



December 10, 2020

CANCELLATION NOTICE OF THE REGULAR MEETING  
AND  
CALL AND NOTICE OF A SPECIAL MEETING OF THE  
OPERATIONS AND DEVELOPMENT COMMITTEE  
OF THE  
BURBANK-GLENDALE-PASADENA AIRPORT AUTHORITY

The regular meeting of the Operations and Development Committee scheduled for Monday, December 21, 2020, at 8:30 a.m., in the Airport Skyroom of Hollywood Burbank Airport, 2627 N. Hollywood Way, Burbank, California 91505 has been cancelled.

NOTICE is hereby given that a special meeting of the Operations and Development Committee will be held Monday, December 14, 2020, at 8:30 a.m., in the Airport Skyroom of Hollywood Burbank Airport, 2627 N. Hollywood Way, Burbank, California 91505.

Pursuant to Governor Newsom's Executive Order N-29-20, members of the Commission or staff may participate in this meeting via teleconference. In the interest of maintaining appropriate social distancing, members of the public may observe and participate in the meeting telephonically through the following number:

Dial In: (978) 990-5000

Access Code: 880737#

A handwritten signature in blue ink, reading "Terri Williams".

Terri Williams, Board Secretary  
Burbank-Glendale-Pasadena Airport Authority

SPECIAL MEETING  
OF THE  
OPERATIONS AND DEVELOPMENT COMMITTEE  
Airport Skyroom  
Monday, December 14, 2020  
8:30 a.m.

*The public comment period is the opportunity for members of the public to address the Committee on agenda items and on airport-related non-agenda matters that are within the Committee's subject matter jurisdiction. At the discretion of the presiding officer, public comment on an agenda item may be presented when that item is reached*

*Members of the public are requested to observe the following decorum when attending or participating in meetings of the Committee:*

- *Turn off cellular telephones and pagers.*
- *Refrain from disorderly or boisterous conduct, including loud, threatening, profane, or abusive language, clapping, whistling, stamping, or other acts that disrupt or otherwise render unfeasible the orderly conduct of the meeting.*
- *If you desire to address the Committee during the public comment period, fill out a speaker request card and present it to the Board Secretary.*
- *Confine remarks to agenda items or to airport-related non-agenda matters that are within the Committee's subject matter jurisdiction.*
- *Limit comments to five minutes or to such other period of time as may be specified by the presiding officer.*



*The following activities are prohibited:*

- *Allocation of speaker time to another person.*
- *Video presentations requiring use of Authority equipment.*



*Any disclosable public records related to an open session item on a regular meeting agenda and distributed by the Authority to the Committee less than 72 hours prior to that meeting are available for public inspection at Hollywood Burbank Airport (2627 N. Hollywood Way, Burbank) in the administrative office during normal business hours.*



*In accordance with the Americans with Disabilities Act of 1990, if you require a disability-related modification or accommodation to attend or participate in this meeting, including auxiliary aids or services, please call the Board Secretary at (818) 840-8840 at least 48 hours prior to the meeting.*

## A G E N D A

Monday, December 14, 2020

1. Approval of Agenda

2. Public Comment

3. Approval of Minutes

a. November 16, 2020

**[See page 1]**

4. Contracts and Leases

a. Award of Contract for Airfield Lighting Electrical Inspection, Testing, and On-Call Repair Services

- Staff report attached

**[See page 3]**

***Staff seeks an Operations and Development Committee recommendation to the Commission to award a contract for a two-year period in the amount of \$43,300 per year to Vellutini Corporation dba Royal Electric Company for quarterly airfield lighting testing and inspection services. The agreement includes two one-year extension options with an allowable 3% increase for each extension year. This contract also includes rates for on-call repair and emergency services if needed.***

5. Items for Information

a. Committee Pending Items

**[See page 6]**

6. Adjournment

**MINUTES OF THE REGULAR MEETING OF THE  
OPERATIONS AND DEVELOPMENT COMMITTEE  
BURBANK-GLENDALE-PASADENA AIRPORT AUTHORITY**

**MONDAY, NOVEMBER 16, 2020**

A regular meeting of the Operations and Development Committee was called to order on this date in the Airport Skyroom, 2627 N. Hollywood Way, Burbank, California, at 8:32 a.m., by Commissioner Devine.

**ROLL CALL**

**Present:** Commissioners Brown, Devine (via teleconference) and Kennedy (via teleconference)

**Absent:** None

**Also Present:** Staff: Frank Miller, Executive Director; John Hatanaka, Senior Deputy Executive Director; Anthony DeFrenza, Director of Engineering and Maintenance; Tom Janowitz, Sr. Manager, Ground Access

**1. Approval of Agenda** The agenda was approved as submitted.

**2. Public Comment** There were no public comments.

**3. Approval of Minutes**

**a. October 19, 2020** Commissioner Kennedy (via teleconference) moved approval of the minutes of the October 19, 2020 meeting seconded by Commissioner Brown. There being no objection, a voice vote was taken to accommodate those participating via teleconference. The motion was approved (3-0).

**4. Contracts and Leases**

**a. Design Services- Replacement Airfield Lighting Vault** Staff sought a Committee recommendation to the Commission to resume design services for the replacement Airfield Lighting Vault under the terms of an existing Professional Services Agreement with Lean Engineering and authorize the Executive Director to issue a new notice to proceed.

The Commission approved the award of the Agreement to Lean on February 18, 2020. The design had advanced to approximately 30% when, on March 30, 2020, due to the impacts of the COVID-19 pandemic and the uncertainty of available Airport Improvement Program federal funding or Passenger

Facility Charge revenues, Staff issued Lean a notice to suspend activities.

**Motion**

Commissioner Kennedy (via teleconference) moved approval of Staff's recommendation, seconded by Commissioner Brown.

**Motion Approved**

There being no objection, a voice vote was taken to accommodate those participating via teleconference. The motion was approved (3-0).

**b. Transit Systems UNLTD., INC. Contract**

Staff sought a Committee recommendation to the Commission to award a Professional Services Agreement to Transit Systems Unltd., Inc, for on-call parking shuttle bus service and emergency transport service and authorize the President to execute the same.

Transit Systems was amenable to entering into a one-year agreement for services that would be available on an on-call basis in the event remote passenger and employee parking operations are resumed or emergency transport of passengers is needed. The contract period will be November 16, 2020, to November 15, 2021.

**Motion**

Commissioner Brown moved approval of Staff's recommendation, seconded by Commissioner Kennedy (via teleconference).

**Motion Approved**

There being no objection, a voice vote was taken to accommodate those participating via teleconference. The motion was approved (3-0).

**5. Items for Information**

**a. Committee Pending Items**

Staff informed the Committee of future pending items that will come to the Committee for review.

**6. Adjournment**

There being no further business, the meeting adjourned at 8:50 a.m.

**STAFF REPORT PRESENTED TO THE  
BURBANK-GLENDALE-PASADENA AIRPORT AUTHORITY  
OPERATIONS AND DEVELOPMENT COMMITTEE  
DECEMBER 14, 2020**

**AWARD OF CONTRACT FOR AIRFIELD LIGHTING ELECTRICAL INSPECTION,  
TESTING, AND ON-CALL REPAIR SERVICES**

**SUMMARY**

Staff seeks an Operations and Development Committee ("Committee") recommendation to the Commission to award a contract, copy attached, for a two-year period in the amount of \$43,300 per year to Vellutini Corporation dba Royal Electric Company ("Royal Electric") for quarterly airfield lighting testing and inspection services. The agreement includes two one-year extension options with an allowable 3% increase for each extension year. This contract also includes rates for on-call repair and emergency services if needed.

**BACKGROUND**

In January 2019, the Commission awarded a two-year contract to Royal Electric for monthly testing and inspection services of the airfield lighting system at a cost of \$156,621 annually. The existing agreement expires on January 31, 2021.

An operational airfield lighting system is critical to the success and safety of the airport's daily operations. The FAA provides detailed guidance on best practices associated with testing and inspection, and with preventative maintenance activities, for different components of a typical airport's airfield lighting system. While the Authority's Maintenance Department provides the preventative maintenance and undertakes certain necessary repairs to the airfield lighting system, Staff believes that continuing the services of a qualified electrical contractor that has expertise with airfield lighting systems will ensure stricter compliance with recommendations that are issued by the FAA as well as improve the reliability and longevity of the existing system.

In addition to services for the testing and inspection of the airfield lighting system at Hollywood Burbank Airport, Royal Electric is the provider of similar services to Los Angeles World Airports.

**PROJECT DETAILS**

The scope of the proposed services was originally developed with the support of the engineering consulting firm Mead & Hunt, which has the expertise and significant experience in airfield lighting testing, inspection, and preventative maintenance programs. The Authority's engineering and maintenance department defined the proposed testing and inspection scope based on the Mead & Hunt recommendations. The original scope and services were closely monitored over the last two years and the proposed new agreement incorporates additional refinements based on Staff's observations and input from Royal Electric.

On-staff maintenance electricians have overseen the testing and inspection services provided by Royal Electric under the existing agreement and gradually incorporated the monthly services into their regular preventative maintenance work schedules. As such, the proposed new contract with Royal Electric reduces the frequency of the scheduled visits from monthly to quarterly. Additionally, the annual check of obstruction lights was removed

from the contract scope and will be completed by on-staff electricians.

As with the original contract award, improving implementation of the FAA guidance is a primary reason to obtain these services. In addition, Staff strongly believes it is prudent to have a qualified electrical contractor with expertise in airfield lighting systems that is intimately familiar with the Authority's airfield lighting system on an on-call basis in the event unexpected issues or an emergency arises. The proposed on-call labor and equipment rates provide for such service if needed.

### PROCUREMENT

In 2018 an RFP was posted soliciting proposals from qualified firms to provide the defined testing, inspection, and on-call repair services. Only Royal Electric submitted a response.

Having received only one qualified response, Staff entered into scope and price negotiations similar to the process recommended by the FAA's advisory circular for Qualifications Based Selection on Engineering and Architectural projects in the hopes that the parties could reach an agreement.

Those negotiations resulted in the existing agreement which is scheduled to expire on January 31, 2021. In November 2020, Staff initiated discussions with Royal Electric on the scope, pricing and terms for a proposed future agreement.

Royal Electric's satisfactory performance under the terms of the existing agreement, its unique specialty and extensive experience with airfield lighting systems, and its familiarity with Hollywood Burbank Airport's airfield lighting system culminated in the proposed agreement.

### OPERATIONS IMPACTS

The quarterly testing and inspection work will be scheduled in advance and tasks will be coordinated with the Authority's maintenance and operations departments as well as the Air Traffic Control Tower to not impact airport operations.

### ENVIRONMENTAL REVIEW

Staff has reviewed the California Environmental Quality Act guidelines regarding exemptions applicable to this work and determined that this work is exempt pursuant to the Class 1 categorical exemption (14 C.C.R. § 15301). Among other things, that exemption covers rehabilitation of deteriorated facilities to meet current standards of public health and safety in situations where damage is not substantial and has not resulted from an environmental hazard.

### BUDGET IMPACTS

The Adopted FY 2021 Budget includes appropriations for this work at \$150,000.

### STAFF RECOMMENDATION

Staff seeks a Committee recommendation to the Commission to award a contract in the amount of \$86,600 to Vellutini Corporation dba Royal Electric Corporation for the defined airfield lighting testing, inspection, and on-call repair services for a two-year base period with two one-year extension options and authorize the President to execute the same. For the two-year base period the agreement will have an annual cost of \$43,300 for the testing and inspection services.

**AIRFIELD LIGHTING SYSTEM  
PROFESSIONAL SERVICES AGREEMENT**

(Burbank-Glendale-Pasadena Airport Authority/Vellutini Corporation dba Royal Electric Company)

THIS AIRFIELD LIGHTING SYSTEM PROFESSIONAL SERVICES AGREEMENT (“Agreement”) is dated \_\_\_\_\_ for reference purposes and is executed by the Burbank-Glendale-Pasadena Airport Authority (“Authority”), a California joint powers agency, and Vellutini Corporation dba Royal Electric Company (“Contractor”), a California Corporation. Contractor’s CSLB license number is 357377. Contractor’s DIR registration number is 1000000111.

**R E C I T A L S**

A. The Authority owns and operates the Bob Hope Airport (commonly known as Hollywood Burbank Airport) (“Airport”) and desires to retain Contractor as an independent contractor to provide the following professional services: airfield lighting system inspection, testing, and on-call repair services.

B. Contractor represents that it is fully qualified to perform such work by virtue of the training and experience of its personnel.

**NOW, THEREFORE**, the parties agree as follows:

**1. Definitions.** In addition to the terms defined above, the following definitions shall apply for purposes of this Agreement:

A. “ADR”: Airport Designated Representative.

B. “Advisory Circular”: Federal Aviation Administration Advisory Circular 150/5340-26C Maintenance of Airport Visual Aid Facilities set forth in the attached Exhibit C (or any later edition).

C. “Base Contract Amount: \$86,600.00

D. “Commencement Date”: February 1, 2021.

E. “Executive Director”: Frank R. Miller or a duly authorized designee.

F. “Expiration Date”: means January 31, 2023 unless extended as provided below.

G. “Federal Requirements” the federal requirements set forth in the attached Exhibit G, which requirements are applicable to projects not funded by an Airport Improvement Program grant from the Federal Aviation Administration.

H. “Fee Schedule”: the fee schedule set forth in the attached Exhibit F.

I. “General Provisions and Special Provisions”: the general provisions and special provisions set forth in the attached Exhibit H.

J. “Indemnitees”: the Authority, TBI Airport Management, Inc., the Cities of Burbank, Glendale and Pasadena, and the respective officers, agents, employees and volunteers of each such entity.

J. K. “Labor Code Requirements”: the Labor Code requirements set forth in the attached Exhibit

L. “On-Call Repair Services”: airfield lighting system repair services performed pursuant to a Task Order.

M. “Preventive Maintenance Inspection Schedule”: the preventive maintenance schedule set forth in the attached Exhibit B.

N. “Scheduled Inspection/Testing Services”: quarterly, semi-annual, and annual checks of the airfield lighting system.

O. “Services”: the Scheduled Inspection/Testing Services and the On-Call Repair Services specified in the attached Exhibit A.

P. “Task Order”: a written work order, in the form set forth in the attached Exhibit K that specifies an On-Call Repair Services assignment to be performed by Contractor.

Q. “Wildlife Hazard Management Plan”: the wildlife hazard management plan set forth in the attached Exhibit I.

## **2. Services.**

A. Contractor shall perform the Services in a timely, regular basis in accordance with the Authority’s rules for the Airport, the General Provisions and Special Provisions, the Federal Requirements, the Wildlife Hazard Management Plan, the Advisory Circular, and applicable laws. Contractor shall provide all labor, equipment, supplies and materials as required for the performance of the Services. Time is of the essence in the performance of this Agreement.

B. Contractor shall perform the Scheduled Inspection/Testing Services in accordance with the Preventive Maintenance Schedule. Contractor shall perform the On-Call Repair Services on a Task Order basis. Each Task Order shall be executed and dated by the ADR and Contractor prior to Contractor’s commencement of work on the project. Task Orders shall be numbered sequentially and shall be subject to all terms and conditions of this Agreement.

C. Contractor shall perform all work to the highest professional standards and in a manner reasonably satisfactory to the Authority. Contractor shall consult the ADR for any decisions that must be made by the Authority. Contractor shall promptly notify the ADR of any unsafe condition that Contractor discovers at the Airport.

D. In the event any claim is brought against the Authority relating to Contractor’s performance of the Services, Contractor shall provide any reasonable assistance and cooperation that the Authority might require.

## **3. Term.**

A. This Agreement shall commence on the Commencement Date and shall expire on the Expiration Date unless extended or earlier terminated as provided below.

B. The Authority shall have two options by which it may extend the term of this Agreement by one year at a time in its sole discretion. The extension options may be exercised sequentially or concurrently. To exercise an extension option, the Authority shall give written notice to Contractor at least 30 days prior to the then-scheduled Expiration Date.

C. If Contractor breaches this Agreement and fails to cure such breach within seven days of written notice from the ADR, then the Authority may immediately terminate this Agreement for cause. Either party may terminate this Agreement for convenience upon 15 days prior written notice to the other party.

#### **4. Compensation.**

A. The Authority shall compensate Contractor for performance of the Services, and Contractor agrees to accept as full satisfaction for such work, payment according to the Fee Schedule. In no event shall the compensation payable to Contractor under this Agreement for the Scheduled Inspection/Testing Services exceed the Base Contract Amount.

B. Contractor shall submit invoices to the Authority for the Services. Each invoice shall itemize the work performed during the billing period and the amount due. Within 10 business days of receipt of each invoice, the Authority shall notify Contractor in writing of any disputed amounts on the invoice. Within 30 calendar days of receipt of each invoice, the Authority shall pay all undisputed amounts on the invoice. The Authority shall not withhold applicable taxes or other authorized deductions from the payments, and Contractor shall pay all required taxes on the payments.

C. With each extension option exercised by the Authority, Contractor may request a 3% increase of the rates in the Fee Schedule for that extension period. Such requests shall be subject to approval by the Authority Commission, which approval shall not be unreasonably denied.

**5. Payment Bond.** In accordance with Civil Code Section 9550, prior to commencement of the Services, Contractor shall provide the Authority with a payment bond in the amount of the Base Contract Amount. Such bond must be issued by a California admitted surety insurer having a rating of not less than A:X in A.M. Best's Insurance Guide and must be on a form acceptable to the Authority.

**6. Prevailing Wage Acknowledgement.** The Authority and Contractor acknowledge that the Services are a "public works project" within the scope of the Prevailing Wage Law (Labor Code Section 1720 et seq.). Contractor shall comply with the Labor Code Requirements.

