5340-26C notes “Generally speaking, any circuit that measures less than 1 megohm is certainly destined for rapid failure.” Airfield lighting series circuits with cable insulation readings of less than 1 megohm are not uncommon for older circuits that are 20 years or more of age.

l. Based on information in FAA AC No. 150/5340-26C MAINTENANCE OF AIRPORT VISUAL AID FACILITIES, the cable insulation resistance value inevitably declines over the service life of the circuit; a 10-20 percent decline per year may be considered normal. In the event that the cable insulation resistance readings have declined more than 2 percent per month it might indicate cable damage due to lightning or damage as a result of Contractor operations. Where the cable insulation resistance readings have declined more than 2 percent per month over the project construction duration as a result of Contractor operations, Contractor will need to investigate, address, and repair the respective cable circuits.

m. All existing series circuit cable loops shall also have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. The resistance of the series circuit loop with connections using #8 AWG copper conductor should be approximately 0.8 to 1 Ohm per thousand feet of cable length. The resistance of the series circuit loop with connections using #6 AWG copper conductor should be approximately 0.5 to 0.7 Ohm per thousand feet of cable

length. The number of series circuit transformers and connections will affect the overall resistance of the series circuit loop and therefore the measurements might be slightly higher than the calculated resistance for the respective length of cable.

n. When test results for constant current regulators indicate readings that are outside the acceptable tolerances calibrate and adjust the regulator to be within acceptable output current levels. Adjustments and calibrations shall be in accordance with the respective regulator manufacturer recommendations and instructions. Provide a true RMS Ammeter for measuring input and output currents on constant current regulators.

o. Copies of test results shall be provided to the Resident Engineer and the respective Project Engineer of Record within five business days of conducting the respective set of tests. See the testing forms included in the Appendix. These tests are required to protect the Owner and the Contractor and to identify existing conditions and any defective cables, circuits, and/or constant current regulators. Failure to comply with this requirement might result in the Contractor being responsible for defective cable and circuit conditions (where previously not identified) and the associated corrective work at no additional cost to the Contract. The Contractor is responsible to perform the tests, record the test results and submit the test results to the Engineer of Record.

p. After airfield lighting modifications, additions, and/or upgrades have been completed, series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the respective vault. All series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the respective vault. Each constant current regulator shall be tested with results recorded. Contractor shall provide a True RMS Ammeter for current measurements. Coordinate testing with the Engineer of Record. The Engineer of Record shall be on site to observe test. Copies of test results shall be provided to the Resident Engineer and the respective Project Engineer of Record. See the testing forms included in the Appendix.

109-5.9 Lockout/Tagout Procedures. Lockout/Tagout Procedures shall include the following:

a. The Contractor shall provide a copy of their electrical energy source Lockout/Tagout Procedures document to the Airport Director, RPR and Engineer. The Lockout/Tagout Procedures document shall include the contact information with 24-hour phone numbers for the Contractor and the Electrical Contractor Superintendent and/or the licensed electricians on the project site.

b. Contractor shall coordinate work and any power outages with the Airport Manager and the Resident Project Representative. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system.

c. Where existing electrical equipment does not have features for lockout/tagout the Contractor will be responsible to provide the appropriate lockout/tagout equipment and measures to ensure the safety of personnel.

d. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

e. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the Contractor.

109-5.10 Grounding Requirements. Grounding shall conform to the following as applicable: The Contractor shall furnish and install all grounding shown on the Plans and/or as may be necessary or required to make a complete grounding system, as required by the latest NFPA 70 – National Electrical Code (NEC) in force. The reliability of the grounding system is dependent on careful, proper installation, and choice of materials. Improper preparation of surfaces to be joined to make an electrical path, loose joints, or corrosion can introduce impedance that will seriously impair the ability of the ground path to protect personnel and equipment and to absorb transients that can cause noise in communications circuits. The following functions are particularly important to ensure a reliable ground system:

a. All products associated with the grounding system shall be UL-listed and labeled.

b. All bolted or mechanical connections shall be coated with a corrosion preventative compound before joining, Sanchem Inc. “NO-OX-ID “A-Special” compound, Burndy Penetrox E, or equal.

c. Metallic surfaces to be joined shall be prepared by the removal of all non-conductive material, per 2023 NEC Article 250-12. All copper bus bars must be cleaned prior to making connections to remove surface oxidation.

d. Metallic raceway fittings shall be made up tight to provide a permanent low impedance path for all circuits. Metal conduit terminations in enclosures shall be bonded to the enclosure with UL-listed fittings suitable for grounding. Provide grounding bushings with bonding jumpers for all metal conduits entering service equipment (meter base, CT cabinet, main service breaker enclosure, etc.), generator breaker enclosures, and automatic transfer switch enclosures. Provide grounding bushings with bonding jumpers for all metal conduits entering an enclosure through concentric or eccentric knockouts that are punched or otherwise formed so as to impair the electrical connection to ground. Standard locknuts or bushings shall not be the sole means for bonding where a conduit enters an enclosure through a concentric or eccentric knockout.

e. Furnish and install ground rods and ground rings at all locations where shown on the Plans or specified herein. Ground rods shall be 3/4-in. diameter, 10 ft. long, UL-listed, copper-clad, unless detailed otherwise on the Plans. Longer ground rods shall be required where detailed on the Plans and/or as specified herein to accommodate respective soil conditions or respective applications. Ground rods shall have 10 mil minimum copper coating. Top of ground rods shall be a minimum of 12 inches below finish grade unless otherwise noted on the Plans. Ground rods shall be spaced, as detailed on the Plans, and in no case spaced less than one-rod length apart.

All connections to ground rods and/or ground rings shall be made with exothermic weld type connectors, Cadweld by Erico Products, Inc., Thermoweld by Continental Industries, Inc., Ultraweld by Harger, or approved equal. Exothermic weld connections shall be installed in conformance with the respective manufacturer's directions using molds as required for each respective application. Bolted connections will not be permitted at ground rods or at buried grounding electrode conductors. Grounding electrode conductors shall be bare copper (stranded or solid) sized, as detailed on the Plans.

f. All connections, located above grade, between the different types of grounding conductors shall be made using UL-listed, double-compression, crimp-type connectors or UL-listed, bolted ground connectors. For ground connections to enclosures, cases, and frames of electrical equipment not supplied with ground lugs, the Contractor shall drill required holes for mounting a bolted, ground connector. All bolted, ground connectors shall be Burndy, Thomas and Betts, or equal. Tighten connections to comply with tightening torques in UL Standard 486A to assure permanent and effective grounding.

g. All metal equipment enclosures, conduits, cabinets, boxes, receptacles, etc. shall be bonded to the respective grounding system. Provide grounding bushings at all conduits entering service entrance equipment (meter bases, service disconnects, service panelboards, etc.) and distribution panels or load centers and ground wire from bushing to ground bus in the respective service entrance equipment or distribution panel.

h. Each feeder circuit and/or branch circuit shall include an equipment ground wire. Metal raceway or conduit shall not meet this requirement. The equipment ground wire from equipment shall not be smaller than allowed by 2023 NEC Table 250-122 "Minimum Size Conductors or Grounding Raceway and Equipment." When conductors are adjusted in size to compensate for voltage drop, equipment-grounding conductors shall be adjusted proportionately according to circular mil area. All equipment ground wires shall be copper, either bare or insulated green in color. Where the equipment grounding conductors are insulated, they shall be identified by the color green, and shall be the same insulation type as the phase conductors.

i. All utility transformer bank grounds shall be installed in accordance with the serving utility company's recommendation and in accordance with the NEC.

j. Bond the main electrical service neutral to ground at the main service disconnect. Bond the service neutral to ground at one location only per the NEC. A grounding connection shall not be made to any neutral circuit conductor on the load side of the service disconnecting means, except as permitted by 2023 NEC 250-24.

k. The secondary neutral of all transformers (separately derived system transformers) shall be grounded in accordance with the NEC. The respective grounding electrode conductor shall be connected to the neutral point of the transformer between the transformer and the output disconnecting means. Size of the grounding electrode conductor shall be in accordance with 2023 NEC Article 250-66 and Table 250-66 unless shown larger on the Drawings. A bond shall be provided between the neutral and transformer case, or other metal that is part of the AC

equipment grounding system, so as to complete a circuit for fault current to the transformer winding from the AC equipment grounding system. Size of the neutral bonding conductor shall be in accordance with 2023 NEC Article 250-102.

l. Test and confirm that the Airport Electrical Vault grounding electrode earth resistance is not greater than 10 Ohms. FAA AC 150/5340-30J Appendix E, Part E.1.4 Equipment Grounding, Paragraph 4 notes "The resistance to ground of the vault grounding system with the commercial power line neutral disconnected must not exceed 10 ohms." Where the ground resistance is greater than 10 Ohms, corrective action will be necessary to comply with FAA AC 150/5340-30J requirements.

m. Make sure each constant current regulator has a good and secured frame ground connection from the regulator housing to the respective vault ground bus and grounding electrode system, prior to energizing each regulator. Prior to operating each constant current regulator (CCR), confirm each CCR frame is grounded to the Airport Electrical Vault grounding electrode system with a minimum #6 AWG Copper conductor and UL listed grounding connector with secure and tight connections. Correct where missing. Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system. Test and confirm that the Airport Electrical Vault grounding electrode earth resistance is not greater than 10 Ohms. FAA AC 150/5340-30J Appendix E, Part E.1.4 Equipment Grounding, Paragraph 4 notes "*The resistance to ground of the vault grounding system with the commercial power line neutral disconnected must not exceed 10 Ohms."* Where the ground resistance is greater than 10 Ohms, corrective action will be necessary. Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system. Contact the Engineer of Record for further directions where applicable**. The Vault ground bus and grounding electrode system is an existing system at DEC Decatur, Illinois Airport.**

n. Include an equipment ground wire with each feeder/branch circuit from the respective power source to the respective constant current regulator. Include an equipment ground wire with the control wiring circuit conductors from the respective control panel to the respective constant current regulator.

o. Furnish and install a #6 AWG (minimum) copper equipment ground wire with the output series circuit conductors from the respective constant current regulator to the respective high voltage wireway and cutout enclosure. Bond the equipment ground wire to the constant current regulator frame and the high voltage wireway frame, and cutout enclosure frame. Cutout enclosures are required to be grounded and bonded per National Electrical Code Article 250.4 "General Requirements for Grounding and Bonding". Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system.

p. All exterior metal conduit, where not electrically continuous because of manholes, handholes, non-metallic junction boxes, etc., shall be bonded to all other metal conduit in the respective duct run, and at each end, with a copper-bonding jumper sized in conformance with 2023 NEC 250-102. Where metal conduits terminate in an enclosure (such as a motor control center, switchboard, etc.) where there is not electrical continuity with the conduit and the

respective enclosure, provide a bonding jumper from the respective enclosure ground bus to the conduit sized per 2023 NEC 250-102.

q. Where acceptable to the Authority of Jurisdiction, install grounding electrode conductors and/or individual ground conductors in Schedule 40 or Schedule 80 PVC conduit. Where grounding electrode conductors or individual ground conductors are run in PVC conduit, do not completely encircle conduit with ferrous and/or magnetic materials. Use non-metallic, reinforced fiberglass strut support. Where metal conduit clamps are installed, use nylon bolts, nuts, washers, and spacers to interrupt a complete metallic path from encircling the conduit.

r. If local codes dictate that individual grounding conductors must be run in metal conduit or raceway, then the conduit or raceway must be bonded at each end of the run with a bonding jumper sized equal to the individual grounding conductor or as required by 2023 NEC 250-102. Note: this does not apply to AC equipment ground conductors run with AC circuits. Confirm requirements with the Authority of Jurisdiction.

s. Grounding work affecting operations at a facility shall be coordinated with the Owner's Representative and to minimize downtime to existing systems. Contractor shall coordinate work and any power outages with the Owner's Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner's Representative prior to shutdown. All power systems (AC or DC) shall have provisions to lockout and tagout any circuit to help ensure the circuit is safe to work on for protection of personnel. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where a facility does not have lockout/tagout kits the Contractor shall provide adequate quantities of lockout/tagout kits suitable for use with the respective equipment. Where existing electrical equipment does not have features for lockout/tagout the Contractor will be responsible for providing the appropriate lockout/tagout equipment and measures to ensure the safety of personnel. All padlocks for use with lockout/tagout procedures shall have a different key. Provide lockout hasps to accommodate multiple padlocks where multiple people are working on the same system. Include lockout tags for each piece of equipment requiring servicing and shutdown. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

t. Never remove, alter, or attempt to repair conductors or conduit systems providing grounding or electrical bonding for any electrical equipment until all power is removed from the equipment. Warn all personnel of the ungrounded condition of the equipment. Display appropriate warning signs, such as danger tags, to warn personnel of the possible hazards.

u. Grounding work and modifications shall not be performed during a thunderstorm or when a thunderstorm is predicted in the area.

v. Per NFPA 70E Standard for Electrical Safety in the Workplace it defines Electrically Safe Work Condition as "*A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to verify the absence of voltage, and, if necessary, temporarily grounded for personnel protection."* Prior to conducting tests or working on equipment, verify equipment enclosures and frames have a good and secure ground connection for the safety of personnel.

w. Where a conflict is determined with respect to grounding requirements per manufacturer installation instructions, National Electrical Code, and/or the Contract Documents, or there are other questions or concerns about the grounding requirements contact the Project Engineer of Record: Kevin Lightfoot for further directions. Safety of personnel is the top priority.

x. PLEASE BE AWARE THAT GROUNDING DOES NOT GUARANTEE YOU WILL NOT RECEIVE A SHOCK, BE INJURED, OR KILLED FROM DEFECTIVE EQUIPMENT OR MATERIALS. PROPER GROUNDING WILL HOWEVER SIGNIFICANTLY REDUCE THE POSSIBILITY OF SHOCK, INJURY, OR DEATH. PLEASE FOCUS ON SAFETY OF PERSONNEL AT ALL TIMES.

109-5.11 Restoration. Any and all trenches and disturbed areas will be backfilled and restored to a smooth grade and seeded to the satisfaction of the Engineer. All trench settlement or disturbed areas shall be corrected for a period of one year. Restoration, grading, and seeding of areas disturbed during the installation of the proposed vault work and/or vault removal work will be incidental to the respective 109 Pay Item. The vault interior shall be cleaned to remove dust, dirt, debris, metal shavings, scrap materials, and waste materials. The Vault floor shall be swept and/or vacuumed to clean. The vault interior shall be cleaned and disinfected.

109-5.12 Safety practices with airfield lighting series circuits. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel should be permitted to work on airfield lighting series circuits. See 125-3.10 Safety practices with airfield lighting series circuits for additional information and requirements for safety practices.

METHOD OF MEASUREMENT

109-6.1 [Not used]

109-6.2 [Not used]

109-6.3 The quantity of equipment to be paid for under this item shall consist of all equipment installed, connected and accepted as a complete unit ready for operation within an existing vault or prefabricated metal housing.

The quantity of vault equipment to be paid for under Item AW109200 "Install Electrical Equipment" shall be made on a lump sum basis wherein no measurement will be made, and shall consist of furnishing and installing all electrical equipment and materials at the vault, as detailed on the Plans and specified herein. This item shall include all labor, materials, transportation, equipment, wiring,

raceways, grounding, lockout/tagout kits and procedures, warranties, tools, coordination, relocations, operational instructions, labeling, testing, cleaning, and all incidentals required to place the vault and associated equipment into proper working order. Cables inside or at the Airport Electrical Vault Building shall be considered incidental to this item, and no additional compensation will be allowed. Conduits inside, adjacent to, interfacing to, or at the Airport Electrical Vault Building shall be considered incidental to this item, and no additional compensation will be allowed. Removal of designated existing electrical equipment and materials in the Vault will be considered incidental to this item and no additional compensation will be allowed. Lockout/tagout kits and associated lockout/tagout procedures will be considered incidental to this item and no additional compensation will be allowed. The equipment, materials, and work at the Baggage Room in the Terminal Building associated with the primary wind cone power and control system will be considered incidental to this item and no additional compensation will be allowed.