**7. Independent Contractor Status.** Contractor is and shall at all times remain as to the Authority, an independent contractor. Contractor shall have no power to incur any debt, obligation, or liability on behalf of the Authority or to act otherwise on behalf of the Authority as an agent. Neither the Authority nor any of its officers, employees, agents or volunteers shall have control over the conduct of Contractor except as set forth in this Agreement.

**8. Work Product Ownership.** All reports, documents, or other written material developed by Contractor in the performance of this Agreement shall be and remain the property of the Authority without limitation upon use or dissemination by the Authority.

**9. Confidentiality.** Contractor shall preserve the confidentiality of all nonpublic data, documents, discussion, or other information that is developed or received by it in connection with this Agreement.

Contractor shall not disclose such information without the prior written authorization of the Executive Director. Upon request, all Authority data shall be returned to the Authority at expiration or termination of this Agreement. Contractor's obligations under this section shall survive expiration or termination of this Agreement.

**10. Conflict of Interest.** Contractor shall not maintain or acquire any financial interest that may be affected by the Services. Contractor shall avoid the appearance of having any financial interest that would conflict in any manner with the Services.

**11. Indemnification.**

A. Contractor shall defend, hold harmless, and indemnify the Indemnitees from and against any actual, alleged, or threatened causes of action, claims, costs, damages, demands, expenses (including fees of accountants, attorneys, and other professionals), judgments, liens, losses, penalties, and proceedings of any nature whatsoever (collectively, "Liabilities") that arise out of the acts or omissions of Contractor or its subcontractors in connection with this Agreement.

B. Contractor's obligations under this section shall survive expiration or termination of this Agreement and shall apply regardless of whether or not any insurance policies are determined to be applicable to the Liabilities.

C. Contractor's obligations under this section shall apply, without limitation, to Liabilities that partially involve active or passive negligence by the Authority. However, Contractor's obligations under this section shall not apply to Liabilities that arise from the sole negligence or willful misconduct of the Authority, as determined by final arbitration or court decision or by consensus of the parties.

**12. Insurance.** Without limiting Contractor's defense, hold harmless, and indemnification obligations under this Agreement, Contractor shall maintain policies of insurance as specified in the General Provisions and Special Provisions.

**13. Suspension.** The ADR may suspend all or any part of the Services for the Authority's convenience or for work stoppages beyond the control of the parties. Written notice of a suspension shall be given to Contractor.

**14. Notices.** Any notices, invoices, or other documents related to this Agreement shall be deemed received on: (a) the day of delivery, if delivered by hand during the receiving party's regular business hours or by e-mail before or during the receiving party's regular business hours; (b) the business day after delivery, if delivered by e-mail after the receiving party's regular business hours; or (c) on the second business day following deposit in the United States mail, postage prepaid, to the addresses listed below, or to such other addresses as the parties may, from time to time, designate in writing.

**Authority**

Burbank-Glendale-Pasadena Airport Authority  
2627 Hollywood Way  
Burbank, CA 91505  
Attn: Anthony Defrenza, Director,  
Engineering and Maintenance  
E-mail: adefrenza@bur.org

**Contractor**

Vellutini Corporation dba Royal Electric Co.  
8481 Carbide Court  
Sacramento, CA 95828  
Attn: Randy Sondreal  
Regional Manager  
E-mail: randys@royalelect.com

**15. Assignability.** Contractor shall not assign, transfer or subcontract any interest in this Agreement or the performance of any of its obligations without the Executive Director's prior written consent. This prohibition is not intended to preclude, and shall not be interpreted as precluding, Contractor from utilizing subcontractors identified in Contractor's proposal for the Services. Any attempt by Contractor to assign, transfer or subcontract any rights, duties or obligations in violation of this prohibition shall be void.

**16. Litigation.** In the event that either party shall commence legal action to enforce or interpret this Agreement, the prevailing party shall be entitled to recover its costs of suit including reasonable attorneys' fees. The venue for litigation shall be Los Angeles County, California. The interpretation of this Agreement shall not be resolved by any rules of construction providing for interpretation against the party who causes the uncertainty to exist or against the party who drafted the disputed language.

**17. Exhibits.** Exhibits A through K are incorporated into this Agreement by reference. In the event of any material discrepancy between the express provisions of this Agreement and the provisions of Exhibit G, the provisions of Exhibit G shall prevail. In the event of any material discrepancy between the express provisions of this Agreement and the provisions of other Exhibit, the provisions of this Agreement shall prevail.

**18. Incorporation of Mandatory Language.** Each and every provision required by law to be inserted in this Agreement shall be deemed to be inserted and this Agreement shall be read and enforced as though such provision were included. If through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon request of either party this Agreement shall promptly be amended to make such insertion or correction.

**19. Incorporation of Task Orders.** Executed Task Orders are incorporated into this Agreement by reference. In the event of any material discrepancy between the express provisions of this Agreement and the provisions of a Task Order, the provisions of this Agreement shall prevail.

**20. Entire Agreement.** This Agreement (and the attached Exhibits) represents the entire and integrated contract between the parties regarding the Services. This Agreement supersedes all prior oral or written negotiations, representations and contracts related to the Services. This Agreement may not be amended, nor any provision or breach waived, except in a writing that is signed by the parties and that expressly refers to this Agreement.

**[SIGNATURES ON FOLLOWING PAGE]**

**TO EXECUTE THIS AGREEMENT**, the parties have caused their authorized representatives to sign below.

**Vellutini Corporation dba Royal Electric Company**

\_\_\_\_\_  
☐ Chairperson ☐ President ☐ Vice President

\_\_\_\_\_  
☐ Secretary ☐ Asst. Secretary  
☐ Chief Finance Officer ☐ Asst. Treasurer

[Pursuant to California Corporations Code Section 313, both signature lines must be executed unless the signatory holds at least one of the offices designated on each line.]

**Burbank-Glendale-Pasadena Airport Authority**

\_\_\_\_\_  
Ross Selvidge, Ph.D, President

Approved as to form:

\_\_\_\_\_  
Richards, Watson & Gershon  
A Professional Corporation

**EXHIBIT A**  
**Scope of Services**

(attached)

## **SCOPE OF SERVICES AND GENERAL REQUIREMENTS FOR AIRFIELD LIGHTING ELECTRICAL INSPECTION AND TESTING**

### **BACKGROUND**

Hollywood Burbank Airport's ("BUR") airfield electrical system consists of 850 runway and taxiway lights, along with airfield guidance signs, various NAVAIDs, and the power and control equipment that operate them. FAA Advisory Circular (AC) 150/5340-26C or latest edition, *Maintenance of Airport Visual Aid Facilities*, requires the inspection and testing of airfield electrical equipment at the intervals described therein.

The Burbank-Glendale-Pasadena Airport Authority seeks a firm to provide electrical inspection and testing for the **quarterly, semi-annual, and annual inspections** as indicated in Exhibit B. This Attachment details the specific testing and inspections to be performed by the Contractor, and the inspection and testing to be performed by others.

AC 150/5340-26C is included as Exhibit C and specifies how this inspection and testing must be accomplished. For reference, an airfield testing site map, indicating the locations to be serviced is included as Exhibit D.

### **SCOPE OF SERVICES**

The following is an overview of the work to be performed:

- 1) The Contractor shall furnish all labor, supplies, materials, equipment, tools, transportation and other incidental and appurtenant work or services necessary to complete the electrical inspection and testing as specified herein. Work must be completed consistent with the requirements defined in Exhibit C.
- 2) The Contractor shall document the testing results in the testing and inspection forms provided in Exhibit E and provide the results to the Airport Designated Representative (ADR) in both hard copy and native/editable electronic format.
- 3) The Contractor shall prepare and submit a testing and inspection report within 1 week of the in-field testing and inspection work. The report shall include:
  - a. a list of the tests and inspections performed,
  - b. any negative or concerning test results (note: results causing for concern for the safety or integrity of the lighting system shall be brought immediately to the attention of the ADR),
  - c. any significant change in the measured readings from prior test to current test,
  - d. completed (relevant) forms provided in Exhibit E
  - e. a description of any deficiencies or observed failures and a recommended plan to further investigate, mitigate or resolve deficiencies or failures.
  - f. Additionally, the Contractor may receive, from the ADR, relevant data (associated with airfield lighting) developed by others. The Contractor shall be responsible for incorporating any provided data with the information they collect as a result of their testing and inspection. The Contractor will be responsible for analyzing the complete data set to assess any areas of deficiency within the entire system as part of a report.
- 4) The Contractor shall submit a Site-Specific Safety Plan which details the appropriate safety equipment and protocols necessary to perform the testing and inspection requirements per the Advisory Circular.

- 5) The Contractor shall submit a schedule monthly indicating the anticipated timing of work for the upcoming 90 days for review and approval. The schedule shall specifically indicate any shutdowns or interruption of functionality associated with the planned work. Notice shall be given to the ADR 72 hours in advance of the anticipated work shown on the approved schedule. Exact timing of any shutdown shall be coordinated by Contractor's in-field personnel with the ADR. It may be necessary to delay or reschedule planned work at BUR discretion without advance notice.
- 6) The contractor shall submit a detailed work plan for each required test in advance of performing the test. Workplan shall indicate:
  - a. the procedure to be followed,
  - b. approximate duration of test and/or inspection,
  - c. any impacts to operation or functionality of the airfield lighting system,
  - d. list of all required testing or monitoring equipment or instruments. Current calibration or instrument certifications shall be attached if applicable, and made available in the field if requested.
  - e. List of personnel required to perform the test with BUR badge #.
  - f. List of required safety equipment required to complete the testing and inspection with reference to the appropriate section of the submitted Site Specific Safety Plan.
- 7) The Contractor shall provide a rate sheet for labor and materials for work further described in the Special Provisions listed below. Should additional work be authorized, the Contractor shall first request and use any materials/parts made available by the Airport.

#### **ADDITIONAL REQUIREMENTS**

The Contractor shall maintain and keep operational all existing airfield electrical facilities and circuits while this inspection and testing work is in progress, whenever practicable.

The Contractor shall notify ADR immediately of any negative or concerning test results. If the test results indicates an immediate risk to safety or property damage the contractor will immediately notify the ADR and take reasonable steps to make safe. The contractor will coordinate with BUR staff to determine the appropriate trouble-shooting or remediation plan as part of this scope of work. However, no action beyond testing and inspection (except as allowed to address immediate safety or property risks) shall be taken by the contractor without authorization via a written task order (Exhibit K).

The ADR will determine the manner under which the trouble shooting or remediation actions will occur:

- work or additional investigation may be deferred or determined as not-required,
- work or additional investigation may be completed by airport personnel,
- the Contractor may be authorized to complete the work or additional investigation via a task order on a lump sum or T&M basis in accordance with the fee schedule submitted with the proposal, or
- additional work or investigation may be opened up for bids/quotes to electrical contractors qualified to complete the necessary work.

The Contractor shall familiarize themselves with the existing site and electrical systems prior to submitting a fee schedule for this work. Lack of understanding of the existing site conditions shall not be cause for an increase in cost of the contractor's fee schedule prices. Any BUR facilities or property damaged by the Contractor's workers or equipment shall be replaced immediately at the Contractor's expense.

The Contractor's staff shall be badged through airport's background checks as outlined in Exhibit H.

The method used for the inspection and testing of electrical systems and equipment and any work that shall be required shall conform to the National Electrical Code (NEC), the National Electrical Contractors Association (NECA) published "Standard of Installation" except where expressly specified or shown

otherwise within the documents provided, and to any state and local codes. All electrical materials, construction methods, and installation shall be in accordance with applicable Federal Aviation Administration's advisory circulars, the latest edition, including amendments, of the Electrical Code, and the American National Standards Institute Standard C2, latest edition.

The Contractor shall have a minimum five (5) years of experience in airfield lighting installation, cable installation, testing of electrical equipment. The workers performing the tests shall be licensed (California C-10) electricians.

Safety is the responsibility of everyone and must be practiced in every activity that is performed. The Site Specific Safety Plan to be provided by the Contractor for review and approval shall include local operational procedures, local, state, and OSHA requirements and shall be observed and complied with in every detail. Any violation there of the safety rules shall be cause for immediate termination of the Contractor's authority to proceed with the work.

The Contractor shall comply with the Airport's Wildlife Hazard Management Plan, included as Exhibit I.

**EXHIBIT B**  
**Preventive Maintenance Inspection Schedule**

(attached)

PREVENTIVE MAINTENANCE INSPECTION SCHEDULE

| 1. AIRPORT LIGHTING VAULT  | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|--|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| 1. Check control operation   | BO    |        |         |            |           |               |          |             |
| 2. Check general cleanliness   |       | BO     |         |            |           |               |          |             |
| 3. Check for moisture  |       | BO     |         |            |           |               |          |             |
| 4. Check ventilator screens or air conditioner controls  |       | BO     |         |            |           |               |          |             |
| 5. Inspect safety boards, safety equipment and fire extinguishers  |       |        | BO      |            |           |               |          |             |
| 6. Check insulation resistance of all field circuits. (Weekly insulation resistance tests may be necessary for older circuits) |       |        | BO      |            |           |               |          |             |
| 7. Check input voltage to vault  |       |        |         |            |           | X             |          |             |
| 8. Check ground resistance   |       |        |         |            |           | X             |          |             |
| 9. Inspect and clean buses   |       |        |         |            |           | X             |          |             |
| 10. Check relay operation  |       |        |         |            |           | X             |          |             |
| 11. Check oil fuse cutouts   |       |        |         |            |           | X             |          |             |
| 12. Check oil switches   |       |        |         |            |           | X             |          |             |
| 13. Operate power transfer switches  |       |        | BO      |            |           |               |          |             |
| 14. Check control panel or computer control equipment  |       |        |         |            |           | X             |          |             |
| 15. Check photoelectric switch   |       |        |         |            |           | X             |          |             |
| 16. Check astronomic time switch   |       |        |         |            |           | X             |          |             |
| 17. Check radio control of lighting equipment  |       |        | BO      |            |           |               |          |             |
| 18. Check lightning arrestors  |       |        |         |            |           | X             |          | BO          |
| 19. Inspect miscellaneous electrical equipment   |       |        |         |            |           | X             |          |             |
| 20. Test oil dielectric strength in transformers and regulators  |       |        |         |            |           |               | X        |             |
| 21. Paint equipment as necessary   |       |        |         |            |           |               | BO       | BO          |

| 2. CONSTANT CURRENT REGULATORS  | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|---|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| 1. Check control circuits on the brightness steps                                 | BO    |        |         |            |           |               |          |             |
| 2. Check condition and operation of regulator                                     |       | BO     |         |            |           |               |          |             |
| 3. Check input voltage and current  |       |        | BO      |            |           | X             |          |             |
| 4. Check output current n each brightness step                                    |       |        | BO      |            |           | X             |          |             |
| 5. Check output load on regulator if needed                                       |       |        |         |            |           | X             |          |             |
| 6. Check relay, wiring and insulation   |       |        |         |            |           | X             |          |             |
| 7. Check dielectric strength of cooling oil (if used)                             |       |        |         |            |           |               | BO       |             |
| 8. Preform a short circuit test   |       |        |         |            |           |               | X        |             |
| 9. Preform an open-circuit test (only on regulators with open circuit protection) |       |        |         |            |           |               | X        |             |
| 10. Clean rust spots and repaint as necessary                                     |       |        |         |            |           |               |          | BO          |

| 3. RUNWAY AND TAXIWAY ELEVATED EDGE LIGHTS                                  | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|---|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| 1. Inspect for outages  | BO    |        |         |            |           |               |          |             |
| 2. Check cleanliness of lenses  | BO    |        |         |            |           |               |          |             |
| 3. Perform photometric testing (HIRL) and check light alignment/orientation |       |        | BO      |            |           |               |          | BO          |
| 4. Re-align lights as needed  |       |        | BO      |            |           |               |          | BO          |
| 5. Clean fixtures and sockets   |       |        |         |            |           |               |          | BO          |
| 6. Check light elevation  |       |        |         |            |           | BO            |          |             |
| 7. Check for moisture in lights   |       |        |         |            |           | BO            |          |             |
| 8. Inspect fixture for rust, deterioration                                  |       |        |         |            |           |               | BO       |             |
| 9. Check lamp fitting and clean contacts                                    |       |        |         |            |           |               | BO       |             |
| 10. Check gaskets   |       |        |         |            |           |               | BO       |             |
| 11. Remove snow and/or vegetation from around lights                        |       |        |         |            |           |               |          | BO          |