109-6.4 Testing the airfield lighting systems and the associated cable tests, constant current regulator tests and calibration will be paid for on a per lump sum basis and shall include all testing prior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits and all testing after airfield lighting modifications, additions, and/or upgrades have been completed. Testing of the airfield lighting systems and the associated cable tests and constant current regulator tests and calibration shall include all labor, transportation, equipment, tools, and measuring devices; all coordination with the Airport Manager, Airport Staff, FAA personnel, Contractor staff, and the Resident Project Representative; all recording of the test results and submission of the test results to the Resident Project Representative and the Engineer; all calibration and adjusting of constant current regulators where test results indicate regulator output currents that are not within accepted tolerances; all retesting where test results indicate unsatisfactory conditions or incorrect testing procedures; and all other incidentals necessary to complete this item. Based on the contract lump sum price for Cable and Constant Current Regulator Testing, partial payments will be allowed as follows:

a. Upon completion of all testing prior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits, submission of testing results to the Resident Project Representative and the Engineer, and acceptance of the testing results by the Engineer, 50 percent of the lump sum payment will be allowed.

b. Upon completion of all testing after airfield lighting modifications, additions, and/or upgrades have been completed, submission of testing results to the Resident Project Representative and the Engineer, and acceptance of the testing results by the Engineer, the remaining 50 percent of the lump sum payment will be allowed.

All lockout/tagout procedures and lockout/tagout kits to ensure and maintain safety of personnel will be considered incidental to the respective item of work for which it applies, and no additional compensation will be allowed.

BASIS OF PAYMENT

109-7.1 ~~Payment will be made at the contract unit price for each completed and accepted vault or prefabricated metal housing equipment installation. 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 to complete the item.~~

109-7.2 Installation of Equipment within Existing Vault in Place shall be paid for at the contract lump sum price, which price shall be full compensation for furnishing and installing electrical equipment and materials inside the vault as detailed on the Plans and specified herein. This item shall include all labor, materials, transportation, equipment, wiring, raceways, grounding, warranties, tools, utility coordination, relocations, operational instructions, labeling, testing, and all incidentals required to place the vault and associated equipment into proper working order as a completed unit to the satisfaction of the Owner and Resident Project Representative. Removal of designated existing electrical equipment and materials in the Vault will be considered incidental to this item and no additional compensation will be provided. Lockout/tagout kits and associated lockout/tagout procedures will be considered incidental to this item and no additional compensation will be provided.

109-7.3 Payment for Cable and Constant Current Regulator Testing and Calibration Procedures will be made at the contract unit price per lump sum and shall include all labor, transportation, equipment, tools, and measuring devices; all coordination with the Airport Manager, Airport Staff, FAA personnel, Contractor staff, and the Resident Project Representative; calibration and adjusting constant current regulators; all recording of the test results and submission of the test results to the Resident Project Representative and the Engineer; all retesting where test results indicate unsatisfactory conditions or incorrect testing procedures; and all other incidentals necessary to complete this item.

Payment will be made under:

Item AW109200	Install Electrical Equipment - per L. SUM
Item AW800564	Cable and CCR Testing and Calibration - per L. 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) Note: where FAA Advisory Circulars are referenced, they shall be the current issue or issues in effect.

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors

AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits
AC 150/5345-49	Specification L-854, Radio Control Equipment;
AC 150/5345-53	Airport Lighting Equipment Certification Program and AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum (current issue in effect).
AC 150/5340-26	MAINTENANCE OF AIRPORT VISUAL AID FACILITIES.
AC 150/5370-2	OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

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

ANSI/ICEA S-85-625	Standard for Telecommunications Cable Aircore, Polyolefin Insulated, Copper Conductor Technical Requirements

American National Standards Institute

ANSI C80.1	Rigid Steel Conduit, Zinc Coated.
ANSI C80.4	Fittings Rigid Metal Conduit and EMT.
ANSI Z535.4-2002	American National Standard for Product Safety Signs and Labels.

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C62	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C90	Standard Specification for Loadbearing Concrete Masonry Units
ASTM D2823	Standard Specification for Asphalt Roof Coatings, Asbestos Containing
ASTM D4479	Standard Specification for Asphalt Roof Coatings – Asbestos-Free
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.

Commercial Item Description (CID)

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

Federal Aviation Administration Standard

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

Institute of Electrical and Electronic Engineers (IEEE)

IEEE 1584	Guide for Performing Arc-Flash Hazard Calculations

Master Painter's Institute (MPI)

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

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 44	Thermoset-Insulated Wires and Cables.
UL Standard 83	Thermoplastic-Insulated Wires and Cables.
UL Standard 467	Grounding and Bonding Equipment.
UL Standard 486A-486B	Wire Connectors.
UL Standard 854	Service Entrance Cables.

National Electrical Manufacturers Association (NEMA)

NEMA TC-2	Electrical Plastic Tubing and Conduit.
NEMA TC-3	Fittings Rigid PVC Conduit and Tubing.

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
NFPA-70E	Standard for Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems

Occupational Safety and Health Administration

OSHA 29 CFR Part 1910	Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures.

END OF ITEM L-109

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. 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. Shop drawings are required for each type of conduit or duct to be used on the project. **Shop drawings shall be clear and legible. Copies that are illegible will be rejected.** The preferred shop drawing submittal format shall be electronic (PDF) copies. Shop drawings shall include the following information:

6. **Certification of compliance with the AIP (Airport Improvement Program) Buy American Preferences for all materials and equipment. Do not submit ARRA (American Recovery and Reinvestment Act) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Do not submit NAFTA (North American Free Trade Agreement) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Shop drawings submitted without certification of compliance with the Airport Improvement Program Buy American Preferences or without certification of manufacture in the United**

States of America in accordance with the AIP Buy American Requirements will be rejected. See the FAA website at: www.faa.gov/airports/aip/buy_american/ for more information on the Airport Improvement Program Buy American Preferences requirements.

7. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

8. Indicate the pay item number for each respective conduit or duct.

9. Shop drawings shall include conduit and/or duct cut sheets with type, size, specifications, UL listing, manufacturer, and catalog or part number.

10. Provide certification that the respective plastic conduits used on this project are manufactured from domestic materials.

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."

Rigid steel conduit and fittings shall be hot-dipped, galvanized UL-listed, and produced in accordance with UL Standard 6 – Rigid Metal Conduit and ANSI C80.1 – Rigid Steel Conduit, Zinc Coated. Couplings, connectors, and fittings for rigid steel conduit shall be threaded, galvanized steel or galvanized, malleable iron, specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4 – Fittings Rigid Metal Conduit and EMT and UL 514B – Conduit, Tubing, and Cable Fittings. Set screw type fittings are not acceptable. Steel used to manufacture conduits shall be 100 percent domestic steel. Contractor shall provide certification that the respective steel conduits used on this project are manufactured from 100 percent domestic steel.

Miscellaneous Fittings. Fittings shall be suitable for use with conduits and ducts supplied. All fittings for use with rigid metal conduit shall be threaded. Set screw-type fittings are not acceptable. All conduit bodies, fittings, and boxes installed in classified hazardous locations (Class I, Division 1 or 2, Group D) shall be suitable for use in Class I, Division 1, and Group D locations. Fittings shall be as manufactured by Appleton, Crouse-Hinds, Hubbell-Killark, O-Z/Gedney, or approved equal."

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. Schedule 40 PVC Conduit shall be UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651. Conduits shall be suitable for underground applications direct burial in earth or concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use. Schedule 40 PVC Conduit shall be UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651 Conduits shall be suitable for above ground applications and/or underground applications direct burial in earth or concrete.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete. Schedule 80 PVC Conduit shall be UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651 Conduits shall be suitable for above ground applications and/or underground applications direct burial in earth or concrete.

d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement. Wall Type SDR 11 HDPE conduit shall be manufactured in accordance with ASTM D-3350 (Specification of Polyethylene Plastics Pipe and Fittings Materials) and ASTM F2160 (Standard Specification for Solid Wall, High-Density Polyethylene Conduit Based on Controlled Outside Diameter), and suitable for directional boring installation.

e. Conduits for directional boring shall be Schedule 40 PVC or Schedule 80 PVC conduit, UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651 and suitable for directional boring installation, Schedule 40 HDPE or Schedule 80 HDPE conduit, UL-listed, conforming to NEMA Standard TC-7 and UL 651B and suitable for directional boring installation, or Wall Type SDR 11 (minimum) HDPE conduit manufactured in accordance with ASTM D-3350 (Specification of Polyethylene Plastics Pipe and Fittings Materials) and ASTM F2160 (Standard Specification for Solid Wall, High-Density Polyethylene Conduit Based on Controlled Outside Diameter), and suitable for directional boring installation. **Per NEC 300.5 (K), raceways installed using directional boring equipment shall be approved for the purpose. Provide manufacturer's literature confirming the respective duct is suitable for directional boring with the respective Shop Drawing submittal.**

Conduit for Item AW110202; 2" PVC Duct, Direct Bury shall be Schedule 40 PVC (minimum), UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651 or Schedule 40 (minimum) HDPE, UL-listed, conforming to NEMA Standard TC-7 and UL 651B or HDPE SDR 13.5 (minimum wall thickness) manufactured in accordance with ASTM D-3350 (Specification of Polyethylene Plastics Pipe and Fittings Materials) and ASTM F2160 (Standard Specification for Solid Wall, High-Density Polyethylene Conduit Based on Controlled Outside Diameter). Conduits shall be suitable for underground applications direct burial in earth or concrete.

Conduit for Item AW110502; 2-Way Concrete Encased Duct shall be 2-inch diameter Schedule 40 PVC (minimum), UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651 or Schedule 40 (minimum) HDPE, UL-listed, conforming to NEMA Standard TC-7 and UL 651B. Conduits shall be suitable for underground applications direct burial in earth or concrete.

Conduit for Item AW110509; 9-Way Concrete Encased Duct shall be 2-inch diameter Schedule 40 PVC (minimum), UL-listed or ETL listed, rated for 90°C cable, conforming to NEMA Standard TC-2 and UL 651 or Schedule 40 (minimum) HDPE, UL-listed, conforming to NEMA Standard TC-7 and UL 651B. Conduits shall be suitable for underground applications direct burial in earth or concrete.

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. Concrete shall have a minimum 28-day compressive strength of **4,000 psi.** Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

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 proposed conduits and ducts shall be constructed at the locations and in accordance with the details shown on the Construction Plans. Ducts shall be installed 18 in. minimum below grade. Ducts located in area subject to farming shall be 42 in minimum below grade. Where detailed on the Plans or where required to avoid obstructions, ducts shall be buried deeper. Where concrete-encased duct interfaces to directional-bored duct at a pavement crossing, the concrete encasement shall be installed up to the respective pavement edge. Where concrete-encased duct interfaces to an electrical handhole or manhole, the concrete encasement shall be installed up to the respective handhole or manhole. Provide bushings or bells at conduit terminations in electrical handholes or manholes.

Underground ducts installed by directional-boring method shall be installed in a manner that will not damage any existing underground utilities and shall not disturb or damage the respective pavement or roadway surface. Ducts shall be directional-bored at the locations shown on the Construction Plans. The ducts will be bored at a minimum depth of 24 in. below the bottom of the pavement it is being bored under. Ducts installed under paved areas and roadways shall extend a minimum of 10 ft beyond the respective pavement or roadway surface. A pull wire will be left in the conduit if it is to be left vacant. The ends of the conduit will be sealed with approved plugs.

The Contractor will determine if there is a conflict between the installation of the proposed electrical ducts and any existing utilities. He will make all necessary adjustments in depth of installation to avoid any and all proposed underground improvements."

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. Ducts for direct burial shall be installed so that the tops of all ducts are at least at least 18 in. below finished grade **and at least 42 inches below finished grade in areas used for farming.**

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 sodding, topsoiling,
fertilizing, liming, seeding, sprigging, mulching 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. Contractor shall have the salvage rights to cable designated to be removed or where cable is removed to accommodate construction. Removal of cable will be considered incidental to the work for which it is associated with and no additional compensation will be allowed.

110-3.9 Locating Existing Underground Utilities and Cables. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor's responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans, and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner's Representative and/or the Resident Project Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract.

All utility cables and lines shall be located by the respective utility. **Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123.** Contact the FAA (Federal Aviation Administration) for assistance in locating FAA cables and utilities. Location of FAA power, control, and communication cables shall be coordinated with and/or located by the FAA. Also contact Airport Director/Manager and Airport Personnel for assistance in locating underground Airport cables and/or utilities. Also coordinate work with all aboveground utilities.

Contractor shall locate and mark all existing cables within 10 ft of proposed excavating/trenching area. Any cables found interfering with proposed excavation or cable/trenching shall be hand dug and exposed. Any damaged cables shall be immediately repaired to the satisfaction of the Resident Project Representative at the Contractor's expense. The Resident Project Representative and Owner shall be notified immediately if any cables are damaged.

Payment for locating and marking underground utilities and cables will not be paid for separately but shall be considered incidental to the respective duct installation.

110-3.10 Separation of High-Voltage and Low-Voltage Wiring. High-voltage series circuit wiring (such as airfield lighting 5000 Volt series circuits that may operate at output voltages up to 4,550 Volts or more under normal operating conditions) and low-voltage circuit wiring (such as 120 VAC, 208 VAC, 240 VAC, 480 VAC circuits using conductors with 600 Volt rated insulation) shall maintain separation from each other, to comply with 2023 National Electrical Code 300.3

"Conductors", (C) "Conductors of Different Systems", (2) "Over 1000 Volts ac, 1500 Volts dc, Nominal", and 2023 NEC 305.4 "Conductors of Different Systems". This is also required by "Airport Lighting Engineering Regional Supplement" issued by Great Lakes Region. High-voltage wiring and low-voltage wiring shall not be installed in the same wireway, conduit, duct, raceway, handhole, or junction box.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) 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, and for interface and termination at the respective manholes, handholes, junction structures, or pull boxes, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

Removal of conduits, ducts, and raceways will be paid for under AW800476 Remove Airfield Lighting per L. SUM. Said price and payment shall constitute full compensation for field verification of existing site conditions and power sources, disconnecting the respective power sources, removing existing airfield signs, runway signs, taxiway signs, airfield lights, transformers, light bases, transformer cans, splice cans, junction structures, junction boxes, handholes, and other electrical equipment enclosures, and associated bases, foundations, concrete pads, and support structures; for removal of conduits, ducts, and wiring associated with the respective items designated for removal; for removal of concrete and cleaning mounting stakes for light fixtures; for all excavating and backfilling; for furnishing all earth material; for all restoration work; and for furnishing all coordination, labor, tools, equipment, and incidentals necessary to complete this item of work.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot 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 and for interface and termination at the respective manholes, handholes, junction structures, or pull boxes. 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, for all sawing and pavement removal; for all duct interface to manholes, handholes, junction structures, or pull boxes including coring of manholes, handholes, junction structures, or pull boxes; and for all excavation and backfilling with aggregate backfill, earth backfill, and concrete; for all restoration work; 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 AW110012	2" Directional Bore – per FOOT
Item AW110202	2" PVC Duct, Direct Bury – per FOOT
Item AW110509	9-Way Concrete Encased Duct – per 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) Note: where FAA Advisory Circulars are referenced they shall be the current issue or issues in effect.

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

American National Standards Institute

ANSI C80.1	Rigid Steel Conduit, Zinc Coated.
ANSI C80.4	Fittings Rigid Metal Conduit and EMT.

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM D3350	Specification of Polyethylene Plastics Pipe and Fittings Materials.
ASTM F2160	Standard Specification for Solid Wall, High-Density Polyethylene Conduit Based on Controlled Outside Diameter.

National Electrical Manufacturers Association (NEMA)

NEMA TC-2	Electrical Plastic Tubing and Conduit.
NEMA TC-3	Fittings Rigid PVC Conduit and Tubing.
NEMA TC-7	Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit.

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
UL Standard 651B	Standard for Continuous Length High-Density Polyethylene (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. This item shall include 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. Shop drawings are required for manhole, handhole, or junction structure to be used on the project. **Shop drawings shall be clear and legible. Copies that are illegible will be rejected.** The preferred shop drawing submittal format shall be electronic (PDF) copies. Shop drawings shall include the following information:

(6) Certification of compliance with the AIP (Airport Improvement Program) Buy American Preferences for all materials and equipment. Do not submit ARRA (American Recovery and Reinvestment Act) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Do not submit NAFTA (North American Free Trade Agreement) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Shop drawings submitted without certification of compliance with the Airport Improvement Program Buy American Preferences or without certification of manufacture in the United States of America in accordance with the AIP Buy American Requirements will be rejected. See the FAA website at:

http://www.faa.gov/airports/aip/buy_american/ for more information on the AIP Buy American Preferences requirements. FAA approved equipment that is on the FAA Buy American Conformance List or the list of Nationwide Buy American Waivers Issued by the FAA complies with the AIP Buy American Preferences and will not require additional waiver paperwork.

(7) In order to expedite the shop drawing review, inspection and/or testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacturer of all material to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

(8) Provide cut sheets with part number and specification for junction cans and lids. Include certification of manufacture in the United States of America.

(9) Provide cut sheets with part number and specifications for covers and frames for each respective handholes or manhole.

(10) Provide drawings and specifications for precast handholes and manholes.

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 pound 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. Cans shall be the size and depth as detailed on the Plans. Lids for splice cans containing high voltage airfield lighting cables shall include minimum 1/2-inch high lettering labeled "**DANGER HIGH VOLTAGE KEEP OUT**" to comply with 2020 NEC (National Electrical Code) Article 300.45 "Danger Signs", 2023 NEC Article 305.12 "Danger Signs" and 2020/2023 NEC Article 314.72(E) "Suitable Covers". This will need to be coordinated with the splice can manufacturer. Lids for splice cans containing low voltage cables (rated 600 Volts and below) will be acceptable to use blank covers.

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. Strength of the concrete shall be as detailed on the Plans and specified herein.

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 **[ ]** 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.

Covers for the handholes and manholes containing High-voltage circuit wiring cables (airfield lighting 5,000 Volt series circuits and/or other circuits rated above 600 Volts) shall include lettering labeled "**DANGER HIGH VOLTAGE KEEP OUT 5000 VOLTS**" to comply with 2020 NEC (National Electrical Code) Article 300.45 "Danger Signs", 2023 NEC Article 305.12 "Danger Signs"

and 2020/2023 NEC Article 314.30(D) "Covers". Covers for the handholes and manholes containing low-voltage circuit wiring (rated 600 Volts and below) shall include lettering labeled "**LOW VOLTAGE"** or "**0 – 600 VOLT ELECTRIC**". Coordinate lettering with manufacturer. ~~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. [Not used]

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 and/or cable holders shall be of stainless steel or reinforced nylon 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. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10 feet long nor less than 3/4-inch 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.

115-3.15 Removal of Electrical Junction Structures. The existing electrical junction structures designated for removal shall be removed in their entirety. Any materials not salvaged by the Airport, shall be disposed of off the airport site, in a legal manner, at the Contractor's own expense. The existing handholes, junction structures, bases, foundations, and associated materials designated for removal shall be disposed of off the airport site, in a legal manner, at the Contractor's own expense. Earth material will be placed in the hole made from respective removal. The disturbed area shall be restored. The following work items shall be considered incidental to the removal of the respective electrical junction structures.

a. Contractor shall examine the site to determine the extent of the work.

b. Contractor shall coordinate work and any power outages with the Airport Manager and the Resident Engineer/Resident Technician. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

c. Contractor shall comply with the requirements of FAA AC No. 150/5370-2G (or current issue in effect) “OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION”.

d. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

e. Power for each respective electrical junction structure and/or airfield lighting system shall be disconnected at the respective power source prior to removal. Contractor shall field verify to confirm the respective power source for each respective airfield lighting system.

f. Where detailed herein and/or to accommodate maintaining operation of the airfield lighting system, the Contractor shall furnish jumper cables and connector kits as required to place the airfield lighting back into operation. All temporary installations shall comply with National Electrical Code Article 590 – “Temporary Installations.” The Contractor shall secure, identify, and place temporary exposed wiring in conduit, duct, or unit duct to prevent electrocution and fire ignition sources in conformance with the requirements of FAA AC 150/5370-2G, Part 2.18.3 “Lighting and Visual NAVAIDs”.

g. Existing airfield lighting cables associated with electrical junction structures to be removed shall be abandoned in place unless it conflicts with new work and then it shall be removed at no additional cost to the Contract. If the Contractor elects to salvage the cable within the circuit to be removed, shown in the Construction Plans as cable to be abandoned, any cost associated with removal of the cable shall be considered incidental to the Contract and no additional compensation will be allowed.

115-3.16 Locating existing underground utilities and cables. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor's responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans, and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner's Representative and/or the Resident Project Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract.

All utility cables and lines shall be located by the respective utility. **Contact Sunshine State One Call of Florida, Inc. for utility information, phone: 1-800-432-4770.** Contact the FAA (Federal Aviation Administration) for assistance in locating FAA cables and utilities. Location of FAA power, control, and communication cables shall be coordinated with and/or located by the FAA. Also contact Airport Director/Manager and Airport Personnel for assistance in locating underground Airport cables and/or utilities. Also coordinate work with all aboveground utilities.

Contractor shall locate and mark all existing cables within 10 ft of proposed excavating/trenching area. Any cables found interfering with proposed excavation or cable/trenching shall be hand dug and exposed. Any damaged cables shall be immediately repaired to the satisfaction of the Resident Project Representative at the Contractor's expense. The Resident Project Representative and Owner shall be notified immediately if any cables are damaged.

Payment for locating and marking underground utilities and cables will not be paid for separately, but shall be considered incidental to the respective handhole, manhole, splice can, junction structure, and/or duct installation.

115-3.17 Separation of high-voltage and low-voltage wiring. High-voltage series circuit wiring (such as airfield lighting 5000 Volt series circuits that may operate at output voltages up to 4,550 Volts or more under normal operating conditions) and low-voltage circuit wiring (such as 120 VAC, 208 VAC, 240 VAC, 480 VAC circuits using conductors with 600 Volt rated insulation) shall maintain separation from each other, to comply with 2023 National Electrical Code 300.3 "Conductors", (C) "Conductors of Different Systems", (2) "Over 1000 Volts ac, 1500 Volts dc, Nominal", and 2023 NEC 305.4 "Conductors of Different Systems". This is also required by "Airport Lighting Engineering Regional Supplement" issued by Great Lakes Region. High-voltage

wiring and low-voltage wiring shall not be installed in the same wireway, conduit, duct, raceway, handhole, or junction box.

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; dewatering if required; all coring and labor associated with conduit, duct, cable in unit duct, and/or cable entries; locating existing utilities, lines, and cables in the respective areas of work; and all coordination with the respective Airport staff, site personnel, and/or FAA personnel. Conduits, conduit nipples, conduit couplings, and other conduit fittings included with junction structures, and/or splice cans, will be considered incidental to the respective item for which they are installed, and no additional compensation will be made. Ground rods, grounding electrode conductors, connections, and associated grounding work included with junction structures, and/or splice cans, will be considered incidental to the respective item for which they are installed, and no additional compensation will be made.

Pay Item AW115615 Electrical Handhole, High Voltage will correspond to a 3' x 3' x 3' precast concrete handhole as detailed on the Plans.

Pay Item AW125565 Splice Can will correspond to a Type L-867, Class IA, Size D (16 inches nominal diameter) and 24 inches deep junction/splice can with 2-inch hubs at 0, 0, 90, 180, 180, and 270 degrees (6-2-inch hubs), as detailed on the Plans. Cover plate shall be 3/8-inch minimum thickness with ½-inch high lettering "DANGER HIGH VOLTAGE KEEP OUT" cast into the cover.

Removal of Electrical Junction Structures will be paid for under AW800476 Remove Airfield Lighting per L. SUM. Said price and payment shall constitute full compensation for field verification of existing site conditions and power sources, disconnecting the respective power sources, removing existing airfield signs, runway signs, taxiway signs, airfield lights, transformers, light bases, transformer cans, splice cans, junction structures, junction boxes, handholes, and other electrical equipment enclosures, and associated bases, foundations, concrete pads, and support structures; for removal of conduits, ducts, and wiring associated with the respective items designated for removal; for removal of concrete and cleaning mounting stakes for light fixtures; for all excavating and backfilling; for furnishing all earth material; for all restoration work; and for furnishing all coordination, labor, tools, equipment, and incidentals necessary to complete this item of work.

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, for all coring and labor associated with conduit, duct, cable in unit duct, and/or cable entries; for all coordination with the respective Airport and/or FAA personnel; 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:

Item AW115610	Electrical Handhole -- per EACH
Item Aw115710	Electrical Manhole – per EACH
Item AW125565	Splice Can -- 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.

This Item of work shall consist of furnishing and installing airfield lighting systems at the locations shown on the Construction Plans and in accordance with the details shown on the Plans. This Item of work shall also consist of the relocation of airfield lights and/or taxi guidance signs at the locations shown on the Construction Plans and in accordance with the details shown on the Plans. This Item of work shall also include the removal of airfield lighting systems and associated electrical equipment and materials. Also included in this Item will be the testing of the installation and all incidentals necessary to place the lighting systems into operation, completed, and to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with 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. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for airfield lighting equipment and materials to be used on the project. **Shop drawings shall be clear and legible. Copies that are illegible will be rejected.** The preferred shop drawing submittal format shall be electronic (PDF) copies. Shop drawings shall include the following information:

1. **Certification of compliance with the AIP (Airport Improvement Program) Buy American references for all materials and equipment. Do not submit ARRA (American Recovery and Reinvestment Act) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Do not submit NAFTA (North American Free Trade Agreement) certification as a substitute for certification of compliance with the AIP Buy American Preferences. Shop drawings submitted without certification of compliance with the Airport Improvement Program Buy American Preferences or without certification of manufacture in the United States of America in accordance with the AIP Buy American Requirements will be rejected. See the FAA website at: http://www.faa.gov/airports/aip/buy_american for more information on the AIP Buy American Preferences requirements. FAA approved equipment that is on the FAA Buy American Conformance List or the list of Nationwide Buy American Waivers Issued by the FAA complies with the AIP Buy American Preferences and will not require additional waiver paperwork.**

2. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

3. Cut sheets with part number and specifications for each airfield light and associated materials. Include cut sheets with part numbers and dimensions for mounting hardware, base cans, cover plates, transformers, and associated components for each airfield light.

4. Cut sheets with part number and specifications for each airfield guidance sign and/or associated materials. Include cut sheets with part numbers, dimensions, legends, mounting hardware, bases, transformer cans, cover plates, transformers, and associated components for each light airfield guidance sign.

5. Concrete mix design.

6. Provide cut sheets with manufacturer's name, catalog number, dimensions, material and UL listing for each type and size ground rod. **Include certification of 100 percent domestic steel for ground rods.** Include cut sheets for exothermic weld connections, ground lugs, and ground wire.

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. All LED light fixtures, must be warranted by the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

f. The Contractor shall ascertain that all lighting system components furnished by him (including FAA-approved equipment) are compatible in all respects with each other and the remainder of the new system. Any non-compatible components furnished by the Contractor shall be replaced by him, at no additional cost to the Airport Sponsor, with a similar unit approved by the Engineer (different model or different manufacturer) that is compatible with the remainder of the airport lighting system.

EQUIPMENT AND MATERIALS

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

a. Rigid Steel Conduit. Rigid Steel Conduit and fittings shall be hot-dipped, galvanized, UL-listed, produced in accordance with UL Standard 6 – Rigid Metal Conduit and ANSI C80.1 – Rigid Steel Conduit, Zinc Coated. Couplings, connectors, and fittings for rigid steel conduit shall be threaded galvanized steel or galvanized malleable iron specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4 – Fittings Rigid Metal Conduit and EMT. Set screw type fittings are not acceptable. Galvanized rigid steel conduit shall be manufactured in the United States of America produced from 100 percent domestic steel.

b. PVC Coated Rigid Steel Conduit. Where noted on the Plans Polyvinylchloride (PVC) coated, galvanized rigid steel conduit shall be furnished and installed for additional corrosion protection. The conduit and fittings, prior to coating, shall be new, unused material, and shall conform to UL 6, Standard for Safety for Rigid Metal Conduit and UL 514B Standard for Safety, Fittings for Conduit and Outlet Boxes. An exterior PVC coating of a nominal 40 mils (.040 in.) shall be applied to the conduit and conduit couplings. The PVC coating shall conform to all applicable requirements of NEMA RN-1, Standard for PVC Coated Conduit. A red urethane coating of 2 mils (.002 in.) shall be uniformly and consistently applied to the interior of conduit and conduit couplings. Conduit or fittings having areas of thin or no interior coating shall be unacceptable. The PVC exterior and urethane interior coatings applied to conduit shall have sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30ºF, (-1ºC). All male threads on conduit, elbows, and nipples, and all female threads on conduit couplings and fitting shall be protected by application of urethane coating.

c. Schedule 40 PVC and Schedule 80 PVC Conduit. Schedule 40 PVC and Schedule 80 PVC conduit shall comply with Item 110 and the following: Conduit shall be Schedule 40 PVC, UL-listed or ETL listed, rated for 90°C cable-conforming to NEMA Standard TC-2 and UL 651. Fittings shall conform to NEMA Standard TC-3 and UL 514B. Conduits shall be suitable for underground applications encased in concrete or direct burial, and suitable for exposed applications aboveground. Conduits for use with base mounted airfield lights shall be Schedule 40 (minimum) PVC.

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 Used.

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.

a. **The proposed runway edge lights for Runway 6-24 shall be Type L-862(L) High Intensity Runway Edge Light with LED (Light Emitting Diode) illumination and arctic heater kits.** All lights shall have an overall height of 24 in. Lens colors shall be as detailed on the Plans. All of the above lights shall be manufactured in accordance with FAA Specification AC No. 150/5345-46E, (or respective edition in force as identified in AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum), and shall be FAA approved, and in compliance with the Airport Improvement Program Buy American Preference Requirements. Medium Intensity Airfield Lights with LED (Light Emitting Diode) illumination shall conform to the applicable requirements of FAA Engineering Brief No. 67D Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures. Include arctic heater kit with each light fixture. **See 125-2.20 Spare Parts for spare part requirements.**

b. **The proposed elevated threshold lights for Runway 6-24 shall be Type L-862E High Intensity Threshold Light with LED (Light Emitting Diode) illumination and arctic heater kits.** All lights shall have an overall height of 24 in. Lens colors shall be as detailed on the Plans. All of the above lights shall be manufactured in accordance with FAA Specification AC No. 150/5345-46E, (or respective edition in force as identified in AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum), and shall be FAA approved, and in compliance with the Airport Improvement Program Buy American Preference Requirements. Medium Intensity Airfield Lights with LED (Light Emitting Diode) illumination shall conform to the applicable requirements of FAA Engineering Brief No. 67D Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures. Include arctic heater kit with each light fixture. **See 125-2.20 Spare Parts for spare part requirements.**

c. **The proposed high intensity in-pavement runway lights shall be an L-850C(L) LED in-pavement runway edge light and arctic heater kits.** Lens colors shall be white/white color or white/yellow colors corresponding to the light fixture schedule. All of the above lights shall be manufactured in accordance with FAA Specification AC No. 150/5345-46E, (or respective edition in force as identified in AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum), and shall be FAA approved, and in compliance with the Airport Improvement Program Buy American Preference Requirements. Light direction and colors shall be as detailed on the Plans. Runway Lights with LED (Light Emitting Diode) illumination shall conform to the applicable requirements of FAA Engineering Brief No. 67D Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures. Include arctic heater kit with each light fixture. **See 125-2.20 Spare Parts for spare part requirements.**

125-2.8 Runway and Taxiway Signs. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44. The proposed lighted runway/taxiway signs shall conform to Advisory Circular 150/5345-44K (or respective issue in force as identified in AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum) and be FAA-approved for Type L-858(L) Runway and Taxiway Signs with LED (Light Emitting Diode) illumination. Runway and Taxiway Signs with LED (Light Emitting Diode) illumination shall conform to the applicable requirements of FAA Engineering Brief No. 67D Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures. The signs shall read as described on the Construction Plans. The proposed lighted runway and taxiway signs shall be Type L-858Y(L) direction, destination, and boundary signs (black legend on yellow background); L-858R(L) mandatory instruction sign (black outline on outside edge of white legend on red background); and L-858L(L) location sign (yellow legend and border on black background)**. The runway and taxiway signs shall be Size 2, Style 2, powered from a 4.8 to 6.6 Amp series lighting circuit and/or Style 3, powered for a 2.8 to 6.6 Amp series lighting circuit; Class 2, for operation from -40°F to 131°F; Mode 2, to withstand wind loads of 200 M.P.H., base-mounted, double-sided, as specified on the Plans. All signs shall include tethers.**

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

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

125-2.11 Circuit Selector Cabinet. Not Used.