PREVENTIVE MAINTENANCE INSPECTION SCHEDULE

| UNSCCHEDULED | ANNUALLY | SEMI-ANNUALLY | QUARTERLY | BI-MONTHLY | MONTHLY | WEEKLY | DAILY | 4. INPAVEMENT RUNWAY AND TAXIWAY LIGHTING                 |
|--------------|----------|---------------|-----------|------------|---------|--------|-------|---|
|              |          |               |           |            |         |        | BO    | 1. Check for burned-out lamps or dimly burning lights     |
|              |          |               |           |            |         | BO     |       | 2. Replace defective lights with refurbished units        |
| BO           |          |               |           |            | BO      |        |       | 3. Clean lights with dirty lenses                         |
| BO           |          |               |           |            | BO      |        |       | 4. Perform photometric testing of runway lighting systems |
|              |          |               |           | BO         |         |        |       | 5. Check torque of mounting bolts                         |
|              |          | BO            |           |            |         |        |       | 6. Check for water in shallow light bases                 |
| BO           |          |               |           |            |         |        |       | 7. Remove snow from around fixtures                       |
| BO           |          |               |           |            |         |        |       | 8. Check wires in saw kerfs                               |

| UNSCCHEDULED | ANNUALLY | SEMI-ANNUALLY | QUARTERLY | BI-MONTHLY | MONTHLY | WEEKLY | DAILY | 5. ROTATING BEACONS                                       |
|--------------|----------|---------------|-----------|------------|---------|--------|-------|---|
|              |          |               |           |            |         |        | BO    | 1. Check for beacon operation and proper color sequence.  |
|              |          |               |           |            |         |        | BO    | 2. Count rpm of beacon.                                   |
|              |          |               |           |            |         |        | BO    | 3. Check telltale indicator lamp for reserve lamp status. |
|              |          |               |           | BO         |         |        |       | 4. Check operation of the lamp-changer.                   |
|              |          |               |           | BO         |         |        |       | 5. Check slip rings and brushes.                          |
|              |          |               |           | BO         |         |        |       | 6. Test the clutch torque.                                |
|              |          |               |           | BO         |         |        |       | 7. Check lens retainers.                                  |
|              |          |               |           | BO         |         |        |       | 8. Check telltale indicator lamp.                         |
|              |          |               |           | BO         |         |        |       | 9. Check operation of relays.                             |
|              |          |               |           | BO         |         |        |       | 10. Clean and polish glassware.                           |
|              |          | X             |           |            |         |        |       | 11. Check and record input voltage.                       |
|              |          | X             |           |            |         |        |       | 12. Check lamp focus and beam elevation.                  |
|              |          | X             |           |            |         |        |       | 13. Lubricate main shaft, motor, ring gear, and padlocks. |
|              |          | X             |           |            |         |        |       | 14. Check operation of electrical switches and contacts.  |
|              |          | X             |           |            |         |        |       | 15. Check lightning arresters and grounding system.       |
|              |          | X             |           |            |         |        |       | 16. Check power meter.                                    |
|              | X        |               |           |            |         |        |       | 17. Check level of base.                                  |
|              | X        |               |           |            |         |        |       | 18. Clean and re-grease gears.                            |
|              | X        |               |           |            |         |        |       | 19. Inspect wiring, lugs, and conduit.                    |
|              | X        |               |           |            |         |        |       | 20. Check weatherproofing and gaskets.                    |

| UNSCCHEDULED | ANNUALLY | SEMI-ANNUALLY | QUARTERLY | BI-MONTHLY | MONTHLY | WEEKLY | DAILY | 6. LIGHTED WIND CONES                                    |
|--------------|----------|---------------|-----------|------------|---------|--------|-------|--|
|              |          |               |           |            |         |        | BO    | 1. Check lamp operation.                                 |
|              |          |               |           |            |         |        | BO    | 2. Check photocell operation.                            |
|              |          |               |           |            | BO      |        |       | 3. Check for freedom of motion of wind cone frame.       |
|              |          |               |           |            | BO      |        |       | 4. Check condition of wind cone fabric.                  |
|              |          |               |           | BO         |         |        |       | 5. Check lamp age for scheduled replacement.             |
|              |          |               |           | BO         |         |        |       | 6. Clean glassware.                                      |
|              |          |               |           | BO         |         |        |       | 7. Check paint on segmented circle.                      |
|              |          | X             |           |            |         |        |       | 8. Clean and grease bearings.                            |
|              |          | X             |           |            |         |        |       | 9. Read insulation resistance.                           |
|              | X        |               |           |            |         |        |       | 10. Check mounting bolts.                                |
|              | X        |               |           |            |         |        |       | 11. Check wiring at hinge.                               |
|              | X        |               |           |            |         |        |       | 12. Check grounding system resistance.                   |
|              | BO       |               |           |            |         |        |       | 13. Check paint on wind cone structure.                  |
| BO           |          |               |           |            |         |        |       | 14. Remove vegetation and check condition at foundation. |

PREVENTIVE MAINTENANCE INSPECTION SCHEDULE

| 7. PAPI (PRECISION APPROACH PATH INDICATOR)                      | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|--|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| 1. Check lamps for operation.                                    | BO    |        |         |            |           |               |          |             |
| 2. Check operation of controls.                                  |       |        | BO      |            | X         |               |          |             |
| 3. Check for damage by service vehicles or aircraft.             |       |        | BO      |            | X         |               |          |             |
| 4. Clean lamps and filters.                                      |       |        | BO      |            | X         |               |          |             |
| 5. Check mechanical parts for damage.                            |       |        | BO      |            | X         |               |          |             |
| 6. Check lightning arresters.                                    |       |        | BO      |            | X         |               |          |             |
| 7. Check for water damage or insect infestation.                 |       |        | BO      |            | X         |               |          |             |
| 8. Check for presence of rodents.                                |       |        | BO      |            | X         |               |          |             |
| 9. Record output current and input voltage of adapter (if used). |       |        | BO      |            | X         |               |          |             |
| 10. Check alignment and aiming of light boxes.                   |       |        | BO      |            | X         |               |          |             |
| 11. Check leveling and operation of tilt switch.                 |       |        | BO      |            | X         |               |          |             |
| 12. Check integrity of obstacle-free approach plane.             |       |        |         |            | X         |               |          |             |
| 13. Check insulation resistance of underground cables.           |       |        |         |            |           | X             |          |             |
| 14. Check resistance of grounding system.                        |       |        |         |            |           | X             |          |             |

| 8. REIL (RUNWAY END IDENTIFIER LIGHTS)  | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|---|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| 1. Check operation of lamps.  | BO    |        |         |            |           |               |          |             |
| 2. Check the operation of controls.   |       |        |         | BO         |           |               |          |             |
| 3. Check cleanliness of optical system.   |       |        |         | BO         |           |               |          |             |
| 4. Check for mechanical damage or misaligned parts.   |       |        |         | BO         |           |               |          |             |
| 5. Check operation of interlocks.   |       |        |         | BO         |           |               |          |             |
| 6. Check for vegetation around lights.  |       |        |         | BO         |           |               |          |             |
| 7. Check cabinets for cleanliness and moisture.   |       |        |         |            |           | X             |          |             |
| 8. Check electrical connections.  |       |        |         |            |           | X             |          |             |
| 9. Check alignment and elevation of unidirectional REIL. Check only elevation of omnidirectional units. |       |        |         |            |           | X             |          |             |
| 10. Realign unidirectional REILs, as required.  |       |        |         |            |           | X             |          |             |
| 11. Check baffles on REIL (if used).  |       |        |         |            |           | X             |          |             |
| 12. Check power distribution equipment.   |       |        |         |            |           |               | X        |             |
| 13. Check insulation resistance of cable.   |       |        |         |            |           |               | X        |             |
| 14. Check resistance of grounding systems.  |       |        |         |            |           |               | X        |             |
| 15. Service timer motor and contacts (if used).   |       |        |         |            |           |               | X        |             |
| 16. Check need for painting.  |       |        |         |            |           |               | BO       |             |

| 9. HAZARD BEACONS AND OBSTRUCTION LIGHTS                   | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|--|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| 1. Check operation of lamps.                               | BO    |        |         |            |           |               |          |             |
| 2. Check flash rate of L-864 obstruction lights.           |       |        | BO      |            |           |               |          |             |
| 3. Check operation of photocell.                           |       |        | BO      |            |           |               |          |             |
| 4. Check insulation resistance and ground resistance.      |       |        |         |            |           | BO            |          |             |
| 5. Check wire and connections.                             |       |        |         |            |           |               | BO       |             |
| 6. Check voltage at lamp socket.1                          |       |        |         |            |           |               | BO       |             |
| 7. Check weatherproofing of the fixture.2                  |       |        |         |            |           |               | BO       |             |
| 8. Check lightning protection system.                      |       |        |         |            |           |               | BO       |             |
| 9. Check power meter.                                      |       |        |         |            |           |               | BO       |             |
| 10. Service lowering device and other supporting hardware. |       |        |         |            |           |               | BO       |             |
| 11. Check changeover relay in dual fixture.1               |       |        |         |            |           |               | BO       |             |
| 12. Clean and recondition L-864 obstruction light.1        |       |        |         |            |           |               | BO       |             |
| 13. Install new lamp after 80 percent of rated life.1      |       |        |         |            |           |               |          | BO          |

1 Not applicable to LED lights – follow manufacturer's instructions

2 For LED lights, check with manufacturer for cleaning procedures

PREVENTIVE MAINTENANCE INSPECTION SCHEDULE

| 10. STANDBY GENERATORS  | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | QUARTERLY | SEMI-ANNUALLY | ANNUALLY | UNSCHEDULED |
|---|-------|--------|---------|------------|-----------|---------------|----------|-------------|
| <b>Engine – Lubricating System</b>                                    |       |        |         |            |           |               |          |             |
| 1. Check for leaks  |       |        |         |            | BO        |               | BO       |             |
| 2. Check engine oil level and pressure                                |       |        |         |            | BO        |               | BO       |             |
| 3. Check hydraulic/mechanical governor oil level                      |       |        |         |            | BO        |               | BO       |             |
| 4. Change engine oil and filters every 150 hours of operation or      |       |        |         |            |           |               | BO       |             |
| 5. Change hydraulic/mechanical governor oil                           |       |        |         |            |           |               | BO       |             |
| <b>Engine – Cooling System</b>  |       |        |         |            |           |               |          |             |
| 1. Check for leaks  |       |        |         |            | BO        |               | BO       |             |
| 2. Check radiator for air restriction                                 |       |        |         |            | BO        |               | BO       |             |
| 3. Check operation of coolant heater                                  |       |        |         |            | BO        |               | BO       |             |
| 4. Check hoses and connections  |       |        |         |            | BO        |               | BO       |             |
| 5. Check coolant level and temperature                                |       |        |         |            | BO        |               | BO       |             |
| 6. Check belt condition and tension                                   |       |        |         |            | BO        |               | BO       |             |
| 7. Check heat exchanger corrosive water treatment plugs (if equipped) |       |        |         |            | BO        |               | BO       |             |
| 8. Check motor operated louvers                                       |       |        |         |            | BO        |               | BO       |             |
| 9. Check radiator duct work and fan shroud                            |       |        |         |            | BO        |               | BO       |             |
| 10. Check antifreeze and additive concentration                       |       |        |         |            |           |               | BO       |             |
| 11. Check fan hub, drive pulley and water pump                        |       |        |         |            |           |               | BO       |             |
| 12. Change coolant filter (if equipped)                               |       |        |         |            |           |               | BO       |             |
| 13. Check thermostat and radiator cap                                 |       |        |         |            |           |               | BO       |             |
| <b>Engine – Air Intake System</b>                                     |       |        |         |            |           |               |          |             |
| 1. Check for leaks  |       |        |         |            | BO        |               | BO       |             |
| 2. Check air cleaner restriction                                      |       |        |         |            | BO        |               | BO       |             |
| 3. Check all piping connections                                       |       |        |         |            | BO        |               | BO       |             |
| 4. Clean air cleaner element and housing                              |       |        |         |            | BO        |               |          |             |
| 5. Change air filter element  |       |        |         |            |           |               | BO       |             |
| 6. Clean crankcase breather element                                   |       |        |         |            |           |               | BO       |             |
| <b>Engine – Fuel System</b>   |       |        |         |            |           |               |          |             |
| 1. Check for leaks  |       |        |         |            | BO        |               | BO       |             |
| 2. Check governor control linkage                                     |       |        |         |            | BO        |               | BO       |             |
| 3. Check fuel lines and connections                                   |       |        |         |            | BO        |               | BO       |             |
| 4. Drain sediment from day tank                                       |       |        |         |            | BO        |               | BO       |             |
| 5. Drain water separators   |       |        |         |            | BO        |               | BO       |             |
| 6. Check day tank fuel level  |       |        |         |            |           |               | BO       |             |
| 7. Check fuel transfer pump   |       |        |         |            |           |               | BO       |             |
| 8. Check diesel engine primer pump                                    |       |        |         |            |           |               | BO       |             |
| 9. Change fuel filters  |       |        |         |            |           |               | BO       |             |
| 10. Change day tank supply filter (or clean)                          |       |        |         |            |           |               | BO       |             |
| 11. Change water separator filter (if equipped)                       |       |        |         |            |           |               | BO       |             |
| 12. Check float tank breather element (if equipped)                   |       |        |         |            |           |               | BO       |             |
| 13. Check fuel tanks for contamination                                |       |        |         |            |           |               | BO       |             |

PREVENTIVE MAINTENANCE INSPECTION SCHEDULE

|   |  |  |  |  |    |  |    |  |
|---|--|--|--|--|----|--|----|--|
| <b>Engine – Exhaust System</b>                            |  |  |  |  |    |  |    |  |
| 1. Check for leaks  |  |  |  |  | BO |  | BO |  |
| 2. Check exhaust restriction                              |  |  |  |  | BO |  | BO |  |
| 3. Drain exhaust condensation trap (if equipped)          |  |  |  |  | BO |  | BO |  |
| 4. Torque exhaust manifold and turbocharger cap screws    |  |  |  |  |    |  | BO |  |
| 5. Torque exhaust flange bolts                            |  |  |  |  |    |  | BO |  |
| <b>Electrical System</b>                                  |  |  |  |  |    |  |    |  |
| 1. Check battery – charging system                        |  |  |  |  | BO |  | BO |  |
| 2. Check battery – electrolyte level                      |  |  |  |  | BO |  | BO |  |
| 3. Check engine safety controls, alarms and wiring        |  |  |  |  | BO |  | BO |  |
| 4. Check battery connections and terminals                |  |  |  |  | BO |  | BO |  |
| 5. Check engine starting motor cranking current           |  |  |  |  |    |  | BO |  |
| <b>Engine Related Systems</b>                             |  |  |  |  |    |  |    |  |
| 1. Check for vibration and metal cracks                   |  |  |  |  | BO |  | BO |  |
| 2. Check engine mounting hardware and tighten             |  |  |  |  |    |  | BO |  |
| 3. Check fuel injector pump and injector timing           |  |  |  |  |    |  | BO |  |
| 4. Check engine for dirt/debris and clean vent screens    |  |  |  |  |    |  | BO |  |
| 5. Grease fan pillow block bearing (if equipped)          |  |  |  |  |    |  | BO |  |
| <b>Main Generator</b>                                     |  |  |  |  |    |  |    |  |
| 1. Check air inlet and outlet restrictions                |  |  |  |  | BO |  | BO |  |
| 2. Grease generator bearing (if equipped)                 |  |  |  |  |    |  | BO |  |
| 3. Clean generator per manufacturer's instructions        |  |  |  |  |    |  | BO |  |
| 4. Perform 4 hour full load test                          |  |  |  |  |    |  | BO |  |
| <b>Switchgear</b>   |  |  |  |  |    |  |    |  |
| 1. Check operation of transfer switch and timing relays   |  |  |  |  | BO |  | BO |  |
| 2. Inspect transfer switch contacts for pitting or arcing |  |  |  |  | BO |  | BO |  |

**EXHIBIT C**  
**Advisory Circular (AC) 150-5340-26C**

(attached)



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# Advisory Circular

---

**Subject:** Maintenance of Airport Visual  
Aid Facilities

**Date:** 6/20/2014

**AC No:** 150/5340-26C

**Initiated by:** AAS-100

**Change:**

---

**1. Purpose.** This advisory circular (AC) provides recommended guidelines for maintenance of airport visual aid facilities.

**2. Applicability.** The Federal Aviation Administration (FAA) recommends the guidance and specifications in this AC for the Maintenance of airport Visual Aid Facilities. In general, use of this AC is not mandatory. However, use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assistance No. 34, Policies, Standards, and Specifications, and PFC Assurance No. 9, Standards and Specifications.

**3. Cancellation.** This AC cancels AC 150/5340-26B, Maintenance of Airport Visual Aid Facilities, dated September 30, 2009.

**4. Principal Changes.** General grammatical and format changes to break up large sections and to facilitate easier reading.

- a. Paragraph 2.0 has an added section to better introduce the concept of safety.
- b. Paragraph 2.2 – a new section is added to be in better alignment with the personnel safety requirements in National Fire Protection Association (NFPA) 70E, Standard for Electrical Safety in the Workplace.
- c. Paragraph 2.4.1.1 is added for arc flash protection description.
- d. Figure 2-1 is added to show an example of an arc flash warning label.
- e. Paragraph 3.2.1 is added to describe maintenance log requirements for PAPI, VASI, and ODALS.
- f. Paragraph 3.7 is added to describe what to do when visual aids are implicated in an aircraft accident. Procedures are also furnished for actions to be taken when a visual aid that was previously NOTAM is restored to service.
- g. Paragraph 5.3.4 is expanded to add requirements for bolt torque and explain one-time bolt use for in-pavement light fixtures.
- h. Paragraph 5.11 – removed “hazard beacons” and added note.

- i. Paragraph 5.15, Omnidirectional Approach Lighting System (ODALS), is added.
- j. Appendix B is added: Maintenance Log Preparation Guide.

A handwritten signature in cursive script that reads "J.R. White for".

**Michael O'Donnell**  
Director of Airport Safety and Standards

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## **Chapter 1. Introduction.**

### **1.0 General.**

This Advisory Circular (AC) provides guidance for the recommended minimum maintenance practices to be used for the maintenance of airport visual aid facilities. Although this AC provides the minimum requirements for establishing a maintenance program, due to the varying complexities of individual airports and the visual aids facilities provided, the program must be tailored to suit each airport's particular needs. Use this AC with the information available in manufacturer's instruction books, equipment manuals, handbooks and other ACs.

Because the function of airport visual aid facilities is to assist in the safe and efficient movement of aircraft during landing, takeoff and taxiing maneuvers, it is essential that a high degree of operating reliability be maintained. To achieve this, an effective preventative maintenance program must be established and maintained. This AC provides suggestions about establishing a program but, due to the varying complexities of airports and the visual aids facilities provided, the program must be tailored to suit each airport's particular needs.