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

Light cans for the airfield light fixtures (not located in pavement) and taxi guidance signs shall conform to the requirements of FAA AC 150/5345-42H, (or respective issue in force as identified in AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum), for Type L-867, Class IA, Size B (12 in. nominal diameter), and 24 in. deep and/or as detailed on the Plans. Each light base can shall include internal and external ground lugs. Include additional external ground lugs for interface to the counterpoise system where detailed on the Plans. L-867 transformer cans for taxi signs shall have galvanized steel covers, 3/8-inch thick (minimum), with stainless steel bolts. Light cans located in paved areas subject to aircraft traffic shall be Type L-868 sized for the respective application and in conformance with the requirements of FAA AC 150/5345-42H, (or respective issue in force as identified in AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum). L-868 transformer cans and splice cans shall have galvanized steel covers, 3/4-inch thick (minimum), with stainless steel bolts.

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. Series circuit isolation transformers for the airfield light fixtures and/or runway and taxiway signs shall be manufactured to FAA Specification AC 150/5345-47C, or the current edition in force, and shall be FAA-approved

(Intertek Testing Services Verified/ETL-Listed). Series circuit transformer shall be properly sized for the respective airfield lighting device and shall be as recommended by the respective equipment manufacturer. Confirm proper transformer selection and sizing with the respective equipment manufacturer. Existing transformers shall be relocated with the respective airfield light fixtures designated for relocation.

125-2.14 Concrete. The concrete used in the construction of the bases for the airfield light fixtures, runway and taxiway signs, splice cans, and other airfield lighting shall be proportioned, placed, and cured in accordance with Item P-610; Concrete for Miscellaneous Structures and as detailed on the Plans. **Concrete for bases and foundations shall have compressive strength of 4,000 psi at 28 days.** The actual P-610 concrete mix design intended for use on this project will be approved by the Engineer prior to its use on this project

125-2.15 Identification tags. Identification tags shall be attached to each airfield light fixture and each runway/taxiway sign. The tag shall be of the type and with the lettering shown on the Plans. The cost of furnishing and installing these tags shall be included in the unit price for the fixtures and/or signs and no additional compensation will be allowed. Each taxi sign shall also include a legend plate that notes the respective power source.

125-2.16 Anti-seize compound. Prior to installing the proposed airfield light fixtures, the Contractor will apply an oxide-inhibiting, anti-seizing compound to all screws, nuts, breakable coupling, and all places where metal comes into contact with metal. The anti-seize compound shall be as manufactured by Thomas & Betts brand name "Contax", or approved equal.

125-2.17 Stainless steel bolts. All base plate-mounting bolts and stake-mounting bolts shall be stainless steel.

125-2.18 Ground rods. Furnish and install 3/4-inch diameter by 10-feet long (minimum), UL-listed, Copper-clad, ground rod at each light fixture and each runway/taxiway sign. Ground rods shall be manufactured in the United States of America. Steel used to manufacture ground rods shall be 100 percent Domestic steel.

125-2.19 Reinforcing Steel. Reinforcing steel shall conform to the requirements of ASTM A-615 Grade 60 or ASTM A-706, Grade 60. Welded wire fabric shall conform to the requirements of AASHTO M55, ASTM A-82, ASTM A-185, or ASTM A-1064. Reinforcing steel shall be manufactured in the United States of America from 100 percent Domestic steel.

125-2.20 Spare Parts. Spare parts for airport visual aids are allowable in accordance with the requirements of FAA Order 5100.38D “Airport Improvement Program Handbook” and the guidelines in FAA AC No. 150/5340-26C “Maintenance of Airport Visual Aid Facilities”. Provide the following spare parts for the airport visual aid/airfield lighting system:

- **a.** 5 (five) spare L862(L) runway edge lights with white lenses corresponding to the respective fixtures furnished. Include mounting hardware and transformers for each spare light fixture.
- **b.** 5 (five) spare L861(L) runway edge lights with bi-directional yellow/white lenses corresponding to the respective fixtures furnished. Include mounting hardware and transformers for each spare light fixture.

c. 4 (four) spare L862E(L) runway threshold lights with bi-directional red/green lenses corresponding to the respective fixtures furnished. Include mounting hardware and transformers for each spare light fixture.

Spare parts for the airport visual aid/airfield lighting system will be considered incidental to the respective airfield lighting system pay items and no additional compensation will be allowed.

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.

The Contractor shall furnish and install all electrical materials necessary for complete and operational installation of the airfield lighting systems as shown on the Plans and detailed herein. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of the NFPA 70 - National Electrical Code (NEC) most current issue in force and the applicable Federal Aviation Administration standards, orders, and advisory circulars. Equipment shall be installed in conformance with the respective manufacturer's directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, (or other third-party listing), and/or the manufacturer's warranty of a device will not be permitted.

a. Keep all work, power outages, and/or shut down of existing systems coordinated with the Airport Manager and the Resident Project Representative. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on the system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

b. Examine the site to determine the extent of the work. Contractor shall field verify existing site conditions.

c. Verify respective circuits and power sources prior to removing, disconnecting, relocating, installing, connecting, or working on the respective airfield lighting, taxi sign, NAVAID, or other device. Identify each respective circuit prior to performing work on that circuit.

d. Install taxiway lights and/or other airfield lighting devices in accordance with the details shown on the Plans.

e. New 1/C #8 AWG FAA L-824 5,000 Volt cable shall be furnished and installed in duct to and from each respective light in order to place the respective light into the lighting circuit. The Contractor shall interface each respective new airfield lighting system to the existing airfield lighting systems scheduled to remain where detailed on the Plans. The cable will be paid for under Item 108. Provide sufficient slack cable at each splice/transformer can to perform cable splices outside of the can.

f. Locate existing underground utilities, cables and lines. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatsoever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor's responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans, and shall obtain, from the respective utility companies, detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner's Representative and/or the Resident Project Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract. All utility cables and lines shall be located by the respective utility. Also coordinate work with all aboveground utilities.

g. Interface each respective new airfield lighting system to the existing airfield lighting systems scheduled to remain where detailed on the Plans.

h. Grounding work and modifications shall not be performed during a thunderstorm or when a thunderstorm is predicted in the area. Grounding for airfield lights and runway and taxiway signs shall be as detailed on the Plans and as specified herein.

i. Homerun cables for a respective circuit that are installed in conduit or duct shall be run together in the same raceway or duct.

j. The respective personnel performing airfield lighting work, vault work, and/or test shall be familiar with, and qualified to work on 5000 volt airfield lighting series circuits, constant current regulators and associated airport electrical vault equipment.

k. FAA requires that every airfield lighting cable splicer shall be qualified in making cable splices and terminations on cables rated at and/or above 5000 Volts AC and shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

l. Obey and comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

m. Other construction projects might be in progress on the Airport at the same time as this project. The Contractor will be required to cooperate with all other contractors and the Airport Manager in the coordination of the work.

n. The Contractor shall comply with the requirements of FAA AC No. 150/5370-2 (current issue in effect) "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION".

o. In the event a conflict is determined with respect to manufacturer installation instructions, National Electrical Code, and/or the Contract Documents, contact the Project Engineer for further direction.

p. Secure, identify, and place any above ground temporary wiring in conduit to prevent electrocution and fire ignition sources in conformance with the requirements of FAA AC 150/5370-2G, Part 2.18.3 "Lighting and Visual NAVAIDs". All temporary installations shall comply with National Electrical Code Article 590 – "Temporary Installations."

q. Existing ducts and cables associated with airfield lighting equipment removals shall be abandoned in place unless it conflicts with the installation of the airfield light, sign, duct, cable, handhole, manhole, site work, pavement or other work, then it shall be disconnected, removed, and disposed of off the site at no additional cost to the Contract. Contractor may remove abandoned cables at no additional cost to the Contract and shall have the salvage rights to abandoned cables.

r. Obtaining the required borrow material, placing the borrow material, grading, seeding, and mulching the disturbed areas will be considered as an Incidental Item to the proposed airfield lighting and no additional compensation will be allowed.

s. Requirements of FAA AC 150/5340-30J, Paragraph 1.6 it notes "Do not use the high voltage series lighting circuit to power devices that are not certified per AC 150/5345-53, Airport Lighting Equipment Certification Program, listed in Appendix 3, Addendum. Using non-certified devices can result in a poor system power factor resulting in unexpected constant current regulator (CCR) shutdowns and lighting circuit start-up problems."

t. When a respective runway is closed the runway lighting and Navaids for that runway shall be shut off. Keep respective Navaids active during times when respective runway is open. Navaids receiving maintenance shall be shut off until operating properly.

u. Per the requirements of FAA AC 150/5340-26C, Chapter 3, Section 3.6.6 Use of Original Equipment Manufacturer (OEM) Part, it notes the following: "*The use of non-OEM parts or lamps in FAA approved equipment is strongly discouraged. The FAA has strict specifications for approval of all airport lighting equipment and use of non-OEM parts or lamps in such equipment or systems can render the equipment to be functionally non-FAA approved. This could possibly lead to serious liability consequences in case of an aircraft incident at an airport following these practices. In the case of runway and taxiway lighting fixtures, the use of a generic, non-approved lamp can render the photometric output of the fixture out of specification and adversely affect the safety of low visibility operations."*

v. The existing airfield lighting and/or signs designated for removal shall be removed in their entirety. The Contractor shall remove the existing lights, signs, including mounting hardware, bases, foundations, ground rods, and transformers. Light fixtures, signs, transformers, and mounting hardware scheduled for removal shall be carefully removed to avoid any damage to the fixtures and/or signs and turned over to the Airport. The electrical cable shall be disconnected from each light and/or sign, removed to accommodate new work, where accessible, and/or as detailed on the Plans, and disposed of off the Airport site. Light bases and foundations associated with removals shall be removed and disposed of off the airport site in a legal manner. The existing lights, signs, transformers, and mounting hardware shall be turned over to the Airport. The Airport shall retain the right of first refusal for any salvageable materials. Any materials not salvaged by the Airport, shall be disposed of off the Airport site, in a legal manner, at the Contractor's own expense. The contractor shall restore the respective areas of light fixture and/or sign removals and associated cables and ducts. Removal of lights, signs, mounting hardware, bases, foundations, ground rods, transformers, conduits, wiring, and associated materials will be paid for under Item AW800476 Remove Airfield Lighting – per Lump Sum

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.

125-3.5 Installation of airport lighting systems and signs.

a. Airfield light fixtures, light bases, runway and taxiway signs, isolation transformers, and accessories shall be installed as shown on the Plans or approved shop drawings and in accordance with the applicable FAA advisory circulars. Tolerances given in the FAA advisory circulars and on the Plans shall not be exceeded. Where no tolerance is given, no deviation is permitted. Items not installed in accordance with the FAA advisory circulars, and the plans shall be replaced by and at the cost of the Contractor.

b. The airfield light fixtures and runway and taxiway signs shall be installed at the locations indicated on the Plans. The Contractor shall exercise caution in the installation of all light

units. Any units damaged by the Contractor's operations shall be repaired or replaced to the satisfaction of the Engineer at no additional cost to the Contract.

c. The Contractor shall assemble units and connect them to the system in accordance with the manufacturer's recommendation and instructions.

d. Personnel installing airfield lighting systems shall be experienced and qualified to perform the respective work. Personnel performing cable connections shall be qualified in making cable splices and terminations on 5,000 Volt rated cable for use on runway and taxiway series circuits in accordance with the requirements of Item L-108.

125-3.6 Maintenance of airfield lighting during construction. The Contractor shall maintain lighting of the runways and taxiways during the various phases of the work as shown on the sequence of construction or as directed by the Engineer. The Contractor shall be responsible for all temporary connections in the field, or at the regulator, necessary for operation of the circuits during construction.

125-3.7 Identification numbers. The Contractor will place light identification number tags on ALL of the proposed and existing airfield light fixtures in the areas of the project work as detailed on the Plans. The correct light identification numbers shall be confirmed with the Airport Engineering and Maintenance Staff.

125-3.8 Grounding for airfield lights and runway and taxiway signs. Furnish and install a ground rod at each L-867/L-868 transformer base/light can. Grounding for Runway Lights, Taxiway Lights, and Lighted Taxi Guidance Signs shall be as detailed on the Plans and as specified herein. A ground rod must be installed at each light fixture and taxi guidance sign. The purpose of the light base ground is to provide a degree of protection for maintenance personnel from possible contact with an energized light base or mounting stake that may result from a shorted power cable or isolation transformer. A light base ground shall be installed at each transformer base/light can associated with runway lights, taxiway lights, and lighted taxi guidance signs. A light base ground shall be installed and connected to the metal frame of each taxi guidance sign as detailed on the Plans and in accordance with the respective taxi guidance sign manufacturer recommendations. The light base ground shall be a #6 AWG bare copper conductor bonded to the ground lug on the respective L-867 transformer base/light can or mounting stake and a 3/4-inch diameter by 10-feet long (minimum), UL-listed, copper-clad ground rod. Connections to ground lugs on the L-867 transformer base/light can shall be with a UL-listed grounding connector. Connections to ground rods shall be made with exothermic-weld type connectors, Cadweld by nVent Erico Products, Inc., Thermoweld by Continental Industries, Inc., Ultraweld by Harger, or approved equal. Exothermic-weld connections shall be installed in conformance with the respective manufacturer's directions using molds, as required for each respective application. Bolted connections will not be permitted at ground rods. Top of ground rods shall be buried 12 in. minimum below grade, unless noted deeper on the Plans.

Per National Electrical Code Article 250.53 "Grounding Electrode System Installation" resistance from the ground rod/electrode must be 25 Ohms or less via measurement with a ground tester. This is a safety issue for protection of personnel. Based on reports from the Decatur Airport, lightning damage of airfield lighting fixtures has been a recurring issue. Therefore, to help improve lightning protection an equal potential counterpoise system will be included with the airfield lighting system. The grounding system described below is based on an equipotential method

counterpoise system with safety grounds at each lighting fixture, sign, junction can and Navaid. A #6 AWG bare tinned solid Copper counterpoise conductor shall be installed with ¾-inch by 20 feet ground rods. The counterpoise shall also be connected to each ground rod at the respective airfield light fixtures, taxi guidance signs, lighted Navaids, and base/splice/junction cans to form a ground ring for the respective airfield lighting system. The #6 AWG bare tinned solid copper counterpoise conductor shall be direct burial in trench approximately 10 inches above the #8 FAA L-824, 5,000-Volt cable in duct. The #6 AWG ground shall be connected to each respective ground rod with an exothermic weld connection. The completed ground wire installation will provide a ground ring and lightning protection counterpoise system for the respective airfield lighting circuit. This is to help accomplish a ground resistance of 25 Ohms or less for the ground rod at each light fixture, taxi sign, and base/splice/junction can for safety of personnel. The #6 AWG bare tinned solid Copper counterpoise will be paid for under Item AR108706 1/C #6 Counterpoise per FOOT."

If there are difficulties encountered when installing the grounding electrode system, contact the Project Engineer of Record for further directions. For each airfield light fixture, airfield sign, Navaid, and junction/splice/base can the Contractor shall test and record the earth ground resistance for the made electrode ground system with an instrument specifically designed for testing ground systems. Test results shall be recorded for each airfield light fixture, taxi guidance sign, runway sign, Navaid, and junction/splice/base(L-867/L-868) can. If ground resistance exceeds 25 Ohms, first check to make sure the earth ground resistance tester is properly calibrated, the batteries are in good working order, and the tester is being properly used in accordance with the manufacturer's instructions. If ground resistance still exceeds 25 Ohms, then check to make sure connections are good and secure, and correct where applicable. If ground resistance still exceeds 25 Ohms, check to make sure the ground rod(s) are connected to the equal potential counterpoise/grounding system (ground ring). Contact the Project Engineer of Record for further directions, where applicable. Copies of ground system test results shall be furnished to the Resident Engineer and the Project Engineer of Record. Grounding is considered incidental to the respective item for which it is required.

Per the requirements of FAA AC No. 150/5340-30J "Design and Installation Details for Airport Visual Aids", Chapter 12, part 12.6 "Light Fixture Bonding" it notes the following: "*Bond the light fixture to the light base internal ground lug via a No. 6 AWG stranded copper wire rated for 600 volts with green XHHW, THWN-2, or other suitable insulation, bare stranded conductor or a braided ground strap of equivalent current rating. The bonding conductor length must be sufficient to allow the removal of the light fixture from the light base for routine maintenance. See the light fixture manufacturer's instructions for proper methods of attaching a bonding wire to the fixture.*" Provide light base covers with grounding lugs to comply with this requirement.

Where a conflict is determined with respect to grounding requirements per manufacturer installation instructions, National Electrical Code, and/or the Contract Documents, or there are other questions or concerns about the grounding requirements contact the Project Engineer of Record: Kevin Lightfoot for further directions. Safety of personnel is the top priority.

125-3.9 Delivery, storage and handling. Materials and equipment should be shipped disassembled to the extent necessary for reasons of: shipping limitations, handling facilities, and to avoid damage during shipment. Materials shall be maintained in new condition. This shall include suitable coverings, indoor storage, etc., to properly protect the equipment and materials. Any equipment and materials, in the opinion of the Engineer, damaged during construction or storage

shall be replaced by and at the cost of the Contractor. Painted and galvanized surfaces that are damaged shall be repaired according to manufacturer's recommendations, to the satisfaction of the Engineer.

125-3.10 Restoration. All turf areas disturbed by the installation of airfield lighting and associated work shall be restored, graded, and seeded to establish a stand of grass to the satisfaction of the Engineer. All areas disturbed by work shall be restored to its original condition. The restoration shall include any necessary topsoiling, fertilizing, liming, seeding, or mulching, as shown on the plans. All such work shall be performed in accordance with Item T-901 "Seeding" and T-908 "Mulching" or as directed by the Engineer. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. Restoration shall be considered incidental to the pay item of which it is a component part.

125-3.11 Testing airfield lighting systems. Each airfield lighting system shall be tested to determine proper installation and operation. Contractor shall coordinate testing with the Resident Project Representative. All equipment, tools, and labor required for testing and demonstrations shall be furnished by the Contractor.

a. Prior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits, all existing series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the respective vault. All existing series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. Contractor shall provide a True RMS Ammeter for current measurements. Copies of test results shall be provided to the Resident Project Representative and the respective Engineer within five business days of conducting the respective set of tests. See the testing forms included in Appendix A. These tests are required to protect the Owner and the Contractor and to identify existing conditions and any defective cables, circuits, and/or constant current regulators. **Failure to comply with this requirement will result in the Contractor being responsible for defective cable and circuit conditions (where previously not identified) and the associated corrective work at no additional cost to the Contract.**

b. After airfield lighting modifications, additions, and/or upgrades have been completed, series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the respective vault. All series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the respective vault. Each constant current regulator shall be tested with results recorded. Contractor shall provide a True RMS Ammeter for current measurements. Copies of test results shall be provided to the Resident Project Representative and the respective Engineer. See the testing forms included in Appendix A.

c. Fully test the installation by continuous operation for a period of not less than twenty-four (24) hours as a completed unit, prior to acceptance by the Owner.

d. Test cabling in accordance with specification L-108.

e. Demonstrate all features and functions of all systems and instruct the Owner's personnel in the proper and safe operation of the systems.

f. The Contractor shall perform the necessary inspection and tests for some items concurrently with the installation because of subsequent inaccessibility of some components. The Engineer shall be notified by the Contractor forty-eight (48) hours in advance of any testing. There are no approved "repair" procedures for items that have failed testing other than complete replacement. Any other corrective measures shall be approved in writing by the Engineer.

g. See Appendix A – "Constant Current Regulator and Cable Testing Forms" for additional information on testing requirements for airfield lighting systems. All testing will be considered incidental to the respective work items and no additional compensation will be allowed.

125-3.12 Safety practices with airfield lighting series circuits. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel should be permitted to work on airfield lighting series circuits. The following safety procedures shall be followed for the safety of personnel.

a. Contractor shall coordinate work and any power outages with the Airport Manager and the Resident Engineer/Resident Technician. Any shutdown of existing systems shall be scheduled with and approved by the Airport Manager prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the Contractor will be responsible to provide the appropriate lockout/tagout equipment for safety of personnel. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on this system.

b. The Contractor shall provide a copy of their electrical energy source Lockout/Tagout Procedures document to the Airport Director/Manager, Resident Engineer and the Project Engineer of Record. The Lockout/Tagout Procedures document shall include the contact information with 24-hour phone numbers for the Contractor and the Electrical Contractor Superintendent and/or the respective licensed Journeyman Electricians on the project site. Per 2024 NFPA 70E, Article 120 "Establishing an Electrically Safe Work Condition", Section 120.5 "Lockout/Tagout Procedures" it notes "***The employer shall maintain a copy of the procedures required by this section and shall make the procedures available to all employees."*** The lockout/tagout procedure must include a method to identify the transfer of responsibility when the job extends beyond multiple shifts as noted in 2024 NFPA-70E Article 120, Section 120.5 (B)(8) "Shift Change", which notes ***"A method shall be identified in the procedure to transfer responsibility for lockout/tagout to another person or to the person in charge when the job or task extends beyond one shift."***

c. Where existing electrical equipment does not have features for lockout/tagout the Contractor will be responsible for providing the appropriate lockout/tagout equipment and measures to ensure the safety of personnel.

d. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the Contractor, the respective maintenance personnel, and any other personnel working on the equipment or electrical system.

e. An airport vault is a building, room, or designated area that contains electrical power and airfield lighting equipment and controls. Note that an Airport Electrical Vault is a restricted access facility and should be limited to experienced and qualified personnel only. Each door to the Airport Electrical Vault is recommended to include a warning sign labeled "**DANGER HIGH VOLTAGE UNAUTHORZED PERSONS KEEP OUT**" to comply with the requirements of 2020/2023 National Electrical Code Article 110, Section 110.34 "Work Space and Guarding" Paragraph (C) "Locked Rooms or Enclosures".

f. FAA AC 150/5340-30J; Design and Installation Details for Airport Visual Aids, Chapter 1 "Introduction", Part 1.2 "Scope" notes the following: "***This AC provides installation methods and techniques for airport visual aids. The standards contained herein are standards the FAA requires in all applications involving airport development of this nature. These standards must be met where lighting systems are required for FAA-developed procedures. Installations should conform to the National Fire Protection Association (NFPA) National Electrical Code (NEC) and local codes where applicable. See referenced materials."***

g. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC) most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment shall be installed in conformance with the respective manufacturer's directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, Factory Mutual approval, (or other third-party listing) and/or the manufacturer's warranty of a device, will not be permitted. National Electrical Code Article 110 "Requirements for Electrical Installation", Part 110.3(B) "***Installation and Use" notes the following: "Equipment that is listed, labeled, or both shall be installed and used in accordance with any instructions included in the listing or labeling".***

h. Provide personnel protective equipment for all personnel working on or testing electrical systems suitable for the respective application. Provide protective equipment for personnel to keep them safe in the event of an arc flash or other electrical accident. Refer to 2024 NFPA 70E "Standard for Electrical Safety in the Workplace", Article 250 "Personal Safety and Protective Equipment" and "Informative Annex H Guidance on Selection of Protective Clothing and Other Personal Protective Equipment (PPE)" for additional information on personal protective equipment.

i. The respective personnel performing airfield lighting work, vault work, and/or tests are recommended to be familiar with, and **qualified** to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment. National Electrical Code Article 100 "Definitions" defines a Qualified Person as ***"One who has the skills and knowledge related to the construction and operation of the***

electrical equipment and installations and has received safety training to recognize and avoid the hazards involved."

j. FAA AC 150/5370-10H – Standard Specifications for Construction of Airports, Item L-108 Underground Power Cable for Airports Part 108-2.5 Splicer qualifications requires the following: ***"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."***

k. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

l. Per 2024 NFPA 70E Standard for Electrical Safety in the Workplace it defines Electrically Safe Work Condition as "***A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested for the absence of voltage, and, if necessary, temporarily grounded for personnel protection."*** Prior to conducting tests or working on equipment, verify equipment enclosures and frames have a good and secure ground connection.

m. Personnel shall comply with the applicable requirements of FAA Advisory Circular Number 150/5340-26C "Maintenance of Airport Visual Aid Facilities". Obtain and review this document for your safety.

n. FAA Advisory Circular Number 150/5340-26C notes that there are three basic rules to remember when working on and around airport lighting circuits. These are noted as follows:

1. *ALWAYS assume that the circuit is energized until you have proven otherwise. ALWAYS check for current before disconnecting the series circuit connector, removing the S1 cutout, or opening the primary series circuit by any other means. Make it a required practice to check the circuit with an ammeter prior to breaking the connection – NO EXCEPTIONS. Never attempt to measure voltage in a series lighting circuit using ordinary volt meters. An inductive voltage measuring device (sometimes referred to as a "ticker") such as is described in Chapter 4 may be used to detect the presence of induced voltage on a series lighting cable after checking for the presence of current. Always use a true RMS clamp-on type ammeter to verify if the circuit is energized. ALWAYS check the operation of the test equipment on a known live circuit before and after measurements are taken.*

2. ***NEVER*** *under any circumstances open or break a live airfield series circuit. The voltage generated in the circuit can reach levels many times normal before the regulator's open circuit protection can shut it down. As long as a current flow can*

be maintained, even if it is through you, the regulator will continue to operate. This is one of the reasons that series circuits can be so hazardous to work around – there is no personnel protection provided such as might be found on parallel interior wiring.

3. *NEVER enter a manhole with energized conductors and never handle cables or transformers in light bases while there is current present. Cables or connectors can have cracked insulation where it is not visible or may be deteriorated and fall apart, exposing you to live circuit conductors.*

o. Never enter a manhole, handhole, or other raceway junction structure with energized conductors. Often light bases, transformer cans, splice cans, junction cans, junction boxes, junction structures, handholes, manholes, and/or other raceways may contain multiple circuits. All circuits must be shut down, locked out and tagged out, not just the circuit being worked on.

p. Verify respective circuits and power sources prior to removing, disconnecting, relocating, installing, connecting, or working on the respective airfield lighting, taxi sign, NAVAID, or other device. Identify each respective circuit prior to performing work on that circuit. Disconnect the airfield lighting series circuit cables from the constant current regulator when performing work or tests on the respective circuit. Disconnect the power source for the respective lighting system, sign, Navaid or other device when performing work or tests on the respective circuit. Shut down and lockout the circuit to help avoid a dangerous hazard for personnel working on the system.

q. When performing work on an airfield lighting circuit the respective circuit is required to be shut down and locked out (locked in off position) in accordance with 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on this system. This includes, but is not limited to, light fixture, sign and/or Navaid removals, repairs, replacements, relocations, lamp replacements, transformer replacements, component replacements, and/or installations; cable work, removals, repairs, replacements, relocations, rerouting, splicing, connecting, testing, and/or installations; grounding work, repairs, replacements, corrections, testing, and/or installations; Airport Electrical Vault work, constant current regulator work, and/or other electrical work.

r. Make sure each constant current regulator has a good and secured frame ground connection from the regulator housing to the respective vault ground bus and grounding electrode system, prior to operation and testing of each regulator.

s. Avoid placing materials on top of constant current regulators. Maintain clearance about constant current regulators for air flow and cooling in accordance with the respective manufacturer's recommendations and requirements.

t. Make sure each airfield light fixture, sign, and Navaid has a good and secured frame ground connection from the respective device to the respective grounding electrode system, prior to operation, working on, and/or and testing of the device.

u. Per the requirements of FAA AC 150/5340-26C, Chapter 3, Section 3.6.6 Use of Original Equipment Manufacturer (OEM) Part, it notes the following: "***The use of non-OEM parts or lamps in FAA approved equipment is strongly discouraged. The FAA has strict specifications for approval of all airport lighting equipment and use of non-OEM parts or lamps in such equipment or systems can render the equipment to be functionally non-FAA approved. This could possibly lead to serious liability consequences in case of an aircraft incident at an airport following these practices. In the case of runway and taxiway lighting fixtures, the use of a generic, non-approved lamp can render the photometric output of the fixture out of specification and adversely affect the safety of low visibility operations."***

v. Never come in contact with water surrounding an active airfield lighting series circuit. Do not put your hand in a junction structure, splice can, handhole, manhole or other raceway system containing live airfield lighting circuits with water. The water may conduct electricity and cause harm, electric shock, injury or death.

w. Series circuit disconnects are required for each constant current regulator in accordance with FAA AC 150/5340-30J "Design and Installation Details for Airport Visual Aids". The following practices are recommended and/or required for series circuit cutouts/disconnects and the associated airfield lighting series circuit wiring.

1. The Type S-1 Series Plug Cutout is a series circuit disconnecting device installed at the output side of a constant current regulator (CCR). With the handle plug assembly removed, the cutout isolates the CCR output from airfield lighting series circuit loop for maintenance and personnel safety. The S-1 cutout also shorts the series loop and shorts the regulator secondary for helping with servicing, maintenance, and troubleshooting.

2. Provide series plug cutouts for each constant current regulator as detailed on the Plans. Series plug cutouts shall be Type S-1, rated 5KV, 20-Amps, and shall comply with FAA AC 150/5340-30J. Cutouts shall be certified in writing by the manufacturer as suitable for the respective application. Cutouts shall disconnect the input from the output, short the input terminals, and short the output terminals when the handle/plug is removed. Series plug cutouts shall be Crouse-Hinds, Type S-1, Model 2, Catalog Number 30775, Manairco Catalog Number MRS1, or an approved equal. Series cutouts where the manufacturer has noted their cutouts are not recommended to operate with the handle pulled/removed are not acceptable. Other cutouts, that do not function as detailed on the Plans or that are not suitable for the respective application, are not acceptable.

3. Install the series plug cutouts in a NEMA 1 or NEMA 12 painted steel enclosure adequately sized to house the cutout(s), with a hinged cover and back panel to

mount the cutouts. All enclosures shall be pad lockable. Where existing cutout enclosures are used provide pad lock kits for each existing enclosure. The installation of series circuit cutouts shall accommodate lockout/tagout for safety of personnel.

4. Never remove or insert a series circuit plug cutout/disconnect with the circuit energized. Removal of a series circuit plug cutout/disconnect on an energized circuit can result in an arc flash that may cause injury, burns, and harm to personnel. Always shutoff and lockout input power to the respective constant current regulator prior to pulling or inserting a series plug cutout.

5. Series circuit plug cutouts/disconnects shall only be used on airfield lighting series circuits in accordance with the respective manufacturer's instructions. Verify ratings and applications with each respective series plug cutout manufacturer. Note, observe, and verify the differences in applications for the different manufacturer series plug cutouts. Confirm ratings and suitability for the respective application with each respective cutout manufacturer. Some manufacturer's Type S-1 series circuit cutouts might not be suitable for applications that other manufacturer's Type S-1 series circuit cutouts are rated for.