Because corrective and preventive maintenance procedures for specific equipment are usually covered in instruction manuals supplied with the equipment, this AC will address maintenance topics of a more general nature.

### **1.1 Scope.**

This AC provides system maintenance information for establishing a preventive maintenance program for airport visual aid facilities. The information provided is for the following systems:

- Airport lighting vault and series lighting circuits
- Constant current regulators
- Runway and taxiway elevated edge lighting systems
- Runway and taxiway in-pavement lighting systems
- Runway guard lights and stop bar lights
- Illuminated runway and taxiway signs
- Rotating beacons
- Lighted wind cone assemblies
- Precision Approach Path Indicator (PAPI) system
- Visual Approach Slope Indicator (VASI)
- Runway End Identifier Lights (REIL) and Omni directional Approach Light System (ODALS)
- Medium Intensity Approach Light System (MALS, MALSF, MALSR)
- Airfield Lighting Control and Monitoring system (ALCMS)
- Runway Status Lights (RWSL)
- Obstruction lights
- Control systems
- Standby power engine generator systems

In addition to equipment topics, this AC also recommends safety practices and troubleshooting procedures for airport series lighting circuits.

## **1.2 Applicable Documents.**

### **1.2.1 National Fire Protection Association (NFPA).**

- NFPA 10, Standard for Portable fire Extinguishers
- NFPA 70E, Standard for Electrical Safety in the Workplace

NFPA documents may be obtained (not free of charge) at:  
[www.nfpa.org/catalog/category.asp?category\\_name=NFPA+70E](http://www.nfpa.org/catalog/category.asp?category_name=NFPA+70E)

### **1.2.2 Occupational Safety and Health Administration (OSHA).**

- General Industry Safety-Related Work Practices – 29 CFR 1910

OSHA documents may be obtained at:  
[https://www.osha.gov/pls/oshaweb/owastand.display\\_standard\\_group?p\\_toc\\_level=1&p\\_part\\_number=1910](https://www.osha.gov/pls/oshaweb/owastand.display_standard_group?p_toc_level=1&p_part_number=1910)

### **1.2.3 American Society for Testing and Materials (ASTM).**

- ASTM D120, Specification for Insulated Rubber Gloves

ASTM specifications may be obtained via standard mail from:

American Society for Testing and Materials  
1916 Race Street  
Philadelphia, PA 19103.

Specifications may also be purchased and downloaded (charges may apply) from the internet at:  
[webstore.ansi.org/SdoInfo.aspx?sdoid=41&Acro=ASTM&DpName=ASTM%20International&source=google&keyword=astm&gclid=CPuey-SylboCFe5cMgodMi0AIA](http://webstore.ansi.org/SdoInfo.aspx?sdoid=41&Acro=ASTM&DpName=ASTM%20International&source=google&keyword=astm&gclid=CPuey-SylboCFe5cMgodMi0AIA)

### **1.2.4 Federal Aviation Administration (FAA) Advisory Circulars (AC).**

- AC 150/5210-5, Painting, Marking, and Lighting of Vehicles Used on an Airport
- AC 150/5210-20, Ground Vehicle Operations on Airports
- AC 150/5340-30, Design and Installation Details for Airport Visual Aids
- AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures

FAA ACs may be downloaded at: [www.faa.gov/airports/resources/advisory\\_circulars/](http://www.faa.gov/airports/resources/advisory_circulars/)

### **1.2.5 FAA Engineering Briefs (EB).**

- FAA EB 83, In-pavement Light Fixture Bolts

FAA EBs may be downloaded at: [www.faa.gov/airports/engineering/engineering\\_briefs/](http://www.faa.gov/airports/engineering/engineering_briefs/)

### **1.2.6 Federal Aviation Administration (FAA) Joint Orders (JO).**

- JO 7930.2, Notices to Airmen (NOTAM)

May be obtained at: <http://www.faa.gov/documentLibrary/media/Order/NTM.pdf>

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## **Chapter 2. Safety.**

### **2.0 General.**

This chapter provides information that will aid airport owners/operators in establishing an effective safety program. Safety is the responsibility of everyone and must be practiced in every maintenance activity that is performed. Any additional local operational procedures and OSHA requirements should also be followed. The safety program established at each airport should include preventive safety precautions used when servicing the equipment and first-aid procedures for use in the event of an injury.

We are all surrounded by various hazards every day such as the careless driver using a cell phone that we see on our way to work. Safety is everyone's responsibility and our own responsibility. We cannot delegate our safety responsibilities to others. It is our responsibility to set the safety example for others. Safe work practices is a learned attitude and skill we should be passing on to our fellow workers and our family.

Safety is no accident. Know and comply with your company's safety program and lockout/tagout procedure. Use and store personal protective equipment (PPE) properly. Verify that your test equipment functions properly. Become familiar and knowledgeable with National Fire Protection Association (NFPA) 70E, Standard for Electrical Safety in the Workplace. Should a conflict between your local safety plan and this document occur, we recommend adherence to the stricter (safer) requirement.

### **THINK SAFETY FIRST!**

### **2.1 Common Causes of Accidents.**

Some common causes of accidents are listed below:

- a. Working on equipment without adequate coordination with equipment users.
- b. Working on equipment without sufficient training or experience.
- c. Failure to follow instructions in equipment manuals.
- d. Failure to follow safety precautions.
- e. Failure to properly lock and tag out equipment.
- f. Using unsafe equipment.
- g. Becoming lax due to working in a familiar environment.
- h. Poor housekeeping of work areas.
- i. Working in a hurried manner.

The number one cause of accidents is working in a hurried manner. It is often the main contributing factor in failing to follow proper safety guidelines in all the other causes outlined in the list above. The perception that there is not enough time to take proper safety precautions or think through the proper procedures has a high potential for causing an accident. When in emergency repair situations, maintenance personnel must be careful to follow proper safety procedures to avoid the possibility of injury or death.

## **2.2 Safety Requirements.**

Only a qualified person, per the definition in NFPA 70E, performs maintenance work. The qualified person must possess the requisite technical skills and be trained to recognize and avoid electrical hazards. The qualified person must also be trained in the proper procedures for operations in an aircraft operation area (AOA). A person may be considered qualified for certain tasks and not qualified for others.

### **2.2.1 Qualified Person.**

A qualified person must, at a minimum, be additionally trained to:

- Distinguish exposed live parts from other parts.
- Determine nominal voltage of exposed parts.
- Determine the approach distances in NFPA 70E; Table 130.2(C).
- Possess the decision-making skills necessary to determine the degree and extent of hazard, PPE required and planning to safely perform the job.

### **2.2.2 Hazard/Risk Evaluation.**

Perform a Hazard/Risk evaluation of the task to be accomplished. For an example of a Hazard/Risk procedure, refer to NFPA 70E, Annex F.

When performing repetitive tasks we tend to take safety for granted. Do not let familiarity with the task provide a false sense of security. A task performed 100 times unsafely without an injury is still unsafe.

### **2.2.3 Job Set-up.**

Before starting each task, review the following basic items:

- a. Hazards associated with the work.
- b. Safe work procedures and any special precautions.
- c. Energy source controls.
- d. PPE requirements.

#### **2.2.4 Electrically Safe Work Condition.**

Energized parts or components that an employee may be exposed to must be put into an electrically safe work condition before an employee works on or near them. Electrical components must be considered to be energized until the source(s) of energy is (are) removed, at which time they must be de-energized. In addition, remove all other sources of energy or stored energy – capacitors, pneumatic, steam, chemical, springs, gravity, jet blast, etc.

- a. Determine all sources of energy to the equipment.
- b. Turn off the equipment using proper controls; open the disconnecting means for each electrical source.
- c. When possible, visually verify all blades of the disconnecting device are fully open and/or draw-out type circuit breakers are withdrawn to the fully open position.
- d. Verify all other energy sources have been identified and turned off, removed, blocked or secured as required to safely and properly control the specific energy source.
- e. Apply lockout/tagout devices per documented and established policy.
- f. Use an adequately rated volt meter to test phase-to-phase and phase-to-ground for voltage. Before and after the test, verify proper operation of the test equipment.
- g. Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts. If components could become reenergized use grounds that can withstand fault currents.
- h. Only when the previous seven steps (2.2.4a through 2.2.4g) are successfully completed, is it possible to create an Electrically Safe Work Condition.

#### **2.2.5 Electrically Unsafe Work Condition.**

An electrically unsafe work condition is defined as “working on or near live parts of 50 volts or more.” The word, “near” is defined as “within the limited approach boundary provided by NFPA 70E, Table 130.4(C) and Table 130.4(C)(b).” To perform work on or near live parts of 50 volts or more, the following steps must be accomplished:

- a. Justification – Demonstrate that de-energizing introduces additional or increased hazards or is not feasible due to equipment design or operational limitations. (see NFPA 70E, Section 130.2)
- b. Complete an energized work permit that authorizes work on energized equipment.

- c. Perform an electrical hazard analysis consisting of:
  - 1. A **shock hazard analysis** to determine the voltage(s) to which personnel will be exposed, boundary requirements and the personal protective equipment (PPE) necessary to minimize the possibility of electric shock to personnel.
  - 2. A **flash hazard analysis** must be completed to protect personnel from the possibility of being injured by an arc flash. The analysis determines the flash protection boundary and the PPE that personnel within the flash protection boundary must use.
- d. Implement the requirements of the shock and flash hazard analysis prior to starting any work.
- e. Complete the work safely and return the system to safe operating status.
- f. Close out the energized equipment work permit.

### 2.3 Safety Procedures and Guidelines.

Most airport visual aid equipment is exposed to weather and may develop electrical shock hazards through damage from lightning or electrical cable insulation deterioration from exposure. Begin maintenance procedures only after a visual inspection is made for possible hazards. Due to the hazards associated with lightning, lighted navigational aids should not be serviced during periods of local thunderstorm activity. Each airport should develop and implement procedures to be followed in the event of an accident. Precious seconds are saved rendering medical assistance to injured personnel when action plans are already in place. Rehearse and review action plans regularly.

### 2.4 Electrical Hazards of Series Lighting Circuits.

Airport lighting circuits are very dangerous. This is especially true for maintenance personnel with little or no experience working on constant current series circuits. Airport lighting circuits can operate at potentials of several thousand volts depending on the size of the regulator driving the circuit and the load.

#### 2.4.1 Basic Rules.

There are three basic rules to remember when working on and around airport lighting circuits:

- a. **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.

- b. **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.
- c. **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.

#### 2.4.2 Induced Voltages.

Series circuits are typically run from the lighting vault in duct banks where the wires are lying parallel to each other in close proximity. Voltages may be induced in an otherwise un-energized conductor and may be a hazard when troubleshooting and testing. Circuits that have a load that varies due to flashing action of runway guard lights or REIL strobes are particularly prone to induce voltages in other conductors due to the pulsing characteristics of the voltage and current in these circuits. Always remember that there may be a possibility of an induced voltage in any conductor. Never work on or in close proximity to live circuits within any duct or manhole.

#### 2.4.3 Re-lamping.

The most common lighting maintenance task on the airfield is re-lamping of incandescent runway and taxiway lighting fixtures.

**Note:** See paragraph 5.3.2 for information about light emitting diode (LED) light fixtures.

Depending on the type of light fixture, this may be accomplished in the field or, in the case of most in-pavement lights, the entire light fixture is removed, replaced, and brought to the maintenance shop for refurbishing. The greatest unseen danger to you is re-lamping or removing the fixture with the circuit energized. This has always been a common practice by airport electricians for convenience and the dangers are often overlooked. There are two primary hazards associated with this practice:

- a. The first hazard occurs when there is a short circuit between the isolation transformer primary and secondary windings. Remember that isolation transformers are not designed for personnel protection. They are designed to isolate the secondary winding from the primary circuit to allow continued operation with a lamp burned out. A transformer with a primary to secondary short may not cause a circuit malfunction and could remain unnoticed during normal operation.

A short from the isolation transformer primary to secondary winding exposes you to the full voltage present on the primary circuit and can be especially dangerous if another

short is present on the primary circuit. When that happens, you can become the path to ground for the full primary current, a circumstance that is almost always fatal. This condition is especially dangerous when working with inset lights and removing them from the light base while the circuit is still energized. As soon as the light fixture is unbolted and lifted from the light base, you might become the path to ground. The FAA has tried to eliminate this hazard by recommending the attachment of a ground wire from the bottom of the light fixture to a grounding lug on the inside of the light base. Remember, you cannot know if the light fixture grounding wire is truly connected until you remove the fixture, at which time it is too late.

- b.** The second hazard encountered when re-lamping an energized light fixture is from the open circuit voltage present at the secondary of the isolation transformer. The open circuit voltage present on the secondary of the isolation transformer is proportional to the size of the transformer. For example, the open-circuit secondary voltage on a 300 watt transformer is approximately 110 volts. Moreover, depending on the materials used in the design of the isolation transformer and the type of regulator powering the circuit, high voltages can be generated. The larger the wattage of the isolation transformer, the higher the open circuit voltage; as much as 200 volts may be present in some circumstances. Therefore, we recommend that you perform re-lamping of the series lighting circuits with the circuits de-energized, especially during the re-lamping of fixtures with exposed contacts.
- c.** A final hazard that is present when re-lamping any type of fixture, whether in the field or at the maintenance shop, is the danger of cuts from broken lamps. Many times when an airfield lamp fails, the glass envelope becomes cracked or brittle and can break during the removal process. Always wear leather gloves when removing lamps to prevent your hands from being cut in the event that a lamp shatters.

## **2.5 Safety Practices.**

When you perform maintenance on airport visual aids, use the following safety practices:

- a.** Ensure that all maintenance workers are trained and familiar with electrical safety.
- b.** Strictly observe all safety rules.
- c.** Ensure that all test equipment is listed by a third party testing laboratory and properly rated for the voltage under test and the intended application.
- d.** Prior to beginning any maintenance work on airport lighting circuits, coordinate the work schedule with the air traffic control tower, facility manager, or airport operations personnel. Make sure circuits will not be energized during maintenance by observing strict lock-out tag-out procedures for the equipment and obtain authorization for local control if equipment is normally operated via remote control.
- e.** Where maintenance is to be conducted on a high-voltage circuit, assign at least two electricians, with at least one having a thorough knowledge of the layout of all airport high-voltage circuits.

- f. Because performing maintenance on many airport visual aids requires workers to traverse the active airfield, all workers must be fully knowledgeable of air traffic control and radio communication procedures. Workers must also be familiar with airport runway and taxiway layouts to avoid the possibility of runway incursions. All air traffic control instructions must be read back to the controller and, if the worker has any question regarding the instructions of the controller, the worker must ask the controller to repeat the message. All vehicles operated within the aircraft operations area (AOA) must be properly marked and lighted per FAA AC 150/5210-5, Painting, Marking and Lighting of Vehicles Used on an Airport.

If you are designated as an observer electrician, your duties include:

- Keeping other personnel not involved in the work clear of the equipment.
- Being familiar with power disconnects and immediately disconnecting the power source in case of emergency.
- Being qualified in first-aid and prepared to render emergency care if necessary. You should keep in mind that prevention of an electrical accident is of primary importance though first-aid treatment is available.
- Observing the work being done to detect and prevent unsafe practices.

### **2.5.1 Personal Safety Precautions.**

Every electrician should use the following safety precautions:

- a. Know the location of main power disconnect devices.
- b. Know how to summon medical aid.
- c. De-energize circuits by removing the proper fuses using insulated fuse pullers or by turning off and locking out circuit breakers or other disconnecting means. Consult circuit diagrams to identify all fuses, breakers or disconnects involved. Remember that removal of a fuse does not remove the voltage from the “hot” fuse clip. Discharge all capacitors.
- d. Do not depend on interlocks to remove power or on indicating lights to signal that power is off. Verify that power is off by using a voltmeter and/or ammeter on the component after opening the power switch. Verify operation of voltmeter (or ammeter) on known live circuit before and after measurements are taken.
- e. Insulate your feet by standing on a dry rubber mat. Remember, however, that any contact with the grounded equipment cabinet could nullify this protection.
- f. Stay clear of terminals, leads, or components that carry voltages of any magnitude. Also, avoid contact with components that are grounded, including the equipment cabinet frame.

- g.** Shut down and de-energize the equipment when it is necessary to reach into the equipment in locations where rapid and direct withdrawal of the hand is not possible. In any case, only one hand should be exposed, with the other hand kept away from contact with voltages or ground.
- h.** Be certain that there is no power applied to a circuit when making a continuity or resistance check (the meter will be damaged and you could be injured).
- i.** Ground test equipment to the equipment under test unless otherwise specified in instruction manuals.
- j.** Place a warning sign, such as “DANGER - DO NOT USE OR OPERATE,” at the main switch or circuit breaker, and provide a lockout for the circuit on which you will be working. Follow direction of local facility lock-out tag-out procedures manual.
- k.** Do not wear jewelry, wristwatches, or rings while working with electrical equipment.
- l.** Keep clothing, hands, and feet dry if at all possible.
- m.** Use the correct tool (screwdriver, alignment tool, etc.) for doing the job.
- n.** Never use toxic or flammable solvents for cleaning purposes.
- o.** Where air pressure is required for cleaning, use a low-pressure (30 psi or less) air source. Eye protection (goggles or face mask) is necessary when using compressed air for cleaning.
- p.** Do not take anything for granted when working with inexperienced help.

#### **2.5.1.1 Arc Flash Protection.** Understanding the Arc Flash Warning Labels

- a.** Each piece of equipment operating at 50 volts or more and not de-energized while work is being performed, must be evaluated for arc flash hazard and shock protection. This evaluation will determine the boundaries (i.e. prohibited, limited, restricted, etc.) of the arc flash and shock hazards. The evaluation will inform employees of what PPE must be worn.
- b.** When the evaluation is complete, an arc flash hazard warning label (see Figure 2-1) must be affixed to the equipment and be conspicuous to employees who may work on the energized equipment.