6. Know the difference between Type S-1 series circuit plug cutouts and Type SCO series circuit plug cutouts. Type SCO cutouts do not operate the same as Type S-1 cutouts. Examples of Type S-1 cutouts include Crouse-Hinds, Type S-1, Model 2, Catalog Number 30775, and Manairco Catalog Number MRS1. Example of Type SCO cutout is ADB Safegate Part Number 1475.92.030 and Part Number 1475.92.030-1. Refer to the respective installation instructions for each type of cutout. This is important for the safety of personnel.

7. Series circuit wiring shall be installed in enclosed raceways. No exposed airfield lighting series circuit cables (L-824) will be permitted in the Airport Electrical Vault. In accordance with National Electrical Code Article 300, Part II Requirements for over 1000 Volts, Nominal, Part 300.37 Aboveground Wiring Methods, Exception, it notes: "*Airfield lighting cable used in series circuits that are powered by regulators and installed in restricted airport lighting vault shall be permitted as exposed cable installations."* An Airport Electrical Vault is a restricted access facility limited to access by qualified persons only. Often airport electrical vault buildings do not have provisions to limit access to only qualified personnel. Therefore, no exposed airfield lighting series circuit cables will be permitted in the Airport Electrical Vault.

8. Maintain separation of high-voltage airfield lighting 5000 Volt series circuits from low-voltage circuit wiring. High-voltage series circuit wiring (such as airfield lighting 5000 Volt series circuits that may operate at output voltages up to 4,550 Volts or more under normal operating conditions) and low-voltage circuit wiring (such as 120 VAC, 208 VAC, 240 VAC, 480 VAC circuits using conductors with 600 Volt rated insulation) shall maintain separation from each other, to comply with 2023 National Electrical Code 300.3 "Conductors", (C) "Conductors of Different Systems", (2)

"Over 1000 Volts ac, 1500 Volts dc, Nominal", and 2023 NEC 305.4 "Conductors of Different Systems". High-voltage wiring and low-voltage wiring shall not be installed in the same wireway, conduit, duct, raceway, handhole, or junction box. High-voltage airfield lighting 5000 Volt series circuits wiring shall enter each respective regulator at the high-voltage/series circuit output section of the regulator. 208 VAC, 240 VAC, or 480 VAC input power wiring shall enter each respective regulator at the low-voltage/input power section of the regulator. Control wiring shall enter each respective regulator at the control section of the regulator.

x. The following are a list of incidents that have taken place on airfields that resulted in dangerous conditions, injuries, electric shock, and/or death. These are provided for informational purposes to help keep personnel safe.

1. Situation 1; In 2023 a taxiway circuit was tested to be in very poor and dangerous condition. The circuit was energized and the Airport staff drove around to see if any lights were on. They observed one of the airfield lighting series circuit transformers was above grade and was on fire on a wet day. The Airport Maintenance Person got out of the truck to go look at the transformer that was on fire. The Hanson employee on site told the Airport Maintenance Personnel to get back in the truck immediately and explained that a 5,000 Volt series circuit on fire in wet conditions can cause electrocution to someone getting into the nearby wet grass and/or standing water. Injury was avoided on this day.

2. Situation 2; The taxiway circuit identified in Situation 1 was troubleshooted by qualified personnel. The circuit was energized, and the Electrical Contractor drove around to see if any lights were on. They observed one of the taxiway lights having steam coming out of the light base due to boiling water caused by a bad transformer and/or ground fault condition. The Contractor recorded this with a video and shortly after the taxiway light fixture blew up and caused an arc flash.

3. Situation 3; The Electrical Contractor was changing light bulbs on a live airfield lighting series circuit. The Contractor did not have the circuit shut off nor was it locked off and tagged off per OSHA requirements. The Contractor was wearing gloves to protect his hands from possible broken lamps. The Contractor had one hand on a lamp and grabbed the stem of the light fixture with his other hand and it blew off the thumb on his hand. The light fixture stem was shorted to the series circuit.

4. Situation 4; The Electrical Contractor was changing light bulbs on a live airfield lighting series circuit. The Contractor did not have the circuit shut off nor was it locked off and tagged off per OSHA requirements. The Contractor had one hand on a lamp and grabbed the stem of the light fixture with his other hand and it blew off the index finger on his hand. The light fixture stem was shorted to the series circuit.

5. Situation 5; An Electrical Contractor was working on a base mounted airfield light fixture on a live airfield lighting series circuit. The Contractor did not have the circuit shut off nor was it locked off and tagged off per OSHA requirements. The contractor was removing the bolts for the light base cover. He had 5 of the six bolts removed. When he removed the sixth bolt the cover blew off and hit him in the face due to a ground fault condition and losing the ground path when the last bolt was removed. It is important to have light base covers connected to ground with a bonding jumper or ground strap to maintain safety of personnel. FAA AC 150/5340-30j requires the following light fixture bonding for safety of personnel: *Bond the light fixture to the light base internal ground lug via a No. 6 AWG stranded copper wire rated for 600 volts with green XHHW, THWN-2, or other suitable insulation, bare stranded conductor or a braided ground strap of equivalent current rating. The bonding conductor length must be sufficient to allow the removal of the light fixture from the light base for routine maintenance.*

6. Situation 6; During an electrical survey at an Airport, it was observed that the electric utility transformer for the Airport Electrical Vault Building had been changed from a 25 KVA unit to a 100 KVA unit to accommodate additional temporary electric services for the annual festival that took place at the Airport. The electric service to the Airport Electrical Vault is 120/240 VAC, single phase, 3 wire. The previous 25 KVA utility transformer had a maximum calculated fault current that was less than 10,000 Amps, and the service disconnect and distribution panelboard were adequately rated for fault current not exceeding 10,000 Amps at 120/240 VAC. The replacement 100 KVA transformer had an impedance of 1.73 percent and a maximum calculated fault current of 17,705 Amps. The existing Service Disconnect had 200 Amp, Bussmann NON-200 One-Time General Purpose Fuses that had 10,000 Amp Interrupting Rating which were no longer suitable for the available fault current. The Distribution panelboard had a 200 Amp, 2 pole main breaker with 22,000 AIC at 240 VAC and branch breakers that were rated 10,000 AIC at 120/240 VAC. To address the higher available fault current of 17,705 Amps the following corrective action was taken. The existing 200 Amp, Bussmann NON-200 One-Time General-Purpose Fuses in the service disconnect were replaced with 200 Amp, Type RK5 fuses that had 100,000 Amp Interrupting Rating. To make the distribution panel fully rated for 22,000 AIC at 120/240 all of the branch and feeder circuit breakers were replaced with new breakers that were rated 22,000 AIC at 120/240 VAC. The point to this is that situations can change that affect existing electrical equipment ratings. When the vault service and distribution equipment was originally installed it was properly rated and suitable for the application where it was served by a 25 KVA transformer that had a fault current of less than 10,000 Amps. The change to the larger 100 KVA transformer was not coordinated with the vault electric service and distribution equipment. This was discovered after the transformer had been replaced with a larger unit. Upon its discovery, corrective action was taken to address this unsafe situation. Please be aware when doing work on electric service and distribution systems it is important to verify the maximum available fault current at the equipment and verify that the respective equipment is properly rated for the fault current. Sometimes changes will be necessary to ensure the equipment is properly rated to safely trip the circuit breakers or blow the fuse in the event of a fault. Where equipment is not adequately rated for the fault current it might be subject to damage and unsafe

conditions for personnel in the event of a fault. Such conditions need to be addressed, and corrective action needs to be taken.

7. Situation 7; Several years ago, a client contacted us and noted they had lightning damage on their runway lighting circuit. Approximately 16 runway light fixtures and transformers were damaged and in some cases the transformers were blown out of the circuit (and disconnected). The client explained that the constant current regulator for the runway lighting system would operate providing 6.6 Amps but 0 (zero) volts output indicating a shorted output. They noted when they switched over to the backup regulator it would not run and provided an open circuit loop alarm. It was explained the client to be very cautious about the regulator that was providing 6.6 Amps output at zero volts output. It sounded like the output lightning arrestors on the regulator had blown and shorted to ground (the frame of the regulator). This condition had the output current running through the metal frame/housing of the regulator and is a concern of electric shock or electrocution. A qualified electrician investigated and determined that both output lightning arrestors had blown and shorted to the frame of the regulator. The regulator was shut down and repairs were made. Based on the above please note the following safety concerns.

   - It is required and important that each constant current regulator always has a good and secure ground connection from its frame to a good grounding electrode system. When operating a constant current regulator confirm it has a good and secure ground connection to its frame prior to operation. This is important for the protection of personnel. In the above situation, if the regulator did not have a good ground to its frame, a condition would have existed that increased the possibility of electric shock or electrocution. Please be aware that grounding does not guarantee you will not receive a shock, be injured, or killed from damaged or defective equipment and/or materials. Proper grounding will however significantly reduce the possibility of shock, injury, or death. Please always focus on safety of personnel.

   - It is recommended to include an output voltage meter on constant current regulators for testing, maintenance, and troubleshooting purposes. This is an optional feature, not a standard feature, and therefore needs to be included with the specification for the respective regulator. Having an output voltage meter on the regulator identified above helped us to determine the failure and unsafe condition.

   - An airport electrical vault is a restricted access electrical facility for qualified and authorized personnel only. Anytime you enter an airport electrical vault you need to be accompanied by someone that is authorized and qualified to ensure your safety. Also note that just because someone is “authorized and qualified”, does not mean that they will also take responsibility for your safety. If you are not comfortable entering an airport electrical vault, please stay out. Your safety is always important and needs to be the priority.

8. Situation 8; In July 2009 we were working at an airport and observing the installation of a new airport electrical vault building and airfield lighting equipment. An airport vault is a building that contains electrical power and airfield lighting equipment and controls. The electrical contractor staff performing the installation had left the site to go work at another location and brought in a different two-man crew (journeyman and apprentice) that was not completely familiar with the status of the work completed to date. We had worked for several days addressing problems and were at the point of testing the new vault equipment. Tests were conducted in the morning and the airfield lighting was observed to be in working order. In the afternoon the apprentice began demolition of the old vault. The electric service had been disconnected and removed from the old vault a number of days earlier. Tests were conducted again in the afternoon for demonstration to the Airport Manager and it was discovered that one of the runway circuits no longer worked. Investigation found that there was an old homerun circuit to the old vault that had not been disconnected from the airfield lighting. The apprentice had removed the old series circuit disconnecting means (cutout) and it resulted in an open circuit condition for the runway lighting series circuit, which caused the lights to no longer work. Remember this old vault had no electric service power, but it still had a live circuit running to it that originated from the new vault. This was an extremely dangerous condition. The issue was corrected, and no one was hurt. The point of this is to be aware of the possible dangers that might occur when a different crew is brought in to complete the work of others. And never assume a circuit is dead unless it has been checked and verified as disconnected at the power source AND disconnected at the respective system it is powering (disconnected at both locations). Please always take measures to ensure your safety and the safety of those you are working with.

9. Situation 9; In April 2011 we were testing a new taxiway lighting system on an old constant current regulator. The cover of the constant current regulator was off for testing and startup purposes. The Resident Technician was looking at the regulator and was told not to look at the regulator during a startup. The Resident Technician was not a qualified electrical person and left the site for safety purposes. The regulator was turned on and tested with no load. The regulator was observed to operate properly. The regulator was shut off and the taxiway lighting circuit was connected to it. The regulator was again turned on and one of the capacitors exploded and caught fire. This is an example of why you should not look at electrical equipment during start up until considered safe and you have appropriate personal protection equipment. It is also an example of the need for personnel protective equipment, clothing, face protection and other protection during start up, testing and operation of electrical equipment.

10. Situation 10; A laborer was performing an airfield lighting series circuit splice connection. He had not practiced lockout/tagout for the respective circuit. An airport maintenance person decided to check the respective airfield lighting for burnt out lamps and turned on the circuit while the laborer was performing a splice. The laborer received electric shock and had to be taken to a hospital for medical attention. The laborer was reported to have spent two days in the hospital and did recover. The point to this is that only qualified and experienced cable splicers are

permitted to perform airfield lighting series circuit connections and lockout/tagout procedures must be followed for safety of personnel.

11. Situation 11; An electrical contractor crew was working on an airfield lighting system. The electrical contractor pulled the airfield lighting series circuit cutouts/disconnects in the Airport Electrical Vault. The Electrical contractor thought they had all airfield lighting series circuits disconnected but actually had one circuit that was not disconnected and was a live circuit. An apprentice electrician went to work on the one circuit that was not disconnected and was electrocuted and died on the site. This is an example of why it is important to verify all power sources, shut off and disconnect power to each respective constant current regulator AND disconnect each respective airfield lighting series circuit/cutout and lockout/tagout the respective circuits.

12. Situation 12; An airport maintenance electrician was working on a taxi guidance sign during daylight hours. The maintenance electrician did not verify the respective series lighting circuit and did not practice lockout/tagout. The maintenance staff thought the respective circuit was off but mistakenly identified the wrong circuit. The maintenance electrician went to work on the taxi sign and received electric shock and required medical attention. The maintenance electrician did survive this incident. This is another example of why it is important to verify all power sources, shut off and disconnect power to each respective constant current regulator AND disconnect each respective airfield lighting series circuit/cutout and lockout/tagout the respective circuits. During the daylight all of the series circuits could have been shut down and not affected airfield operations. The safety of personnel is the most important issue.

13. Situation 13; An airfield maintenance staff person was troubleshooting an airfield lighting series circuit. They were in communication with the Air Traff Control Tower (ATCT) staff and having them turn the circuit off. They were not practicing lockout/tagout of the circuit and were relying on the Air Traffic Control Tower staff to tell them when the circuit was off. They requested the ATCT to turn off the circuit and the ATCT person reported back the circuit was off. The circuit had not been turned off as reported and the maintenance person died due to electrocution while working of the circuit. The point to this is, never trust someone else to shut off and lockout a circuit. You need to shut off and lockout circuits for your protection and safety.

14. Situation 14; In May 2019, it was observed during a vault survey that all of the Type SCO series circuit cutouts were wired incorrectly. This was reported to the head maintenance electrician at the Airport. The head maintenance electrician took a serious interest in this situation and requested directions for correction. The head maintenance electrician informed us that the reason he became the head maintenance electrician was because his previous supervisor had been electrocuted and died while working on an airfield lighting series circuit.

15. Situation 15; it was a very hot day in July 2011. The heat index was reported to be 122 degrees F. The actual temperature was observed on a local thermometer as 113 degrees F. An electrical contractor was working on an airfield lighting series circuit. People on site including engineering staff and contractor staff were getting overheated and it was affecting their judgement. One of the electricians received a phone call about a friend of his that was also an electrician and that was working on another nearby job site. This electrician had been electrocuted and died on the job site. The point is that weather conditions can create unsafe working conditions, and this always needs to be considered for the safety of personnel.

16. Situation 16; Please note when electrical/mechanical equipment and/or materials are energized after installation, repairs, relocation, maintenance, servicing, or other applications there is a danger of arc flash, fire, or other unsafe conditions that might take place. When in the field observing work, stand clear of and do not look at electrical/mechanical equipment/materials when being turned on until it is confirmed to be safe and operating properly. Often during startups equipment can cause an arc flash, fire, or come apart due to defective components, incorrect wiring, failing or weakened components, incorrect application, or other factors that might affect the installation. This is a dangerous situation that can cause injury, fire, or death. Please make sure to always consider your safety and the safety of others. Many of these installations are restricted to qualified and authorized personnel only. Regardless of your qualifications you need to make sure your safety is always addressed.