Figure 2-1. An Arc Flash Warning sign

## 2.6 Safety Boards.

Locate a plywood board for posting safety procedures and a pegboard for mounting safety equipment in the airport lighting vault, switchgear rooms, engine generator rooms, and other appropriate locations. In addition, provide a telephone for emergency use as well as regular communications use. Recommended safety procedures and safety items to be included on or adjacent to safety boards are as follows:

- a. Accident and fire procedures.
- b. Emergency telephone numbers, such as doctor, hospital, rescue squad, fire department, airport operations, police and Air Traffic Control Tower (ATCT).
- c. Resuscitation instructions.
- d. Resuscitation equipment (Resuscitube or equivalent).
- e. First-aid kit.
- f. High-voltage disconnect (hot) stick.
- g. Non-conductive body rescue hook.
- h. Rubber gloves rated for maximum voltage present with leather gloves and protective storage bag.
- i. Insulated fuse puller.
- j. Non-metallic flashlight
- k. Grounding stick.
- l. Safety posters and bulletins.
- m. Portable non-conductive warning signs with non-conductive hangers.
- n. Fire extinguisher of proper type rating for electrical fires.
- o. Emergency eyewash station if not provided elsewhere in building.
- p. Automatic External Defibrillator (may require certified personnel)

### **2.6.1 Safety Board Inspection.**

Inspect the equipment located on the safety board as indicated below:

- a. Test rubber gloves in accordance with ASTM D120, Specification for Insulated Rubber Gloves.

ASTM specifications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103. Specifications may also be purchased and downloaded from the internet at:

<http://webstore.ansi.org/SdoInfo.aspx?sdoid=41&Acro=ASTM&DpName=ASTM%20International&source=google&keyword=astm&gclid=CPuey-Sy1boCFe5cMgodMi0AIA>

- b. Testing may be performed by private testing labs, utility companies, and large military and Federal establishments.
- c. Gloves should be proof-tested at the following intervals:
  - In daily use – 30 days.
  - Infrequently used – 180 days.
- d. Visually inspect hot sticks for paint smears, carbon paths, dirt smears, etc., and clean them, if required, prior to use. Re-surface and test hot sticks that cannot be cleaned and/or have significant surface-coating ruptures.

**Note:** Wear certified rubber gloves (ASTM D120) and protective leather gauntlets whenever hot sticks are used.

### **2.7 Safety Checklist.**

Perform a safety inspection on a monthly basis to ensure that the safety boards contain all required items and that test equipment is in a safe operating condition. Retain the completed checklist on file for at least one year.

### **2.8 Safety Equipment in Vehicles.**

All vehicles operated on the airfield should have a properly sized fire extinguisher and first aid kit. Equip all vehicles and/or personnel with radio communication to be available to summon help in an emergency. Mark and register all vehicles appropriately. Equip all vehicles with a lighted warning beacon (see AC 150/5210-5, Painting, Marking, and Lighting of Vehicles Used on an Airport, for additional information about airport vehicle mounted beacons).

### **2.9 Electric Shock.**

An electric shock is the passing of an electric current through a person. The amount of damage depends on the amount of voltage and current to which the person is subjected.

- a. Voltages between 200 and 1000 volts at commercial power line frequencies are particularly harmful since, under these conditions, heart muscle spasm and paralysis of

the respiratory center occur in combination. However, lower voltages can also prove fatal, as evidenced by records of deaths caused by 32 volt farm lighting systems. The body response to current is as follows:

- 5 to 15 mA stimulates the muscles
- 15 to 19mA can paralyze the muscles and nerves through which it flows
- 25 mA and above may produce permanent damage to nerve tissues and blood vessels
- 70 mA and above may be fatal.

- b. The injurious effects suffered during electric shock depend upon the path of the current through the body. The current path will take the most direct route through the body from the two points of contact. For this reason, any current path which involves the heart or the brain is particularly dangerous. Therefore, keeping one hand clear of the equipment will eliminate the possibility of a current path from arm to arm.

## **2.10 Safety Training.**

Establish a safety training course and conduct for all employees. Conduct follow-up training on a periodic basis to ensure that employees are safety motivated. Include first aid and CPR (Cardio-Pulmonary Resuscitation) training in the safety training course. The safety course must include driver safety training (see AC 150/5210-20, Ground Vehicle Operations on Airports) and proper procedures on contacting local emergency, police, and fire agencies.

## **2.11 Safety Warning Signs/Danger Tags.**

The following discusses the use of warning signs on high voltage equipment.

### **2.11.1 Warning Signs.**

Permanently place “DANGER – HIGH VOLTAGE” signs on all fixed electrical equipment where potentials of 500 volts or more terminal-to-ground are exposed. Place signs in a conspicuous location, usually on the outside of the equipment.



**Figure 2-2. Example of a “Danger – High Voltage” sign**

### 2.11.2 Lock-Out/Tag-Out and Danger Tags.

Every airport electrical maintenance department must have a written lock-out/tag-out procedure. Equipment or circuits should never be worked on unless they are locked out and tagged by the person performing the work. In these situations, make it a rule to never trust anyone but yourself. Have your partner check behind you to make sure the proper equipment is turned off.

The lock-out tag should only be removed by the person who signed it except in some circumstances when verbal permission has been granted to another person or when the worker who signed the tag is on vacation, etc. Never rely on the air traffic controllers to assure electrical safety. Air traffic controllers are relieved periodically and the next person may not know of the work that is going on.

Always take whatever time is necessary to make sure that the circuit or equipment you are working on is safe. One of the primary reasons for accidents is when workers get in too great a hurry and don't take proper precautions and follow proper safety procedures. Always follow safety procedures and never become negligent or lax because you are doing the "same old job" on a daily basis.



Figure 2-3. Examples of Danger Tags

### 2.11.3 Locks and Padlocks.

Use built-in locks on switchgear and disconnecting switches whenever the equipment is tagged, and return the keys to the supervisor responsible for their control. Padlocks need not be used if it is decided that use and control of them would be difficult because of the type of switchgear and its location. However, use padlocks with "DANGER" tags attached when equipment or electrical lines remain out of service or when electrical work has been discontinued until a later date. When outside contractors are involved, each contractor should attach and control tags and locks independently.

## 2.12 Grounding and Bonding.

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 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.

## 2.13 Confined Spaces.

Be sure to have a plan in place for dealing with confined spaces that conforms to OSHA standards. Make sure to test the air quality and use an approved blower to ventilate any confined spaces before entering. This includes any unventilated space especially manholes and storage tanks. Remember that gases produced by rotting materials, both vegetable and animal, will displace oxygen. These materials can be commonly found in airport lighting manholes. When working in manholes and storage tanks with vertical access, personnel must wear proper Class II or Class III harnesses and be connected to a rescue tripod-mounted winch mounted above the entrance. Use forced air blowers with flexible ducts to provide fresh air to confined spaces. Keep vehicles away from air intakes for blowers. Vehicle exhaust can quickly contaminate the quality of the forced air.

## 2.14 Lightning.

When personnel are subjected to direct lightning strikes, the results are nearly always fatal. Although extraordinary escapes from direct strikes have been reported, the shock is usually so great that survival is rare. The major portion of lightning casualties arises from secondary effects, such as side flashes and induced charges.

**Note:** If administered in time, first-aid treatment, especially artificial respiration or cardiopulmonary resuscitation may prevent death.

Assess your lightning risk and take appropriate actions. During thunderstorms, no place outside is safe. If you can hear thunder, lightning is close enough to strike. Stop what you are doing and seek safety in a substantial building or a hard-topped metal vehicle.

Lightning: What You Need to Know

- ***NO PLACE*** outside is safe when thunderstorms are in the area!!
- If you hear thunder, lightning is close enough to strike you.
- When you hear thunder, *immediately* move to safe shelter: a substantial building with electricity or plumbing or an enclosed, metal-topped vehicle with windows up.

Stay in safe shelter at least 30 minutes after you hear the last sound of thunder.

For additional information about lightning safety see: [www.lightningsafety.noaa.gov/tips.htm](http://www.lightningsafety.noaa.gov/tips.htm)

## **2.15 Toxic Agents.**

Toxic agents are poisonous substances that can cause injury by contact or injection. Substances termed “caustic” or “corrosive” cause the flesh to be dissolved on contact; the results of contact with these agents range from minor skin irritations to severe burns. There are materials that are toxic only if they are taken internally. Toxic agents also exist as a gaseous vapor and may be injurious immediately or over a long period of time. There are also a few substances used in electric equipment that are basically non-toxic agents, but under certain conditions can become highly toxic.

### **2.15.1 Carbon Tetrachloride.**

Never use carbon tetrachloride. Contact with liquid carbon tetrachloride destroys the natural oils of the skin, producing a whitish appearance on skin surfaces that are exposed. Continuous skin exposure may cause skin eruptions. Carbon tetrachloride fumes are highly toxic.

### **2.15.2 Trichloroethylene.**

This agent, used principally as a degreasing solvent, is a narcotic and anesthetic material. Organic injury rarely results from overexposure, but repeated overexposure can cause anemia and liver damage.

### **2.15.3 Battery Acids.**

The most common battery acid is sulfuric acid. Sulfuric acid is a corrosive toxic agent; repeated or prolonged inhalation of its fumes can cause inflammation of the upper respiratory tract, leading to chronic bronchitis. Loss of consciousness with severe damage to the lungs may result from inhalation of concentrated vapors when the sulfuric acid is hot. Sulfuric acid, when used in a highly concentrated form (prior to adding water for battery use), acts as a powerful caustic, destroying skin and other tissue on contact. This destruction appears as severe burns, and such exposure may be accompanied by shock and collapse. The fumes from highly concentrated sulfuric acid cause coughing and irritation of the eyes; prolonged exposure may produce chemical pneumonitis.

Batteries and battery acid also produce hydrogen gas, a by-product of the charging process. Hydrogen gas, when mixed with air in the right proportions, is highly flammable and can react explosively in conjunction with a spark or flame.

All locations where lead-acid batteries are used or housed should have, as a minimum, an emergency eyewash station installed. If water is not readily available, portable emergency eyewash stations consisting of a wall mountable water bottle should be made readily available.

## **2.16 Fire Extinguishers.**

Conveniently locate fire extinguishers of the proper type (see paragraph 2.15.4), and in good working condition, near all high-voltage equipment. For additional details about fire extinguishers, see NFPA 10, Standard for Portable fire Extinguishers.

### **2.16.1 A Brief Introduction to Fire Extinguishers and Fire Types.**

When used properly, portable fire extinguishers can save lives and property by extinguishing or containing a small fire until the fire department arrives.

Portable fire extinguishers, however, are not designed to fight large or spreading fires. Even for small fires, they are useful only under certain conditions:

- The operator must know how to use the extinguisher. There is no time to read directions during an emergency.
- The extinguisher must be within easy reach and in working order, fully charged.
- The operator must have a clear escape route that will not be blocked by fire.
- The extinguisher must match the type of fire being fought. Extinguishers that contain water are unsuitable for use on grease and electrical fires.
- The extinguisher must be large enough to put out the fire. Many portable extinguishers discharge completely in as few as 8 to 10 seconds.

### **2.16.2 How to Use Portable Fire Extinguishers.**

Remember the **PASS** system:

**P**...Pull the Pin

**A**...Aim the extinguisher nozzle at the base of the flames

**S**...Squeeze trigger while holding the extinguisher upright

**S**...Sweep the extinguisher from side to side

**ALWAYS** make sure the fire department is called and inspects the fire site, even if you think you have extinguished the fire!

### **2.16.3 Should You Try to Fight the Fire?**

Before you begin to fight a fire:

- Make sure everyone has left or is leaving the building
- Make sure the fire department is called
- Make sure the fire is confined to a small area and is not spreading
- Make sure you have an unobstructed escape route to which the fire will not spread
- Make sure you have read the instructions and know how to use the extinguisher.

**It is reckless to fight a fire in any other circumstances. Instead, leave immediately and close off the area.**

### **2.16.4 Class of Fire Extinguishers.**

Fire extinguishers are divided into four categories that are based upon different types of fires. Each fire extinguisher also has a numerical rating that serves as a guide for the amount of fire the extinguisher can handle; the higher the number, the more fire-fighting power. The following is a quick guide to help choose the right type of extinguisher:

- **Class A** extinguishers are for combustible materials such as paper, wood, cardboard, and most plastics. The numerical rating on these types of extinguishers indicates the amount of water it holds and the amount of fire it can extinguish.
- **Class B** fires involve flammable or combustible liquids such as gasoline, kerosene, grease and oil. The numerical rating for Class B extinguishers indicates the approximate number of square feet of fire it can extinguish.
- **Class C** fires involve electrical equipment, such as appliances, wiring, circuit breakers and outlets. Never use water to extinguish Class C fires – the risk of electrical shock is far too great! Class C extinguishers do not have a numerical rating. The C classification means the extinguishing agent is non-conductive.
- **Class D** fire extinguishers are commonly found in a chemical laboratory. They are for fires that involve combustible metals, such as magnesium, titanium, potassium and sodium. These types of extinguishers also have no numerical rating, nor are they given a multi-purpose rating – they are designed to Class D fires only.

Some fires may involve a combination of these classifications.

#### 2.16.5 Most Common Types of Fire Extinguishers.

- Water extinguishers** or air-pressurized water (APW) extinguishers are suitable for **Class A fires only. Never use a water extinguisher on grease fires, electrical fires or Class D fires – the flames will spread and make the fire bigger!** Water extinguishers are filled with water and pressurized with oxygen. Again – water extinguishers can be very dangerous in the wrong type of situation. Fight the fire only if you are certain it contains ordinary combustible materials.
- Dry chemical extinguishers** come in a variety of types and are suitable for a combination of **Class A, B and C fires**. These are filled with foam or powder and pressurized with nitrogen.
  - (1) BC** - This is the regular type of dry chemical extinguisher. It is filled with sodium bicarbonate or potassium bicarbonate. The BC variety leaves a mildly corrosive residue which must be cleaned immediately to prevent any damage to materials.
  - (2) ABC** – This is the multipurpose dry chemical extinguisher. The ABC type is filled with monoammonium phosphate, a yellow powder that leaves a sticky residue that may be damaging to electrical appliances such as a computer.

Dry chemical extinguishers have an advantage over CO<sub>2</sub> extinguishers because they leave a non-flammable substance on the extinguished material, reducing the likelihood of re-ignition.

**Carbon Dioxide (CO<sub>2</sub>) extinguishers** are used for **Class B and C fires**. CO<sub>2</sub> extinguishers contain carbon dioxide, a non-flammable gas, and are highly pressurized. The pressure is so great that it is not uncommon for bits of dry ice to shoot out the nozzle. They don't work very

well on Class A fires because they may not be able to displace enough oxygen to put the fire out, causing it to re-ignite.

CO<sub>2</sub> extinguishers have an advantage over dry chemical extinguishers because they don't leave a harmful residue – a good choice for an electrical fire on a computer or other electronic device.

**It is vital to know what type of extinguisher you are using. Using the wrong type of extinguisher for the wrong type of fire can be life-threatening.**

## **2.17 First Aid.**

First aid is performed before the doctor arrives - it is never a substitute for qualified medical help. The maintenance technician should perform the lifesaving measures necessary in emergencies, but avoid doing any harm. Many first-aid measures are quite simple and do not require “split-second speed” in their application. Haste without knowing what one is doing can be worse than doing nothing at all. At other times, immediate action is essential to save a life or prevent serious complications; this action can only be taken by someone who is on the scene when minutes are vital. Learn about first aid before emergencies happen. Be prepared to give help safely and beneficially when necessary. Contact the American Red Cross to provide refresher first-aid courses to maintenance personnel to keep them proficient.

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## **Chapter 3. Maintenance Management.**

### **3.0 Maintenance Philosophy.**

The purpose of the maintenance management system is to ensure the maximum availability of any given system at a minimum cost in man-hours or funds. “Availability” and “costs” are relative terms; they must be interpreted for each airport. For example, a CAT I runway may still be considered operational with 15% of the edge lights out, while a PAPI system may be unserviceable with more than one lamp out per box.

By the same reasoning, the cost of maintaining a spare regulator may be considered cost prohibitive, while stocking replacements for 10% of the runway edge lights may be considered a normal practice. In addition, operational factors are a major consideration in determining what maintenance is required. Airports with heavy traffic may require more frequent maintenance servicing than those with light traffic. The maintenance operations include maintenance planning, preventive maintenance inspection, visual inspection, repair, installation, calibration, and unscheduled maintenance procedures.

Maintenance procedures, including the work order and documentation required, may vary between airports. The purpose of this document is to provide the minimum maintenance procedures required for safe and efficient movement of aircraft during takeoff, landing, and taxiing operations.

Regardless of the actual maintenance routines decided upon, the following elements are essential to any controlled maintenance program. The maintenance procedures in this AC are considered minimum guidelines:

- a. Document the service checks that comprise the maintenance program.
- b. Record the performance of each maintenance action, scheduled or unscheduled.
- c. Document repairs and troubleshooting performed on each piece of equipment and the results of those actions as well as the symptoms related to the malfunction. This allows for more rapid troubleshooting of similar problems at a later date.

### **3.1 Maintenance Schedule.**

Documenting the maintenance schedule by spelling out each item of routine maintenance is beneficial in several ways:

- a. It allows planned allocation of man-hours to the maintenance function.
- b. It helps to establish spare part stock levels.
- c. It identifies the necessary maintenance routines to new employees, decreasing training time needed for system familiarization.