17. Situation 17; When using a voltmeter to check if a circuit is live always check the meter first on a known live source to confirm the voltage meter is working properly. Many years ago, we (my supervisor at the time and myself) were working at a project site and were checking an electric service for the voltage and got no voltage reading on the voltmeter. We were pretty sure the service was active, so we checked again with a second voltmeter and got no voltage reading on the meter. We were not convinced this service was off and therefore checked it again with a third voltmeter and got no voltage reading on the meter. An electrician was on site, and we asked him about the service and he used his voltmeter and confirmed the service was active. We had three different voltage meters that all had bad batteries and were giving false readings. Never assume an electrical system is off unless you have confirmation the system is shut off and have checked it with a known working voltage meter. Additionally, if you are not comfortable or qualified to use a voltage meter, leave that task to those that are qualified. Regardless of your qualifications you need to make sure your safety is always addressed.

18. Situation 18; During an airport electrical vault survey, we observed a Type S-1 series circuit plug cutout wired to a 120 VAC Circuit for use as a primary disconnect to a 120 VAC to 480 VAC step-up transformer. This is an unacceptable and dangerous practice. The Airport maintenance staff noted that each time they try to shut off the transformer it blows up. When the cutout plug is removed it causes a line to neutral fault (short circuit between phase conductor and neutral) and an arc flash. This puts the personnel at risk of injury, burns, and harm. The series circuit

cutout in this application needs to be disconnected, removed, and replaced with a heavy duty 30 Amp, 240 VAC, 2 pole, safety switch suitable for the 120 VAC power application. Series circuit plug cutouts shall only be used on airfield lighting series circuits in accordance with the respective manufacturer's instructions.

19. Situation 19; An Airport Manager contacted us and noted the circuit breaker had tripped for their main runway lighting constant current regulator. This was during the summer on a day when the ambient temperature was 103 degrees Fahrenheit. It was suggested that they check the Airport Vault building fan to make sure it was operating properly. The Airport Manager confirmed the fan was operating. A few minutes later the Airport Manager called and noted that he discovered they had a filter on the intake air louver, and it was completely clogged with dirt. The Airport Manager noted they were not aware that this intake air louver included a filter and that it might not have been changed since the original installation of the Airport Vault building. Note it is important that constant current regulators have adequate air flow and cooling to accommodate proper operation. Confirm ventilation and cooling systems are in proper working order.

20. Situation 20; Two electricians were troubleshooting an airfield lighting series circuit. Both were experienced electricians with more than 30 years of experience each but had little knowledge and experience with constant current regulators. They put a 600 Volt rated voltmeter across the output terminals of the constant current regulator and blew up the meter. The electricians were not aware that the maximum output voltage for the 7.5 KW constant current regulator was over 1100 Volts. Neither electrician was harmed, but the voltage meter was destroyed. It is recommended to include an output voltage meter on constant current regulators for testing, maintenance, and troubleshooting purposes. This is an optional feature, not a standard feature, and therefore needs to be included with the specification for the respective regulator. Having an output voltage meter on the regulator identified would have helped avoid the unsafe condition that occurred.

21. Situation 21: An individual was surveying existing taxi guidance signs to help confirm the sign legends and existing electrical loads. As the individual approached the respective sign his boot lace got caught on an exposed ground rod and grounding electrode conductor. This caused the individual to trip and fall into a nearby ditch with rip rap. The individual injured his elbow and had to go to the Emergency room of a nearby hospital for treatment. The point to this is that the grounding for taxi guidance signs need to have a schedule 80 plastic conduit coordinated in the pad, located under the sign to accommodate the grounding electrode conductor and the ground rod needs to be buried below grade to help avoid tripping hazards and help avoid damage to the grounding system for the respective sign.

22. Situation 22: A General Contractor and engineering staff were called out to a pump station site due to the pump motor starters tripping off. The Electric Utility was at the project site along with the Electrical Contractor. The service to the pump station was a 240/120 VAC, 3 phase, 4 wire delta with a high leg. The weather was cold

and had been below freezing for several days and was below 0 degrees F at night for a few of the previous days. The Contractor thought that the motor starters had gone bad and prepared a change order to replace each motor starter. The voltage was measured as follows: Phase A to Ground: just over 500 Volts, Phase B (high leg) to ground: just over 800 Volts, and Phase C to ground: just over 500 Volts. The electric utility was unsure of what was causing the problems and the unusually high voltage readings for a 240/120 VAC, 3 phase, 4 wire service. It was observed that the ground rod for the electric service had been excavated and was reinstalled at an approximate 30-degree angle with about two-thirds of the ground rod exposed above grade. It did not appear that the ground rod extended below the frost line. The Engineer requested that the ground rod be installed properly such that the ground rod was driven vertically for the full ten feet of length and extended below the frost line. Upon correction of the ground rod installation the pump motor starters worked properly, and the voltage measurements were recorded again as follows: Phase A to Ground: approximately 125 Volts, Phase B (high leg) to ground: approximately 217 Volts, and Phase C to ground: approximately 125 Volts. This is a good example to justify the requirement that a grounding electrode system needs to be installed below the frost line to help establish a ground resistance that meets the requirements of the National Electrical Code.

23. Situation 23: While observing constant current regulator tests it was noticed that some of the taxiway constant current regulators had outputs currents at the B100 step (100 percent brightness step) that were considerably lower than the specified tolerance of 6.5 to 6.7 Amps. Some of the taxiway regulators had output currents of approximately 5.7 to 6.0 Amps at the B100 setting which corresponded to brightness levels of 40 to 60 percent. It was discovered that each of these constant current regulators were rated for 240 VAC input voltage, but the electric service to the Vault was 208/120 VAC. The lower input voltage of 208 VAC instead of 240 VAC had reduced the output on each constant current regulator to unacceptable brightness levels. The regulators each had input voltage tap settings and were corrected to 208 VAC input. After each CCR was reconnected for 208 VAC input power, the lighting output of each CCR at step B100 was increased to provide an output current closer to the nominal specified current of 6.6 Amps. It is important to have airfield lighting systems operating at the proper brightness levels to meet FAA requirements. Where runway and taxiway lighting fixtures are operating below acceptable tolerances it will affect the photometric output of the fixtures and adversely affect the safety of low visibility operations.

24. Situation 24: A new runway lighting system was being installed. Many of the days were considered unworkable due to rain, standing water and muddy site conditions at the project site. The Contractor performing the work had a good reputation and was known to be willing to work in site conditions that others would consider unworkable. The site conditions were muddy and unreasonable to work in. They were working on a conduit trench for a PAPI (Precision Approach Path Indicator), and the cable trencher sank and got stuck in the mud. During the process of trying to remove the cable trencher it nearly overturned. Often Contractors are pressured to get work done to meet Contract schedules and sometimes it results in working in

conditions that are considered unworkable or unsafe. It rained on approximately 22 of the 42 construction calendar days for the duration of this project. Regardless of a project schedule the safety of the personnel needs to be the priority on a project.

25. Situation 25: During a site visit at an Airport Vault, it was observed that the main runway high intensity regulator output current at step B5 was only 4.5 Amps corresponding to about 8 percent brightness instead of 100 percent brightness. It was during the summer and the Airport staff was going home before dark and was not aware of the reduced brightness level. It was reported to the Airport, and they commented that the runway lighting system was being checked each day and was working fine, and that they had received no complaints from pilots about the lighting. The Maintenance staff also noted the lighting system was working fine and offered to demonstrate their testing procedures using radio control. The Maintenance Manager and the Engineer went out on the Airfield to the MALSR (Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights) and clicked up the lighting system to the 100 percent brightness level. The Engineer commented that the MALSR appears to be working properly but the runway edge lighting was too dim. The Maintenance Manager commented that he was not aware that the MASLR and the runway edge lighting were two different systems. He noted that he usually just checked the MALSR and if it was good he thought the runway edge lighting was also good. The Engineer helped the Maintenance Manager troubleshoot the Runway lighting system and discovered that a circuit board had gone bad in the constant current regulator. The Airport had a spare circuit board on site and replaced the circuit board in the regulator. After repairs the CCR was then operating better and closer to the respective correct brightness levels for all five steps. It is important to understand the proper operation of airfield lighting systems, their power sources, and their control systems. Visual observations of airfield lighting systems need to accompany verification of properly operating constant current regulators and/or power sources. Where runway and taxiway lighting fixtures are operating below acceptable tolerances it will affect the photometric output of the fixtures and adversely affect the safety of low visibility operations.

SAFETY OF PERSONNEL IS THE PRIORITY ON THE JOB. PLEASE ALWAYS PRACTICE SAFETY PROCEDURES FOR THE PROTECTION OF PERSONNEL.

METHOD OF MEASUREMENT

125-4.1 Runway and taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR. Runway/taxiway signs will be measured by the number of each type and size installed as completed units, in place, ready for operation, and accepted by the RPR.

All lockout/tagout procedures to ensure and maintain safety of personnel will be considered incidental to the respective item of work for which it applies, and no additional compensation will be allowed.

The transformer base can and series isolation transformer, associated with the light fixture, sign, or other airfield lighting device, and slack cable to perform cable connections outside of the base can, will be considered incidental to the respective item for which it is required, and no additional compensation will be allowed.

Labeling, identification tags, nameplates, power source legends plates, and other identification for each airfield light fixture and/or airfield sign will be considered incidental to the respective airfield light fixture and/or airfield sign and no additional compensation will be allowed.

Testing the airfield lighting systems and the associated constant current regulator tests and cable tests will be considered incidental to the respective work item for which they are installed, and no additional compensation will be allowed.

Spare parts for the airport visual aid/airfield lighting system will be considered incidental to the respective airfield lighting system pay items and no additional compensation will be allowed.

Conduits, conduit nipples, conduit couplings, and other conduit fittings included with splice cans, junction structures, Navaid installations, base mounted airfield light fixtures, airfield signs, and/or other airfield fixtures, will be considered incidental to the respective item for which they are installed, and no additional compensation will be made.

Ground rods, grounding electrode conductors, connections, and associated grounding work included with airfield lights and/or airfield guidance signs will be considered incidental to the respective item for which they are installed, and no additional compensation will be made.

Ground resistance tests for the made electrode ground system at each airfield light fixture and/or airfield sign will be considered incidental to the respective airfield light fixture and/or airfield sign and no additional compensation will be allowed.

All temporary wiring will be considered incidental to the associated work for which it is necessary, and no additional compensation will be allowed.

Item AW800476 Remove Airfield Lighting will be paid for at the contract unit price bid price per lump sum for removal of the existing airfield lighting and/or airfield signs and associated electrical equipment and materials. This price and payment shall constitute full compensation for field verification of existing site conditions and power sources, disconnecting the respective power sources, removing the existing airfield signs, runway signs, taxiway signs, airfield lights, light bases, mounting stakes, transformers, foundations, transformer cans, splice cans, junction structures, junction boxes, handholes, and other electrical equipment enclosures, and associated bases, foundations, concrete pads, and support structures; for removal of conduits, ducts, and wiring associated with the respective items designated for removal; for removal of concrete and cleaning mounting stakes for light fixtures; for all excavating and backfilling; for furnishing all earth material; for all restoration work; and for furnishing all coordination, labor, tools, equipment, and incidentals necessary to complete this item of work.

BASIS OF PAYMENT

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

Removal work for existing airfield lighting and electrical equipment and materials will be paid for at the contract unit price bid price per lump sum. Said price and payment shall constitute full compensation for field verification of existing site conditions and power sources, disconnecting the respective power sources, removing existing airfield signs, runway signs, taxiway signs, airfield lights, transformers, light bases, transformer cans, splice cans, junction structures, junction boxes, handholes, and other electrical equipment enclosures, and associated bases, foundations, concrete pads, and support structures; for removal of conduits, ducts, and wiring associated with the respective items designated for removal; for removal of concrete and cleaning mounting stakes for light fixtures; for all excavating and backfilling; for furnishing all earth material; for all restoration work; and for furnishing all coordination, labor, tools, equipment, and incidentals necessary to complete this item of work.

Payment will be made under:

Item AW125442	Taxi Guidance Sign, 2 Character – per EACH
Item AW125443	Taxi Guidance Sign, 3 Character – per EACH
Item AW125444	Taxi Guidance Sign, 4 Character – per EACH
Item AW125445	Taxi Guidance Sign, 5 Character – per EACH
Item AW125447	Taxi Guidance Sign, 7 Character – per EACH
Item AW125515	HIRL, Base Mounted – per EACH
Item AW125525	HIRL, Inpavement – per EACH
Item AW125550	HI Threshold Light Base Mtd – per EACH
Item AW800476	Remove Airfield Lighting – per L. 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) Note: where FAA Advisory Circulars are referenced, they shall be the current issue or issues in effect.

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program and AC 150/5345-53D, AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM Appendix 3 Addendum (current issue in effect).
AC 150/5370-2	OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

Engineering Brief (EB)

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

American National Standards Institute

ANSI C80.1	Rigid Steel Conduit, Zinc Coated.
ANSI C80.4	Fittings Rigid Metal Conduit and EMT.

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
NFPA-70E	Standard for Electrical Safety in the Workplace

Occupational Safety and Health Administration

OSHA 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures.

Underwriters Laboratories (UL)

UL Standard 6 Electrical Rigid Metal Conduit – Steel

UL Standard 514B Conduit, Tubing, and Cable Fittings

UL Standard 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

UL Standard 467 Grounding and Bonding Equipment.

END OF ITEM L-125

APPENDIX A

DEC-Decatur Airport,
Decatur, Illinois

Reconstruct Runway 6/24 Lighting
& Airfield Guidance Signs

Cable and Constant Current Regulator
Testing Forms

Engineering Firm	Hanson Professional Services Inc.	**TESTING**
Airport Name	DEC-Decatur Airport	**FORMS**
Project	Reconstruct Runway 6/24 Lighting & airfield Guidance Signs	
Hanson Project	24A0105	
Date		

Prior to beginning excavations, airfield lighting modifications, cable installation, and/or any other work that might possibly affect airfield lighting circuits, all existing series circuit lighting cables in the areas of work shall be Megger tested with an insulation resistance tester and recorded at the respective airport electrical vault. The respective series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. The Contractor is responsible to employ the services of personnel qualified, familiar with, and trained to perform the respective tests, and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment. Please understand that airfield lighting series circuits are dangerous and only qualified personnel should be permitted to work on them and safety procedures need to be followed. National Electrical Code defines a Qualified Person as "***One who has the skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved."*** NFPA 70E - Standard for Electrical Safety in the Workplace defines a Qualified Person as "***One who has demonstrated skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk."*** OSHA (Occupational Safety and Health Administration), Part Number 1910 Occupational Safety and Health Standards, Subpart S, Electrical, Standard Number 1910.399 defines Qualified person as follows: "***Qualified person. One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved."*** Safety of personnel is the top priority. Follow safety procedures for all work. Only qualified and experienced personnel are permitted to work on airfield lighting series circuits.

Personnel shall coordinate work and any power outages with the Owner's Designated Representative(s). Any shutdown of existing systems should be scheduled with and approved by the Owner's Designated Representative(s) prior to shut down. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout). Where the facility is not equipped with lockout/tagout equipment the respective personnel will be responsible for providing the appropriate lockout/tagout equipment. Failure to shut down and lockout the circuit presents a dangerous hazard for personnel working on this system. Compliance with Lockout/Tagout Procedures and all other safety procedures and requirements are the responsibility of the respective personnel working at the facility.

Personnel are recommended to comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

Provide personnel protective equipment for all personnel working on or testing electrical systems suitable for the respective application. Provide protective equipment for personnel to keep them safe in the event of an arc flash or other electrical accident. Refer to NFPA 70E "Standard for Electrical Safety in the Workplace", Article 250 "Personal Safety and Protective Equipment" and "Informative Annex H Guidance on Selection of Protective Clothing and Other Personal Protective Equipment (PPE)" for additional information on personal protective equipment.

Insulation resistance testing equipment for use with 5,000 Volt series circuit cables shall use an insulation resistance tester capable of testing the cables at 5,000 Volts. New 5,000 Volt rated airfield lighting series circuit cables shall be tested at not less than 5,000 Volts. Existing older series circuit cables and/or cables in poor condition may require the test voltage to be performed at a voltage lower than 5,000 Volts to obtain an insulation resistance reading (Example 1,000 Volts, 500 Volts, or less than 500 Volts). Insulation resistance testing equipment often has the feature to adjust the test voltage corresponding to the condition of the cable. The respective test voltages shall be recorded for each cable insulation resistance test result. Measuring the cable insulation resistance of existing conductors/cables is important to document the condition of existing conductors/cables and help determine if there are existing hazards and/or unsafe conditions that will need to be addressed for protection of personnel.

Insulation resistance testing equipment for use with 600 Volt rated cables shall use a 500 Volt insulation resistance tester. The respective test voltage shall be recorded for each cable insulation resistance test result.

It is recommended to use the same insulation resistance test equipment throughout the project to ensure reliable comparative readings at the beginning of the project and at the completion of the project.

Disconnect the airfield lighting series circuit cables from the constant current regulator when performing cable insulation resistance tests (Megger Tests). Test the cables that go to the airfield for the respective airfield lighting series circuit. Connect the cable insulation resistance tester to one of the airfield lighting series circuit cables and to a good ground in the airport electrical vault such as the airport vault ground bus. Conduct the cable insulation resistance test on each respective cable for not less than 90 seconds. Record the test results at the end of the time duration for the test.

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FAA Advisory Circular 150/5340-26C Maintenance of Airport Visual Aid Facilities provides guidance on Insulation Resistance Tests. Also refer to the user manual for the respective cable insulation resistance tester. Reasonably new series circuit cables and transformers with good connections should read 500 Mega-Ohms to 1,000 Mega-Ohms or higher. The readings should decrease with age. The resistance value declines over the service life of the circuit; a 10-20 percent decline per year may be considered normal. A yearly decline of 50 percent (4 percent monthly) or greater indicates the existence of a problem, such as a high resistance ground, serious deterioration of the circuit insulation, lightning damage, bad connections, bad splices, cable insulation damage, or other failure. FAA Advisory Circular 150/5340-26C notes ***"Generally speaking, any circuit that measures less than 1 megohm is certainly destined for rapid failure."*** Airfield lighting series circuits with cable insulation readings of less than 1 megohm are not uncommon for older circuits that are 20 years or more of age.

The insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments shall not be less than 500 megohms at 5,000 Volts, at 90 seconds.

Based on information in FAA AC No. 150/5340-26C Maintenance of Airport Visual Aid Facilities, the cable insulation resistance value inevitably declines of the service life of the circuit; a 10-20 percent decline per year may be considered normal. In the event that the cable insulation resistance readings have declined more than 2 percent per month it might indicate cable damage due to lightning or damage as a result of Contractor operations. Where the cable insulation resistance readings have declined more than 2 percent per month over the project construction duration as a result of Contractor operations, Contractor will need to investigate, address, and repair the respective cable circuits.

Please beware, where the respective series circuit cable insulation resistance test voltage is less than the operating voltage of the circuit, the cable needs to be replaced and is considered very poor to dangerous condition. For example, if a 30 KW, 6.6 Amp circuit cable insulation resistance tests less than 1 Mega-ohm at 450 volts, this cable is considered very poor to dangerous condition. A 30 KW, 6.6 Amp constant current regulator may output 4500 Volts where it is loaded near capacity. A cable that tests less than the operating voltage is considered dangerous and in need of replacement. Where the cable insulation resistance test voltage is less than the cable insulation rating it is unacceptable for continued use. A 5,000 Volt rated series circuit conductor that needs to be suitable to operate and be tested at 5,000 Volts, also needs to be capable of being tested at 5,000 Volts. Anything less indicates the cable insulation is starting to fail and/or is in dangerous condition. Dangerous condition indicates lighting failures,

ground faults, transformer failures, bad connections, unsafe conditions, risk of electric shock, injury and/or death, and other failure conditions can be expected or presently exist. Personnel are at risk of electric shock, injury, and death when on the airfield areas that contain the lighting systems, when the lighting systems are in operation. The airfield lighting series circuit cables are unsafe, and that being near them with standing water on the ground could be life-threatening. Caution needs to be exercised when working on or around these circuits. The airfield lighting series circuits are considered to be in such bad condition that they are a safety hazard to personnel working on the airfield, and safety measures need to be performed when working around these circuits. These circuits need immediate replacement. The respective lighting system can be expected to fail at any time.

SAFETY OF PERSONNEL MUST BE AND IS THE PRIORITY. When the airfield lighting circuits become dangerous, they need to be replaced immediately to help protect the pilots, airport staff, maintenance personnel, contractors, the public, and others that use or visit the airport.

All existing series circuit cable loops shall also have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. The resistance of the series circuit loop with connections using #8 AWG copper conductor should be approximately 0.8 to 1 Ohm per thousand feet of cable length. The resistance of the series circuit loop with connections using #6 AWG copper conductor should be approximately 0.5 to 0.7 Ohm per thousand feet of cable length. The number of series circuit transformers and connections will affect the overall resistance of the series circuit loop and therefore the measurements might be slightly higher than the calculated resistance for the respective length of cable.

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__Record the date for the respective tests.

__ Record the manufacture and model number of the insulation resistance tester used for the Megger tests. Note: it is recommended to use the same insulation resistance tester again after airfield lighting modifications, additions, and/or upgrades have been completed.

__ Record the manufacture and model number of the Ohmmeter used to measure resistance of each series circuit cable loop. Note: it is recommended to use the same Ohmmeter again after airfield lighting modifications, additions, and/or upgrades have been completed.

__ Record the manufacture and model number of the Ammeter used to measure current. Note: it is recommended to use the same Ammeter again after airfield lighting modifications, additions, and/or upgrades have been completed.

__Record personnel conducting tests.

__Record personnel observing tests.

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__ For each respective circuit conduct cable insulation resistance test (Megger test) at the vault and record test results. Time duration of test should not be less than 90 seconds.

Cable Under Test	Cable Insulation Resistance	Test Voltage	Time Duration
Runway 6-24 series circuit cable			
Runway 18-36 series circuit cable			
Runway 12-30 series circuit cable			
Taxiway A-South series circuit cable			
Taxiway F series circuit cable			
Taxiway G-East series circuit cable			
Taxiway A-North series circuit cable			
Taxiway G-Center series circuit cable			
Taxiway G-West series circuit cable			

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__ Each respective lighting series circuit cable loop shall have the resistance tested and recorded at the vault. Use an Ohmmeter and measure the resistance of the series circuit loop at the Vault.

Cable Under Test	**Series Circuit Loop Resistance in Ohms**
Runway 6-24 series circuit cable	
Runway 18-36 series circuit cable	
Runway 12-30 series circuit cable	
Taxiway A-South series circuit cable	
Taxiway F series circuit cable	
Taxiway G-East series circuit cable	
Taxiway A-North series circuit cable	
Taxiway G-Center series circuit cable	
Taxiway G-West series circuit cable	

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Tests for constant current regulators shall include the following.

1. The respective personnel performing airfield lighting work, vault work, and/or tests shall be familiar with and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment.

2. Prior to conducting tests confirm each constant current regulator has a good and secure frame ground connection to the vault grounding electrode system. The constant current regulator frame ground shall be a minimum #6 AWG copper conductor and UL listed grounding connectors with secure and tight connections. Correct where missing. Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system.

3. Prior to conducting tests confirm each series circuit cutout enclosure is grounded properly. Each cutout enclosure shall have a #6 AWG (minimum) equipment ground wire with the 6.6 Amp output series circuit conductors from the respective constant current regulator to the respective cutout enclosure. Each cutout enclosure shall have a #6 AWG (minimum) equipment ground wire with the 20 Amp output series circuit conductors from the respective constant current regulator to the respective cutout enclosure. Bond the equipment ground wire to the constant current regulator frame and the cutout enclosure frame. Cutout enclosures are required to be grounded and bonded per National Electrical Code Article 250.4 “General Requirements for Grounding and Bonding”. Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system. Correct where missing.

4. The respective personnel performing tests shall be familiar with the respective test equipment and the use and operation of the test equipment. The Contractor is responsible to employ the services of personnel qualified to perform the respective tests and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment.

5. Test each brightness step and measure and record the input current on Phase A and Phase B for the 240 VAC branch circuit to each CCR. Note: Provide a True RMS Ammeter for current measurements.

6. Test each brightness step and record the CCR output current to the series circuit lighting. Each CCR should be equipped with an output current meter. In the event the output current meter is not working properly or is out of calibration use a True RMS Ammeter for output current measurements and measure the current in the output series circuit conductor.

7. Test each brightness step and record the CCR output voltage for the series circuit lighting. Each CCR should be equipped with an output voltage meter. Where the CCR does not include an output voltage meter, the output voltage measurements are not required. Do not use a 0 to 600 Volt voltmeter to measure voltage across the CCR output terminals due to safety concerns and high voltages at the CCR output.

8. Note that some of the existing airfield lighting series circuits have been observed to be in very poor to dangerous condition and might not be operational. If this is the case, note this in the respective test forms.

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #1 Runway 6-24 Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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__ Test CCR #1 Runway 6-24 Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #2 Runway 18-36 Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #2 Runway 18-36 Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #3 Runway 18-36 Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #3 Runway 18-36 Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #4 Runway 12-30 Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #4 Runway 12-30 Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #5 Runway 12-30 Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #5 Runway 12-30 Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #6 Taxiway A-South Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #6 Taxiway A-South Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #7 Taxiway A-South Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #7 Taxiway A-South Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #8 Taxiway F Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #8 Taxiway F Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #9 Taxiway F Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #9 Taxiway F Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #10 Taxiway G-East Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #10 Taxiway G-East Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #11 Taxiway G-East Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #11 Taxiway G-East Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #12 Taxiway A-North Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #12 Taxiway A-North Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #13 Taxiway A-North Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #13 Taxiway A-North Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #14 Runway 6-24 Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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__ Test CCR #14 Runway 6-24 Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #15 Taxiway G-Center Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #15 Taxiway G-Center Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #16 Taxiway G-Center Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #16 Taxiway G-Center Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #17 Taxiway G-West Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #17 Taxiway G-West Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #18 Taxiway G-West Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #18 Taxiway G-West Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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After airfield lighting modifications, additions, and/or upgrades have been completed, series circuit cables shall be Megger tested with an insulation resistance tester and recorded at the vault. All series circuit cable loops shall have the resistance measured with an Ohmmeter and recorded for each circuit at the vault. Each constant current regulator shall be tested with results recorded. Record the date for the respective tests.

__ Record the manufacture and model number of the insulation resistance tester used for the Megger tests.

__ Record the manufacture and model number of the Ohmmeter used to measure resistance of each series circuit cable loop.

__ Record the manufacture and model number of the Ammeter used to measure current. Note: it is recommended to use the same Ammeter again after airfield lighting modifications, additions, and/or upgrades have been completed.

__Record personnel conducting tests.

__Record personnel observing tests.

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__ After airfield lighting modifications, additions, and/or upgrades have been completed, conduct cable insulation resistance test (Megger test) for each respective circuit at the vault and record test results. Time duration of test should not be less than 90 seconds.

Cable Under Test	Cable Insulation Resistance	Test Voltage	Time Duration
Runway 6-24 series circuit cable			
Runway 18-36 series circuit cable			
Runway 12-30 series circuit cable			
Taxiway A-South series circuit cable			
Taxiway F series circuit cable			
Taxiway G-East series circuit cable			
Taxiway A-North series circuit cable			
Taxiway G-Center series circuit cable			
Taxiway G-West series circuit cable			

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__ After airfield lighting modifications, additions, and/or upgrades have been completed, each respective lighting series circuit cable loop shall have the resistance tested and recorded at the vault. Use an Ohmmeter and measure the resistance of the series circuit loop at the Vault.

Cable Under Test	**Series Circuit Loop Resistance in Ohms**
Runway 6-24 series circuit cable	
Runway 18-36 series circuit cable	
Runway 12-30 series circuit cable	
Taxiway A-South series circuit cable	
Taxiway F series circuit cable	
Taxiway G-East series circuit cable	
Taxiway A-North series circuit cable	
Taxiway G-Center series circuit cable	
Taxiway G-West series circuit cable	

Tests for constant current regulators shall include the following.

1. The respective personnel performing airfield lighting work, vault work, and/or tests shall be familiar with and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment.

2. Prior to conducting tests confirm each constant current regulator has a good and secure frame ground connection to the vault grounding electrode system. The constant current regulator frame ground shall be a minimum #6 AWG copper conductor and UL listed grounding connectors with secure and tight connections. Correct where missing. Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system.

3. Prior to conducting tests confirm each series circuit cutout enclosure is grounded properly. Each cutout enclosure shall have a #6 AWG (minimum) equipment ground wire with the 6.6 Amp output series circuit conductors from the respective constant current regulator to the respective cutout enclosure. Each cutout enclosure shall have a #6 AWG (minimum) equipment ground wire with the 20 Amp output series circuit conductors from the respective constant current regulator to the respective cutout enclosure. Bond the equipment ground wire to the constant current regulator frame and the cutout enclosure frame. Cutout enclosures are required to be grounded and bonded per National Electrical Code Article 250.4 “General Requirements for Grounding and Bonding”. Failure to properly ground this equipment presents a dangerous hazard for personnel working on this system. Correct where missing.

4. The respective personnel performing tests shall be familiar with the respective test equipment and the use and operation of the test equipment. The Contractor is responsible to employ the services of personnel qualified to perform the respective tests and qualified to work on 5000 Volt airfield lighting series circuits, constant current regulators, and associated airport electrical vault equipment.

5. Test each brightness step and measure and record the input current on Phase A and Phase B for the 240 VAC branch circuit to each CCR. Note: Provide a True RMS Ammeter for current measurements.

6. Test each brightness step and record the CCR output current to the series circuit lighting circuit. Each CCR should be equipped with an output current meter. In the event the output current meter is not working properly or is out of calibration use a True RMS Ammeter for output current measurements and measure the current in the output series circuit conductor.

7. Test each brightness step and record the CCR output voltage for the series circuit lighting circuit. Each CCR should be equipped with an output voltage meter. Where the CCR does not include an output voltage meter, the output voltage measurements are not required. Do not use a 0 to 600 Volt voltmeter to measure voltage across the CCR output terminals due to safety concerns and high voltages at the CCR output.

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #1 Runway 6-24 Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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__ Test CCR #1 Runway 6-24 Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #2 Runway 18-36 Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #2 Runway 18-36 Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #3 Runway 18-36 Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #3 Runway 18-36 Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #4 Runway 12-30 Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #4 Runway 12-30 Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

Engineering Firm	Hanson Professional Services Inc.	**TESTING**
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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #5 Runway 12-30 Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #5 Runway 12-30 Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #6 Taxiway A-South Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #6 Taxiway A-South Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #7 Taxiway A-South Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #7 Taxiway A-South Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

Engineering Firm	Hanson Professional Services Inc.	**TESTING**
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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #8 Taxiway F Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #8 Taxiway F Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

Engineering Firm	Hanson Professional Services Inc.	**TESTING**
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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #9 Taxiway F Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #9 Taxiway F Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #10 Taxiway G-East Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #10 Taxiway G-East Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #11 Taxiway G-East Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #11 Taxiway G-East Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #12 Taxiway A-North Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #12 Taxiway A-North Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #13 Taxiway A-North Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #13 Taxiway A-North Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #14 Runway 6-24 Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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__ Test CCR #14 Runway 6-24 Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B1	Phase A:		
	Phase B:		
B2	Phase A:		
	Phase B:		
B3	Phase A:		
	Phase B:		
B4	Phase A:		
	Phase B:		
B5	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #15 Taxiway G-Center Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #15 Taxiway G-Center Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #16 Taxiway G-Center Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #16 Taxiway G-Center Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #17 Taxiway G-West Primary Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #17 Taxiway G-West Primary Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

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Note: Provide a True RMS Ammeter for current measurements. Note Output voltage measurements are not required for constant current regulators that do not include an output voltage meter.

__ Test CCR #18 Taxiway G-West Spare Unit by Manual Control and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		

__ Test CCR #18 Taxiway G-West Spare Unit in remote mode by airfield lighting control system and record input current and output current at each step.

STEP	INPUT CURRENT	OUTPUT CURRENT	OUTPUT VOLTS
B10	Phase A:		
	Phase B:		
B30	Phase A:		
	Phase B:		
B100	Phase A:		
	Phase B:		