- d. It identifies the scope of the maintenance task in terms of man-hours and material requirements.

### **3.2 Maintenance Records.**

Maintenance records are an important part of an effective maintenance management system; they provide a service history of each piece of equipment, ensure regular maintenance without duplication of effort, and provide a data base for statistical analysis of lighting system performance. Without records, knowledge gained from regular inspections will not be retained, and preventive maintenance will be difficult.

An effective records system should allow for the recording and retrieval of information with a minimum of effort. The records system should compile data that will document the effectiveness of the maintenance program. By checking the records, a manager should be able to determine whether a particular maintenance task is being done too frequently or not often enough. By such a trial-and-error process, a maintenance program uniquely tailored to the facility can be developed.

#### **3.2.1 Maintenance Logs for Lighted Navigational Aids - PAPIs, VASIs, REILs, or ODALS.**

To ensure that visual lighting aids are properly maintained, maintenance logs (see example in appendix B) should be kept for all non-federal lighted navigational aids (precision approach path indicators (PAPIs), visual approach slope indicators (VASIs), runway end identifier lights (REIL), and omnidirectional approach light systems (ODALS)). The maintainer of these facilities, if different from the airport sponsor/owner, should provide copies of the completed maintenance log to the airport manager to be filed at the airport.

Upon completion of scheduled maintenance/inspections, the airport sponsor/owner should include a written statement in the maintenance log declaring that:

- maintenance/inspection of the subject facility has been performed per the applicable sections of Chapter 5 of this advisory circular,
- the facility is per equipment manufacturer's specifications
- the facility is per Appendix A (Standards and Tolerances, Tables 3, 6, and 7) of this advisory circular.

All facility maintenance logs should be retained per the requirements in Chapter 3, Maintenance Management, of this AC. Guidance for the proper completion of a maintenance log and examples of maintenance log content are in appendix B.

### **3.3 Preventive Maintenance Program.**

Reliable functioning of airport lighted visual aids is essential to airport safety, capacity, and operation especially for low visibility operations. Therefore, it is essential that a preventive maintenance program be established to ensure reliable service and proper equipment operation.

Properly scheduled inspections, testing, and calibrations are essential to the proper functioning of these systems. Airport lighting systems are designed to be dependable and may continue to operate for long periods of time despite neglected maintenance. Eventually a failure will occur and, if the failure occurs at a critical time, safety may be jeopardized. Lighted visual aid maintenance should receive high priority to prevent equipment failure, false signals, and overall deterioration of the system.

### **3.3.1 Installation and Material.**

The most important element in a preventive maintenance program is high quality, properly installed equipment. Preventive maintenance is difficult on equipment that has been installed haphazardly without consideration of maintenance requirements. When such conditions exist, they should be brought to the attention of the proper authority and corrected rather than trying to establish a preventive maintenance program to compensate for the condition.

Consult the electrical maintenance supervisor at an airport prior to and during the design of any installation of new or additional visual aid systems. By so doing, the airport can avoid costly problems during and after construction. Consideration should also be given to the method of selection and training of any contractor personnel involved in the installation of airfield lighting products. The need for specialized training for airport maintenance electricians applies to the contractor personnel also.

### **3.3.2 Personnel.**

The second element in a preventive maintenance program is trained and experienced personnel. Maintenance personnel should have a thorough knowledge of the equipment, experience with high voltage, and should be able to perform inspections and repairs. Special training is available and may be desirable, as most well-qualified electricians can be trained on-the-job if suitable supervision and instruction are provided.- Qualified maintenance individuals should be present, or on-call, during the operating hours of the airport to correct any deficiencies that may develop. Airport visual aid maintenance personnel should be specialists in the field.

### **3.3.3 Tools and Test Equipment.**

The third element in a preventive maintenance program is the tools and test equipment required to perform the maintenance. This includes specialized tools and test equipment, adequate working space, adequate storage space, spare parts, and applicable technical manuals.

### **3.3.4 Preventive Maintenance Inspection Program.**

The fourth element in a preventive maintenance program is an effective inspection schedule for each visual aid. The schedule should also include all cable systems that are associated with visual aids. The preventive maintenance inspection (PMI) schedule is the foundation for the successful maintenance of the equipment. If the PMI is performed properly and at the scheduled time, it will ensure top system performance and will minimize unscheduled interruptions and breakdowns. Reviews of the inspection records, checks, tests, and repairs provides a constant awareness of the equipment condition and gives maintenance personnel advanced warning of impending trouble.

### **3.3.5 Preventive Maintenance Inspection Schedule.**

Scheduled inspections and tests are those accomplished on specific types of equipment on a periodic basis. The schedule may be based either on calendar or on hourly-use increments. The PMI schedules, based upon recommendations from the manufacturers and users of the equipment, are considered to be the typical requirements to keep the equipment in good condition. Adjust the frequency of a particular PMI after experience is gained under local operating conditions.

### **3.4 Record Retention.**

There is no set period of time that maintenance records should be kept, but in keeping within the goals mentioned above, a period of twice the longest period recorded would appear to be the minimum (i.e., 2 years in the case of annual maintenance action). Records of daily inspection will, of course, lose their significance much sooner, probably within a month. It should be noted however, that maintenance records should be retained permanently, if possible, because situations may develop years later when those records can prove invaluable.

### **3.5 Reference Library.**

Establish a reference library to maintain a master copy of all Equipment Technical Manuals (ETMs), ACs, as-built drawings, and other useful technical data. The electrical supervisor should establish and maintain responsibility for maintaining the technical reference library and ensure that technical manuals and drawings are kept up to date and not lost or damaged.

#### **3.5.1 Equipment Technical Manuals (ETMs).**

ETMs and other manufacturer's literature form an important part of the reference library. Obtain three copies of all technical manuals and related manufacturer's literature. Retain a master copy in the reference library and provide a separate copy for the shop. In addition, keep a copy of each equipment manual at the equipment location. This facilitates troubleshooting and repairs without traveling back to the shop location to retrieve the manual.

Do not remove the master copy of the technical manual from the reference library because it can easily become misplaced or lost. In the event the shop copy is lost, make another photocopy of the technical manual from the reference library instead of releasing the master copy.

#### **3.5.2 Advisory Circulars.**

Important reference information about installation, design tolerances, and operation of visual aid equipment may be found in FAA ACs. Include a copy of the ACs for the equipment at the facility, along with a copy of this AC, in the reference library.

#### **3.5.3 Other Technical Data.**

Other reference information that is occasionally useful should also be added to the library. This might include local electrical codes, engineer's handbooks, test equipment manuals, and other general information publications.

### **3.5.4 As-Built Drawings.**

Maintain the master copy of all as-built (record) drawings as part of the reference library. Incorporate modifications to any equipment into the drawings as soon as the modification is completed. Give a copy of the “as-built” lighting plan, showing the location of all cable runs, runway lights, etc., and including the wiring diagrams for the lighting, engine generator, and the visual aid system, to the field technicians as a working copy. Install or identify test points at appropriate locations in the field circuitry and record locations of these test points on the “as-built” drawings. Immediately update any notations regarding test points or discrepancies in the drawings made in the field on the master set in the reference library.

### **3.6 Spare Part Provisioning.**

This paragraph contains guidelines on how to establish a stock of spare parts to be used for quick repair of lighting equipment that fails unexpectedly. The purpose of a spare parts system is to have the necessary part on hand when a piece of equipment fails; this will minimize the time the system is out of operation. However, the greater the number of spare parts stored, the greater the inventory costs. The optimum spare part system balances the cost of system downtime (lost operation, tenant inconvenience, safety, etc.) with the cost of purchasing and storing spare parts.

A small airport with few operations may suffer little inconvenience with the loss of their lighting system and may, therefore, choose to stock few spare parts. A large airport may rely heavily on its lighting system for low visibility operations and would, therefore, require a substantial quantity of spare parts. In the case of a large airport, the funds lost by the tenants due to interrupted operations and the impact on the safety and security of the traveling public must also be taken into consideration. A malfunction at a major airport can have a far reaching effect on the national airspace system. When establishing a spare parts inventory, two questions must be answered:

- (1) What parts should be stocked?
- (2) How many of each part?

When new construction occurs or a project is funded for replacement of existing systems, fund and include a quantity of spare parts (light fixtures, lamps, fuses, relays and spare CCR control boards, etc.) in the equipment furnished by the contractor. This gives the maintenance department a built-in stock of spare parts and lessens the time required to procure parts for the new equipment. This is especially true if the equipment being installed is different from what is currently in use.

#### **3.6.1 Choosing Spare Parts.**

To answer the two questions posed above, several factors must be considered, including failure rate, part availability, and effect of the part failure on airport and flight operations.

### **3.6.2 Failure Rate.**

The failure rate (or replacement rate) is the product of the expected life of an item and the number of items in the system. For instance, if a lamp is expected to last six months, and we have 100 lamps in the system, then an average of 100 lamps will be replaced every six months or approximately four per week. Accurate records of parts used over time will help immensely in determining a failure rate.

### **3.6.3 Part Availability.**

Part availability refers to the time required to secure a replacement part. This usually means procurement lead time. If a part can be readily procured from shelf stock of a local supplier, it might not be necessary to add the part to the spare parts inventory; as it could be purchased when needed or the number of spare parts in the inventory could be reduced. However, if there is a six-week lead time required by the supplier, then stock six times the weekly failure rate (24 lamps in the example above). Spare parts for constant current regulators and other special equipment fall into this category. For instance, a replacement printed circuit board or other assembly typically has a six to twelve week lead time and unless a spare regulator is maintained for emergency use, the loss of a circuit could have a serious effect on airport operations.

There are methods of obtaining parts which may reduce the effect of a long lead time. These include substitution (the use of a functionally equivalent part from another manufacturer), cannibalization (replacing one of a pair of adjacent failed lamps by “borrowing” a lamp from elsewhere in the system), and temporary fixes (such as the use of portable lights in place of the fixed light installation) while awaiting corrective maintenance. It should be noted, however, that these solutions should be considered only as an emergency measure and that proper spare parts provisioning will eliminate the need for such techniques.

### **3.6.4 Effect of the Failure.**

The effect of the failure of a particular spare part depends on how important the part is to the equipment operation and how vital the equipment is to airport operations. The failure of a lamp in an edge light would not lead to any system downtime, but the failure of a circuit board in a constant current regulator would cause the loss of the entire lighting circuit that it powers. The equipment manufacturer will give guidance on recommended spare parts. As experience is gained with the system, other parts may be added or deleted from the inventory. The impact of a part's failure should be considered when building a spare parts inventory.

### **3.6.5 Part Identification.**

An important part of maintaining a spare parts inventory is accurately cataloging the parts on hand by manufacturer's part number. This is important to ensure that the correct part is used in a broken piece of equipment; many optical parts are visually similar but vary significantly in performance. The use of the manufacturer's part number is also vital when reordering; if a part is ordered by its generic name, the manufacturer may send a later version of the part which is incompatible with the existing system. It is extremely important to maintain manufacturer's data which reflects your equipment, describing the type, model number, and serial number details.

### **3.6.6 Use of Original Equipment Manufacturer (OEM) Part.**

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.

### **3.7 When Lighted Navigational Aids are Identified as Suspect in an Aircraft Accident.**

When notified by the FAA that a lighted navigational aid is declared out of service due to being suspect in an aircraft accident, the airport sponsor/owner/operator should:

- Immediately inspect the affected facility and record as found all functional parameters per the appropriate table of Appendix A, Standards and Tolerances, of this AC.
- Retain the as-found inspection record (technical performance record) per paragraph 3.4 of this AC and store it at the airport manager's office (on site at the airport) for ready access by authorized personnel.
- Prepare a maintenance log entry and include a written statement that a facility "as-found inspection" is complete. The airport sponsor/owner/operator should also state that the equipment is functional per the manufacturer's standards, tolerances, and specifications. The statement should be delivered to the airport manager for filing in the airport manager's office.
- Contact the Operations Control Center (OCC) to cancel the NOTAM. NOTAM cancellation should be per FAA JO 7930.2, current revision.

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## **Chapter 4. Test Equipment.**

### **4.0 Introduction.**

An electrician may have little day-to-day use for anything more than a voltmeter; however, when maintaining airport lighting series circuits, the equipment needs become more demanding. An airport electrician needs to be able to perform many tasks involving troubleshooting and calibration that are typically out of the norm for the average wireman. Series circuits operate at potentially high voltages and are prone to develop shorts and opens that require an advanced knowledge of the use of ohmmeters and insulation resistance testers (meggers) to properly trace the problem and get the lighting circuits back up and operating in a minimum of time.

There is also a need for current measurements at relatively low currents (<20 amps) that require accurate and calibrated equipment. A small change in the output current in a series circuit can have a large effect on light output and lamp life. At maximum output of 6.6 amps at the lamp, a current change (increase or decrease) of 1% can change the light output of the lamp by as much as 5%. That same 1% change (increase) can result in a 20% decrease in lamp life.

Accurate test equipment and proper knowledge of its usage are vital to the maintenance of the airfield lighting system. Due to the non-sinusoidal output waveform of many constant current regulators, it is imperative to verify the accuracy of all current measuring devices. Evaluate all equipment used for the calibration of regulators and have the equipment calibrated for the values to be measured (2.8 – 20 amps) by a certified calibration lab.

For maintenance purposes, it is recommended that every airport acquire at least a volt-ohm-meter, an insulation tester and an accurate true RMS measuring clamp-on AC ammeter or true RMS digital multimeter with an accurate clamp-on ammeter probe. These units are useful for various maintenance routines and are necessary for troubleshooting and calibration of constant current regulators and series lighting circuits.

### **4.1 Types of Equipment and Usage.**

#### **4.1.1 Volt-Ohm-Milliammeter (VOM).**

An analog VOM is a highly versatile piece of test instrument that is capable of measuring AC/DC voltages, resistance, and low values of DC current. The better quality units offer reasonable accuracy and ruggedness and are useful for making a large variety of measurements. The most common use of this instrument is for making resistance measurements on series circuits for the purpose of troubleshooting when a fault has occurred. An analog VOM is useful because of its ability to show fluctuating trends and rates and the ease with which it offers a go, no-go check when rapid troubleshooting is required. An analog VOM does have limitations however. Its relatively low-input impedance and susceptibility to interference make it unsuitable for some measurements, especially when dealing with electronic circuits or when working in an environment with RF (radio frequency) energy present. Also it must be remembered that a typical VOM should not be used for making current measurements in an airfield lighting series circuit because it may not be designed for true RMS, high accuracy measurements.

#### 4.1.1.1 Safety.

Safety must always be considered when using a VOM. Know the voltage levels and shock hazards related to all equipment to be tested. Be sure that the VOM has been tested and calibrated. Inspect and calibrate portable test instruments at least once a year. Check the condition of the VOM test leads before making any measurement. General recommendations for specific uses of a VOM are contained in the manufacturer's manual supplied with the equipment.

- a. High-voltage measurements. Never try to take direct voltage measurements on power distribution circuits rated over 600 volts. Measurement of high voltage is accomplished by installing properly rated instrument transformers and meters.
- b. Switch settings. When making voltage measurements on power and control circuits, be sure that the meter selector and range switches are in the correct position for the circuit under test before applying test leads to the circuit conductors. To prevent damage to the meter movement, always use a range that ensures less than full-scale deflection of the pointer. A 1/3 to mid-scale deflection of the pointer assures the most accurate readings.
- c. Case insulation. Do not hold the VOM in the hand while taking the reading. Support the instrument on a flat surface. If holding the VOM is unavoidable, do not rely upon the insulation of the case.

#### 4.1.2 Digital Multimeter (DMM).

A DMM is another piece of essential test equipment for the airport electrician's toolbox. This versatile instrument can deliver high accuracy and, through the use of various accessories, the ability to make a wide range of measurements. The best advice when purchasing this or any type of test equipment is to buy the best you can possibly afford. Always make sure that the DMM you use is a true RMS type and that the accessories are of the highest accuracy (see paragraph 4.1.5).

A DMM with a good quality clamp on ammeter accessory is a good combination for measuring the output current of constant current regulators. Verify that all DMM accessories are within the accuracy requirements for the intended task. Ensure that the accuracy of the DMM and all accessories are checked and calibrated annually by a certified calibration lab for the ranges to be measured. In the case of airport lighting series circuits, 2.8 to 20 amps is the range for verifying proper calibration.

All safety precautions listed for VOMs also apply to DMMs.

#### 4.1.3 Insulation Resistance Tester (MegOhmMeter).

The insulation resistance tester or megohmmeter is a necessary tool for maintaining and troubleshooting underground airport lighting series high voltage cables. Insulation resistance testers come in a variety of styles from the traditional hand-crank models to battery and AC mains powered versions. These instruments are used for testing the insulation resistance-to-ground of underground cables; for testing insulation resistance between conductors; and for testing resistance-to-ground or between windings of transformers, motors, regulators, etc. The

battery powered models are the most prevalent and come in all shapes and sizes in both analog and digital readout. Most of the digital models have an analog bar graph to supplement the digital reading. Another consideration in selecting an insulation resistance tester is the output voltage.

Some battery and line powered units now have selectable output voltages that can range as high as 5000 volts DC. As a minimum, select an insulation resistance tester with an output of 1000 volts DC.

#### **4.1.3.1 Safety.**

- a. When preparing to make an insulation resistance test, first make a complete safety check. Make sure that equipment to be tested is disconnected from all power sources. Open all safety switches and lock out other control equipment so that the equipment cannot be accidentally energized.
- b. If neutral or ground conductors must be disconnected, make sure they are not carrying current and that, when disconnected, no other equipment will lack protection.
- c. Observe the voltage rating of the tester and take suitable precautions.
- d. Large equipment and cable usually have sufficient capacitance to store a dangerous amount of energy from the test current. After taking resistance readings and before handling the test leads, allow any energy stored in the equipment to discharge by leaving the tester connected for at least 30 seconds before touching the leads. Many new testers will automatically discharge the equipment under test and give the user a visual or audible indication when it is safe to remove the test leads. Consult the equipment manual for information on manufacturer's instructions.
- e. Do not use the tester in an explosive atmosphere. An explosion may result if slight sparking is encountered when attaching or removing test leads, or as a result of arcing through or over defective insulation.

#### **4.1.4 Underground Cable/Fault Locators.**

A cable locator is an indispensable tool for quickly locating airport lighting cable and ducts. A cable locator normally consists of a transmitter which is either directly (or indirectly by means of an inductive coupler) attached to an underground cable and a receiver that is used to pick up the transmitted signal to follow the path of the cable. Cable locators are very handy for locating the path of a conductor while troubleshooting cables in PVC conduit and are even more necessary when dealing with direct buried cables.

Whenever work on the airport requires digging of any kind, it is necessary to utilize a cable/fault locator to prevent inadvertent cutting of cables. Most of the receivers also incorporate the ability to locate 60 Hz AC cables without the necessity of applying a signal or tone to the conductor. If the airport circuits are supplied by direct-buried conductors or have direct-buried control cables, it is advisable to purchase a locator which also has the capability of locating ground faults. It should be noted, however, that faults in cables installed in conduit cannot be located using these

devices. Cable locators that include fault-finding capability are normally equipped with an A-frame probe that is used with the receiver to determine the direction of a fault between the conductor or shield to ground.

#### **4.1.4.1 Safety.**

When using a direct connection to the conductor to be located or tested, always exercise care to ensure that the circuit supplying the conductor has been de-energized and locked out, and tagged.

#### **4.1.5 Clamp-on Ammeter.**

The stand-alone clamp-on ammeter is useful for measuring AC and sometimes DC current. Most of the modern instruments of this type are provided with plug-in leads to permit the instrument to be used as a voltmeter or as an ohmmeter. Ensure that the unit is a true-RMS type so it can measure the distorted waveform output of some constant current regulators. The same warnings apply to these devices as to the DMM/clamp-on combination when it comes to accuracy of the instrument. Because most of these devices are rated to measure current far in excess of what you need to measure on airport lighting circuits, their accuracy at the low end of the measurement scale may be in question – this may be particularly true for lighting circuits that use LED lamps. Clamp-on devices having an accuracy of  $\pm 2\%$  or better should be used because a small change in series circuit lamp current can produce a large change in lamp light output and potentially shorten lamp life. It may be beneficial to have a registered calibration laboratory check the instrument and calibrate it to the lower amp range.

##### **4.1.5.1 Safety.**

A clamp-on ammeter reduces operator exposure to high voltage. However, the operator must observe normal safety precautions to prevent coming in contact with exposed conductors when taking current readings.

#### **4.1.6 AC Proximity Voltage Tester.**

These small non-contact testers, sometimes referred to as “tickers,” can be handy for detecting voltage present in insulated cables. Depending on the model, they may have a wide measurement range. They should not, however, be used to determine if an airfield lighting series circuit is energized (4.1.6.1). The reason for this is because of the behavior of voltage in a series circuit. The voltage is reduced by the various voltage drops (loads) present in the circuit until at some point near the middle of the circuit there is no measurable voltage although current flow is still present. Breaking a live series circuit at any point can result in injury or death. See paragraph 2.3.1.

##### **4.1.6.1 Safety.**

Do not rely on these units as the only instrument used to protect oneself from coming into contact with energized conductors. A good quality clamp-on ammeter device is the only safe way to check for an energized series lighting conductor. After checking for the presence of current with a clamp-on ammeter, an inductive proximity voltage measuring device may be used to detect the presence of induced voltage. Also, as with all test instruments used for measuring

voltage or current, make sure that you test the device on a known live circuit before and after making any measurement of this kind.

#### **4.1.7 Time Domain Reflectometer.**

The Time Domain Reflectometer (TDR) was once a very expensive laboratory quality instrument used for testing control and coax cable systems. However, these instruments have evolved into less expensive hand-held units capable of pinpointing the location of opens or faults in long runs of twisted pair control cables. If your facility is using long runs of telephone type twisted pair cables for control of airfield lighting equipment from a remote control tower location, it may be useful to invest in one of these devices for troubleshooting purposes. The TDR applies a signal to the cable pair in question and can give readout in feet indicating the distance to the cable fault as well as a visual display of the cable run. This can save many hours of troubleshooting when trying to find a bad splice in a long run of control cable. The newest models have settings for testing power cables, data cables, coax cables, as well as telephone and control cables. Some of these units are capable of measuring cable lengths of up to 48,000 ft.

A similar device is the Optical Time Domain Reflectometer which is used to perform similar tests on optical fiber cable. With the advent of computerized control systems employing fiber optic networks for control of airfield lighting systems, the ability to troubleshoot these cable systems is becoming necessary. At the time of this writing, these instruments are still extremely high in price and probably not a justifiable expense to the average airport maintenance department. In most cases it may be more economical to employ outside contractors to perform any troubleshooting and repairs on fiber optic cable systems.

##### **4.1.7.1 Safety.**

For other measurement devices that require direct connections to conductors, be sure to exercise a proper safety check to verify that the conductor or circuit under test has been de-energized and is locked-out and tagged.

#### **4.1.8 Tone and Probe Tracing Sets.**

Normally used by technicians employed in the telephone industry, these devices can be a great addition to the airfield electrician's toolbox. The kits are inexpensive and can be used for many purposes at an airport to identify individual conductors whether in a control cable or individual power cables in a manhole or vault. The simple transmitter is connected directly to any un-energized conductor and injects a tone on the conductor that can be heard by using an inductive probe.

##### **4.1.8.1 Safety.**

For other measurement devices that require direct connections to conductors, be sure to exercise a proper safety check to verify that the conductor or circuit under test has been de-energized and is locked-out and tagged.

#### **4.1.9 Infrared Thermometer.**

Infrared thermometers are hand-held devices that can give a direct temperature readout of any surface from several feet away. They can be aimed at the target via a laser target sight. In addition to identifying loose connections in electrical panelboards, these instruments may be used for troubleshooting ground faults in airfield lighting circuits. By measuring the temperature of different light bases on the runway or taxiway and comparing the temperature differential between light bases, it is possible to find the location of a ground fault if the cable and transformer assembly is arcing and burning inside a light base.

##### **4.1.9.1 Safety.**

Because the use of an infrared thermometer requires no contact with the surface of the object to be measured, these devices are generally very safe to use. Follow manufacturer's instructions and avoid direct eye exposure to the laser sighting beam.

#### **4.1.10 Portable Oil Dielectric Tester.**

Most older constant current regulators (CCR) are oil filled for cooling. The oil also acts as an insulator and must be maintained. Dirt, sludge, and other contaminants will reduce the dielectric strength of the insulating oil causing a potential for failure of the transformer. Sample and test the oil per paragraph 5.2.5. A portable oil tester may be a justifiable expense if the airport maintains a large number of oil-cooled CCRs.

##### **4.1.10.1 Safety.**

Portable oil dielectric testers utilize high voltages up to 30 kV and extreme care must be taken operating this equipment. Always follow all manufacturer's operation and safety instructions.

#### **4.1.11 Ground Rod Resistance Tester.**

Ground rod resistance testers come in several styles and are necessary for checking and maintaining the effectiveness of airport grounding and counterpoise systems. The testers measure the resistance between the grounding system and the earth ground. Some of the newer models are simple clamp-on units capable of measuring the resistance-to-ground of ground rods or grounding conductors by measuring the ground leakage current without disconnecting the grounding conductor under test. Follow the manufacturer's instructions to obtain an accurate ground resistance reading.

The grounding system in question may be used for beacon towers, lighting vaults, engine generators, and for other lighted visual aids, or it may be a counterpoise system for underground cables. The maximum acceptable ground resistance is 25 ohms; the lower the resistance, the better. In many locations, the water table is gradually falling. In these cases, the ground electrode systems that were effective when initially installed may no longer be effective. This emphasizes the importance of a continuous program to periodically check the grounding system. It is not sufficient to check the grounding system only at the time of installation.

#### **4.1.11.1 Safety.**

A grounding system is a very important integral safety feature in airport lighting systems. To be effective, the grounding system must have a very low resistance-to-ground. When the grounding system has a high resistance, a very high voltage can build up on a grounded chassis or equipment frame. When this built-up voltage discharges through a person, injury or death may result. For this reason, check the effectiveness of the grounding system regularly.

#### **4.1.12 Mobile Photometric Measurement System.**

Maintain the light output of runway lighting systems within specified limits to provide effective visual cues to the pilot while landing in low visibility conditions. Clean or service the lights when the brightness of the fixture is less than 70% of the minimum output required when operated at full intensity, per values listed for that fixture in AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures. A fixture degraded below this is ineffective for high background brightness, low visibility conditions and should be targeted for maintenance. See Appendix A, Standards and Tolerances, Table 8.

In the past, *in situ* photometric measurements were only possible using a hand held spot meter. This method has proven to be very ineffective and can only detect gross differences between lights and cannot account for alignment errors. Now, however, mobile systems are available which can test individual fixtures within a lighting system at high speed and with a high degree of accuracy. Some of these systems can produce individual isocandela diagrams of individual lights to aid in troubleshooting and maintenance as well as indicate misaligned fixtures. Some systems can also provide GPS coordinates for each light on the runway to aid in locating deficient fixtures for cleaning or repair. Equipment used for photometric measurements must be of the highest quality and be proven capable of high accuracy and repeatability to avoid the collection of erroneous data.



## **Chapter 5. Preventive Maintenance.**

### **5.0 General.**

This chapter discusses the preventive maintenance program for the visual aid facilities and equipment. It includes a Preventive Maintenance Inspection (PMI) schedule for each major item of equipment with step-by-step instructions for performing the PMI. The PMIs establish a recommended routine which may be altered to suit local conditions.

This AC uses the following timeframe definitions:

- Quarterly: A period not to exceed three consecutive calendar months.
- Semi-Annually: A period not to exceed six consecutive calendar months.
- Annually: A period not to exceed twelve consecutive calendar months

General troubleshooting procedures for airport lighting systems are contained in Chapter 6. Corrective maintenance procedures for specific equipment will be found in the manufacturer's operating and maintenance instructions and are not included in this AC.

### **5.1 Airport Lighting Vault.**

To perform the PMIs per Table 5.1, proceed as follows:

#### **5.1.1 Daily Checks.**

Check the operation of all controls. If the airport is equipped with a computer control system that allows control and monitoring from the maintenance shop or other remote location, verify the proper operation of all controls from that location.

#### **5.1.2 Weekly Checks.**

- a. Cleanliness. Check the general cleanliness of the vault. Sweep out the vault regularly. Keep it free from dust, dirt, sand, spider webs, insect nests, etc.
- b. Moisture. Check for any collection of moisture. If there is a drain in the floor, make sure that it is operating properly. Mop up moisture from the floor.
- c. Screens. Check the intake screens on all ventilators. Clean, repair, or replace the screens to maintain equipment air flow and keep out wasps and other nest-building insects. Check the operation of ventilation fans and thermostat controls. If the vault is equipped with air conditioning, check for proper operation of system and thermostat control in warm weather months.

- d. **Storage.** Check the vault for improper use as a storeroom. Avoid storing spare parts, rags, etc., near high-voltage equipment. If the vault has an attached room, use this room for storing spare lamps, fuses, rags, spare parts, etc.

### **5.1.3 Monthly Checks.**

#### **5.1.3.1 Insulation-Resistance Test.**

Performing regular preventive maintenance checks on airfield lighting circuits is absolutely necessary for reliable operation of the system. Because of the potential of operating at very high voltages, the components of the series circuit are extremely susceptible to failure.

- a. Perform insulation resistance tests on all airfield circuits on a monthly basis as a minimum. If the airport has circuits that fail regularly due to age or other reasons, consider weekly checks. Many potential failures can be found during daylight hours before they become a problem by making weekly PM insulation resistance checks a habit. Keep records in the regulator vault with the circuit identified as well as the date and results of the test. Provide space for notes as to special conditions such as weather conditions at the time of the test, recent lightning activity and to note failure locations and causes when found. A sample form is shown in Figure 5-1.
- b. A single insulation resistance test (IR test) (megger test) does not present a true picture of the condition of a cable's insulation system. A single IR test provides an insulation condition assessment at that particular point in time only. For IR testing to have real value the IR testing needs to be trended over time. The trending can be used as a tool to predict cable failure allowing (preventative maintenance) replacement of failing cable to be scheduled. The values set by the FAA for initial testing and acceptance are easily obtained by the installers. Typically a high initial reading would seem to indicate a good installation.
  - (1) Starting with a high initial reading may sound good, but how the cable maintains that IR value over time is the important factor. A system with a 500 megohm IR value on day 1 and a 1 megohm value on day 365, is not as good as a system with a 75 megohm value on day 1 and 25 megohm value on day 365. The downward trend is much steeper in the first example.
  - (2) The test voltage is not as important as the consistent application of the test parameters. A 1,000 volt IR test is sufficient for most airfield lighting applications, provided the IR test is precisely duplicated each time, with temperature correction, to provide accurate results that can be trended.
- c. Insulation resistance test sets can be purchased that are operated by hand-crank, batteries, or on 120 volt AC supply. The battery operated sets are the most versatile. Hand-crank units are the least accurate as the operation of the instrument can vary significantly between operators. Take care in selecting a test set and potential output voltages. As a minimum, the test set should have an output of 1000 volts DC. Test sets with outputs of 2500 VDC to 5000 VDC are also available and are superior at detecting high resistance faults. It should be noted, however, that when testing older circuits,

especially circuits that normally operate at lower voltages, use of a 5000 VDC tester may show a fault in an otherwise undetected weak spot in a cable or transformer. It is therefore advisable, when testing at voltages higher than 1000 VDC, to be prepared to make immediate repairs if necessary.

- (1) When performing insulation resistance tests for preventive maintenance, it is necessary to be consistent in the way the tests are carried out from one session to the next. Test results may vary due to a number of circumstances. For instance, the test should be administered for the same length of time each time it is performed and at the same test voltage so that the results may be accurately compared.
  - (2) A very important consideration when performing insulation resistance tests is the time required for the reading of insulation resistance to reach a maximum. The primary cause of delay in reaching full charge is known as the dielectric absorption effect. It may be a matter of several minutes before this is completed and for the reading to reach an absolute maximum. It is best to establish a minimum time for conducting the tests based on experience.
  - (3) For short time readings of insulation resistance, operate the instrument for a definite length of time, either 30 seconds to 1 minute, and read at the end of that time. Make future tests with the same length of operating time.
  - (4) Other variables such as moisture, weather, and time of day may affect the readings. Readings should ideally be taken after circuits have been de-energized for several hours. Readings may appear higher immediately after operating the circuit. This is a sign of deteriorating insulation in transformers and possibly the series lighting high voltage cable that is allowing moisture to enter. Operating the circuits raises the temperature and drives moisture from the insulation resulting in an artificially higher reading.
- d. There is no ideal value for insulation resistance readings on series circuits due to factors such as circuit length, age, etc. The best rule here is to base this decision on past experience with your own facility. Each circuit may be different based on age, manufacturer of cable and equipment, installation methods (direct buried or installed in conduit), local weather conditions, and amount of moisture normally present in the system.
  - e. The decision of when to consider a circuit failing and in need of preventive maintenance repairs may vary from one circuit to another at the same facility. Generally speaking, any circuit that measures less than 1 megohm is certainly destined for rapid failure. The time it takes for a circuit to fail is affected by the output voltage of the regulator, type of fault and presence of moisture at the location of the fault. The larger the circuit size in kW, the higher the output voltage and hence, the more the condition of the insulation becomes critical.

- (1) The important information is the deterioration of the resistance values from month to month and year to year. The resistance value inevitably declines over the service life of the circuit; a 10-20 percent decline per year may be considered normal.
- (2) A yearly decline of 50 percent (4 percent monthly) or greater indicates the existence of a problem (such as a high resistance ground) or serious deterioration of the circuit insulation. In this instance the maintenance supervisor should consider performing troubleshooting to locate the problem (Chapter 6).
- (3) It should also be noted that the insulation resistance that is required for new installations will have a great effect on the ability of the maintenance staff to maintain the series lighting circuits after installation and acceptance. With newer cable installations being more frequently installed in conduit and light bases as opposed to direct burial, initial resistance values up to and in excess of 500 megohms are achievable.

#### **5.1.3.2 Input Voltage.**

Measure the input voltage to the vault. Take this measurement at various times of the day and/or night because the demand on the commercial power network varies throughout the day. Record the input voltage of each phase for future reference. If it is out of tolerance, contact the power company and have them correct the problem.

## VAULT OR SUBSTATION # \_\_\_\_\_

**CIRCUIT IDENTIFICATION** \_\_\_\_\_

[illegible]

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#### **5.1.4 Semi-annual Checks.**

##### **5.1.4.1 Ground Resistance.**

Perform a ground-resistance measurement for each item of equipment using a ground resistance tester. Record the readings and compare with previous readings to discover deterioration in the grounding system. The lower the resistance value, the better; a value of 5 to 10 ohms is desirable. If the resistance is greater than 25 ohms, immediate action must be taken to lower the resistance.

##### **5.1.4.2 Primary High-Voltage Buses and Ground Buses.**

Check the high-voltage bus installation with particular attention to the condition of the insulators, supports, and electrical connections. Keep the bus insulators wiped free of dust or any other deposits. Check the ground bus carefully throughout its entire length. If the bus or any ground connection to the bus is broken, make immediate repairs. De-energize the system before cleaning or repairing the bus.

##### **5.1.4.3 Relays.**

Inspect the protective relay, circuit selector switches, and auxiliary relay panels when servicing the vault equipment. Check the operation of these devices, clean the contacts, adjust release springs, and check contact arms and dash pots. Replace all unserviceable parts.

##### **5.1.4.4 Oil Fuse Cutouts.**

Check operation and electrical connections of the oil fuse cutouts. Check the contacts and check the oil level. Add oil when necessary. If fuses with replaceable links have failed, replace them with fuse links especially manufactured for this purpose. If the oil fuse cutouts have a manual operating lever, check the operation of the locking arrangement. Be sure the manual operating handle is locked in the "OFF" position before servicing vault equipment that is being supplied through the oil fuse cutout.

##### **5.1.4.5 Oil Switches.**

Check the operation of the oil switches. Be sure that the moveable handle on the oil switch, which has three positions, "MANUAL OFF," "MANUAL ON," and "AUTOMATIC," is in the "AUTOMATIC" position at all times. This allows the switch to be remotely controlled. Check the contacts and oil level and service when necessary.

##### **5.1.4.6 Power Transfer Switches.**

Check operation of power transfer switches. Check contacts for dirt or corrosion.

##### **5.1.4.7 Control Panel or Computer Control Equipment.**

In some cases, an auxiliary airport lighting control panel is installed in the vault, or a computer controlled system is installed along with a monitor interface that may provide control capabilities

from the vault. In such cases, carefully check the operation of all parts of the panel. Make sure that all electrical connections are in good condition. Clean the panel with cleaning agents approved/recommended by the manufacturer. Using non-approved cleaning agents may cause smears that are difficult to remove or may damage the screen surface (especially true for low glare screens). If airport lighting control panels are computer-controlled, inspect and clean all air filters associated with the cooling fans for the computers and uninterruptible power supply units if so equipped.

#### **5.1.4.8 Photoelectric Time Switch.**

If a photoelectric time switch is installed, maintain per the manufacturer's instructions. Check light levels with a calibrated light meter (foot candles or lux) to ensure that the control turns on and off at the proper ambient light levels.

#### **5.1.4.9 Astronomic Time Switch.**

If this switch is installed, service per ~~according to~~ the manufacturer's instruction book. Inspect the operation, check clock for proper time, clean motor commutator and main switch contacts, and check all electrical connections. Because an astronomic time switch is a precision instrument, only the manufacturer or an authorized service representative should make repairs.

#### **5.1.4.10 Radio-Control of Airport Lighting.**

Check the operation of radio-controlled airport lighting by keying a portable transmitter and observing the actuation of the airport runway/taxiway lights and switching mechanism. If a fault is detected, follow the manufacturer's recommendation for repair or replacement.

#### **5.1.4.11 Lightning Arresters.**

Check lightning arresters for burning, scorching, or other signs of failure. Inspect lightning arresters for damage after each lightning storm in the area.

#### **5.1.4.12 Miscellaneous.**

Inspect all miscellaneous vault items, such as circuit breakers, terminal blocks, potheads, vault lights, switches, etc. Make sure they are clean and all connections are tight. Inspect all safety board equipment and fire extinguishers.

### **5.1.5 Annual Checks.**

#### **5.1.5.1 Dielectric Checks.**

Perform dielectric tests on oil in oil-filled equipment such as circuit breakers, regulators, and transformers per paragraph 5.2.

#### **5.1.5.2 Paint.**

Check the condition of the paint on the equipment and vault. Repaint when necessary.

### **5.1.6 Recommended Vault Procedures.**

#### **5.1.6.1 Airport Plan.**

Permanently post an airport plan in the vault to aid in testing and troubleshooting the airfield lighting circuit loops. This airport plan (preferably behind glass/plastic) shows the field layout, marked with the location of all lights, cable runs, cable splices, and lighted visual aid equipment. Name and telephone number(s) of person(s) responsible for electrical maintenance for the airport should be located adjacent to the airport plan.

#### **5.1.6.2 Schematic Diagram.**

Display up-to-date diagrams of all power and control circuits in the vault. Display both a schematic diagram, which is a symbolic depiction of the logic of the circuit, and a wiring diagram, which is a detailed layout showing all wires and connections.

#### **5.1.6.3 Vault Security.**

Lock the vault, except during maintenance, to keep unauthorized personnel out. Contact with the high-voltage buses in an airport lighting vault is nearly always fatal. Allow only authorized personnel, experienced in the hazards of high voltage, in the vault.

#### **5.1.6.4 High-Voltage Warning Signs.**

Prominently display high-voltage warning signs per paragraph 2.10, at appropriate locations.

#### **5.1.6.5 Safety Board.**

Install electrical safety boards in the vault per paragraph 2.5.

**Table 5-1. Preventive Maintenance Inspection Schedule for Airport Lighting Vaults**

| <b>Maintenance Requirement</b>                                    | <b>D<br/>A<br/>I<br/>L<br/>Y</b> | <b>W<br/>K<br/>L<br/>Y</b> | <b>M<br/>T<br/>H<br/>L<br/>Y</b> | <b>S<br/>M<br/>A<br/>N<br/>Y</b> | <b>A<br/>N<br/>N<br/>L<br/>Y</b> | <b>U<br/>N<br/>S<br/>C<br/>H</b> |
|---|----------------------------------|----------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1. Check control operation  | X                                |                            |                                  |                                  |                                  |                                  |
| 2. Check general cleanliness                                      |                                  | X                          |                                  |                                  |                                  |                                  |
| 3. Check for moisture   |                                  | X                          |                                  |                                  |                                  |                                  |
| 4. Check ventilator screens or air conditioner controls           |                                  | X                          |                                  |                                  |                                  |                                  |
| 5. Inspect safety boards, safety equipment and fire extinguishers |                                  |                            | X                                |                                  |                                  |                                  |
| 6. Check insulation resistance of all field circuits*             |                                  |                            | X                                |                                  |                                  |                                  |
| 7. Check input voltage to vault                                   |                                  |                            |                                  | X                                |                                  |                                  |
| 8. Check ground resistance  |                                  |                            |                                  | X                                |                                  |                                  |
| 9. Inspect and clean buses  |                                  |                            |                                  | X                                |                                  |                                  |
| 10. Check relay operation   |                                  |                            |                                  | X                                |                                  |                                  |
| 11. Check oil fuse cutouts  |                                  |                            |                                  | X                                |                                  |                                  |
| 12. Check oil switches  |                                  |                            |                                  | X                                |                                  |                                  |
| 13. Operate power transfer switches                               |                                  |                            | X                                |                                  |                                  |                                  |
| 14. Check control panel or computer control equipment             |                                  |                            |                                  | X                                |                                  |                                  |
| 15. Check photoelectric switch                                    |                                  |                            |                                  | X                                |                                  |                                  |
| 16. Check astronomic time switch                                  |                                  |                            |                                  | X                                |                                  |                                  |
| 17. Check radio control of lighting equipment                     |                                  |                            | X                                |                                  |                                  |                                  |
| 18. Check lightning arrestors                                     |                                  |                            |                                  | X                                |                                  | X                                |
| 19. Inspect miscellaneous electrical equipment                    |                                  |                            |                                  | X                                |                                  |                                  |
| 20. Test oil dielectric strength in transformers and regulators   |                                  |                            |                                  |                                  | X                                |                                  |
| 21. Paint equipment as necessary                                  |                                  |                            |                                  |                                  | X                                | X                                |

\* Weekly insulation resistance tests may be necessary for older circuits.

## **5.2 Constant Current Regulators (CCRs).**

CCRs come in two basic types, air cooled and liquid (usually oil) filled. The two basic types of regulators can be further classified as either ferromagnetic or electronic. Ferromagnetic types typically use a ferroresonant network circuit or a saturable reactor. The manufacturer's literature about the operation and recommended maintenance procedures for the CCRs used at the facility should be kept at hand in the vault and maintenance office for reference.

Most constant current regulators manufactured today are reliable and reasonably trouble-free. However, do not be lulled into complacency when considering preventive maintenance of these 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 in 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. At a minimum, keep one type of each PC board and critical components such as silicon controlled rectifiers (SCRs) on hand for each type and size of CCR in use at the airport. This task has been made easier by some manufacturers as they make CCRs that use common control circuit boards and components.

### **5.2.1 Daily Checks.**

Check all control equipment for proper operation. Check remote control operation on each brightness step. This has been made easier at many airports due to the upgrade to computer controlled systems with an interface terminal at the maintenance shop office. Before the end of each shift, the supervisor can energize the airport lighting systems and monitor the CCRs for proper operation.

### **5.2.2 Weekly Checks.**

Visit each electrical vault or substation at least once a week to check for cleanliness and general condition. We recommend making the visit while the circuits are in operation so as to notice any unusual noises or smells that could lead to discovering a problem with one of the CCRs. If the airport has a weekly schedule of performing insulation tests on field circuits or testing emergency generators, test and inspect the CCRs at this same time.

### **5.2.3 Monthly Checks.**

- a. Check and record the electrical vault input voltage and current. If the voltage is not within  $\pm 5\%$  of the design voltage, notify the power company to correct the input voltage.
- b. Check and record the output current of each CCR on each brightness step. Compare the values with the tolerances listed in Tables 5-3 and 5-4. Make sure you are using a high accuracy true RMS ammeter when making these measurements. If any are found to be out of tolerance, adjust CCR per manufacturer's instructions.

### **5.2.4 Semi-annual Checks.**

If it is suspected that a circuit may be overloaded, a measurement of the output load may be made at this time. Evidence of overloading could be overheating, failure to produce rated current (6.6 or 20 A) at maximum brightness setting, or erratic behavior when operated with a transient load such as runway guard lights or runway end identifier lights (REILs).

#### **CAUTION:**

**Measurements of the output load of a CCR require taking voltage measurements at the load output terminals of the CCR. A CCR can develop as much as 4545 volts in the case of a fully loaded 30 kW CCR. Never attempt to measure the voltage across the output of a regulator**

**without a load connected. In open circuited conditions, the voltage can reach extremely high values before open-circuit shut down of the regulator occurs. Only qualified electricians exercising extreme caution and using the correct instruments and safety precautions should attempt these measurements.**

Measure the voltage across the output of the CCR using a potential transformer having a ratio of 40:1 and a primary voltage rating of at least 4800 volts. Use a high accuracy true-RMS digital multimeter or power analyzer to measure the output of the potential transformer. Alternatively, many newer control and monitoring systems have provision for constant monitoring of output voltage, current and circuit load. Before measuring output load, it is imperative that a check be made to ensure that all the lamps are operating in the circuit. Open secondary windings on series transformers impose an inductive load on the regulator which can result in erratic behavior of the regulator and inaccurate measurements. Measure the output voltage across the output terminals with the normal load connected and the regulator operating at the highest brightness step. Multiply the output current (normally 6.6 or 20 A) by the voltage measured across the output of the regulator to obtain the approximate load (i.e.  $4545 \text{ volts} \times 6.6 \text{ amps} = 30 \text{ kilowatts}$ ). This is a close approximation that assumes that the regulator is operating at a high power factor. Assure that the load value does not exceed the given kW rating of the regulator.

Visually inspect the regulator for any signs of loose connections or overheating. Be aware that many of the connections that should be inspected are not visible by merely opening the front access panel on the regulator. De-energize and lock out power to the regulator and remove the top, sides, or back panels depending on the type of CCR to access and inspect the connections. Pay special attention to line and load connections where high current is present and also inspect connections on capacitors closely. Look for any signs of discoloring that would indicate overheating and a loose connection and physically test any and all connections for tightness.

### **5.2.5 Annual Checks.**

For regulators that are oil filled, make a dielectric strength test of the oil. Take at least a 1-pint sample of oil from the oil sampling or drain valve at the base of the regulator tank. Sediments may have settled to the bottom of the tank that could contaminate the sample. If sediments are observed in the sample, take another sample to try to obtain a sample that is free of sediment or if possible, remove a sample from the top of the regulator tank. It is also very important to make sure that a clean vessel is used to obtain and store the sample so it isn't contaminated.

An oil dielectric tester, per Chapter 4, may be used or if no facilities are available for making dielectric tests, contact the nearest power company equipped to perform these tests. If the oil is dirty or black, this is usually a sign of a major electrical problem within the tank which will require major work. If the oil dielectric strength is low, it should be replaced or filtered and dried to restore its dielectric strength. Wash out sludge deposits on the core and coil assembly and in the tank with clean dry oil. Models with an internal primary switch will tend to collect more sludge due to arcing under oil. Fill with oil to the proper level with the type oil approved by the regulator manufacturer. Dielectric strength (kV) for new oil should be 30kV+. A normal range for oil being tested should be 26-30 with 22 kV as the minimum acceptable level.

**a.** Perform a short circuit test per the following:

Turn off power to the regulator. Short the output terminals using No. 10 AWG wire (or larger) across the output terminals. Turn on the regulator and advance intensity through each step. Read the output current on each step using an accurate true RMS ammeter. The output current should be within the tolerances shown in Tables 5-3 and 5-4.

**b.** If the current output is not within limits, check the voltage input to the regulator. It should be within  $\pm 5$  percent of rated input voltage. Be sure the correct voltage tap is used (on dry-type transformers). Turn off the regulator and lock out and tag out the input supply. Disconnect the short and reconnect output cables. Compare the short circuit values with those obtained from the monthly output current readings. If necessary, adjust output current according to the manufacturer's equipment maintenance manual.

**c.** Perform an open circuit test per the following:

Perform this test only on those regulators with open circuit protective devices. Turn off power to the regulator and lock out the primary supply circuit. Disconnect cables from output terminals. Turn on power to the regulator. Advance the brightness selector switch to any step. The open-circuit protective device should automatically operate within two seconds to turn off the regulator. Turn off the selector switch. Reset the open-circuit protective device. If the test is satisfactory, turn off regulator power and lock out primary supply and reconnect the output cables. Re-energize primary power to the regulator and set selector switch for automatic (remote) operation.

**d.** Perform an over-current test:

If the regulator is equipped with over-current protection, follow the manufacturer's recommendations and procedures as outlined in the regulator manual for performing an over-current test.

Standard FAA CCR Output Currents vs. Allowable Range, Per FAA AC 150/5345-10:

**Table 5-2. 3-Step CCR Output Tolerances**

| <b>Output Step</b> | <b>Nominal Output</b> | <b>Allowable Range</b> |
|--------------------|-----------------------|------------------------|
| 3                  | 6.6 amps              | 6.50 - 6.70            |
| 2                  | 5.5 amps              | 5.40 - 5.60            |
| 1                  | 4.8 amps              | 4.70 - 4.90            |

**Table 5-3. 5-Step CCR Output Tolerances**

| <b>Output Step</b> | <b>Output 6.6 A Regulator</b> | <b>Allowable Range</b> | <b>Output 20 A Regulator</b> | <b>Allowable Range</b> |
|--------------------|-------------------------------|------------------------|------------------------------|------------------------|
| 5                  | 6.6 amps                      | 6.50 – 6.70            | 20.0 amps                    | 19.70 – 20.30          |
| 4                  | 5.2 amps                      | 5.10 – 5.30            | 15.8 amps                    | 15.50 – 16.10          |
| 3                  | 4.1 amps                      | 4.00 – 4.20            | 12.4 amps                    | 12.10 – 12.70          |
| 2                  | 3.4 amps                      | 3.30 – 3.50            | 10.3 amps                    | 10.00 – 10.60          |
| 1                  | 2.8 amps                      | 2.70 – 2.90            | 8.5 amps                     | 8.20 – 8.80            |

**Table 5-4. Preventive Maintenance Inspection Schedule for Constant Current Regulators**

| <b>Maintenance Requirement</b>  | <b>D<br/>A<br/>I<br/>L<br/>Y</b> | <b>W<br/>K<br/>L<br/>Y</b> | <b>M<br/>T<br/>H<br/>L<br/>Y</b> | <b>S<br/>M<br/>A<br/>N<br/>L<br/>Y</b> | <b>A<br/>N<br/>N<br/>L<br/>Y</b> | <b>U<br/>N<br/>S<br/>C<br/>H</b> |
|---|----------------------------------|----------------------------|----------------------------------|--|----------------------------------|----------------------------------|
| 1. Check control circuits on all brightness steps                                 | X                                |                            |                                  |  |                                  |                                  |
| 2. Check condition and operation of regulator                                     |                                  | X                          |                                  |  |                                  |                                  |
| 3. Check input voltage and current  |                                  |                            | X                                |  |                                  |                                  |
| 4. Check output current on each brightness step                                   |                                  |                            | X                                |  |                                  |                                  |
| 5. Check output load on regulator if needed                                       |                                  |                            |                                  | X                                      |                                  |                                  |
| 6. Check relays, wiring and insulation  |                                  |                            |                                  | X                                      |                                  |                                  |
| 7. Check dielectric strength of cooling oil (if used)                             |                                  |                            |                                  |  | X                                |                                  |
| 8. Perform a short-circuit test   |                                  |                            |                                  |  | X                                |                                  |
| 9. Perform an open-circuit test (only on regulators with open circuit protection. |                                  |                            |                                  |  | X                                |                                  |
| 10. Clean rust spots and repaint as necessary.                                    |                                  |                            |                                  |  |                                  | X                                |

### 5.3 Light Fixture and Base Maintenance.

#### 5.3.1 Introduction.

Airport lighting fixtures for runway and taxiway use are divided into two broad categories: elevated and in-pavement. The maintenance requirements for each of these types are quite different.

- a. In-pavement lights generally require more maintenance than elevated lights to provide consistent performance and uniformity of light output.
- b. Elevated runway edge lights require more care in alignment so that the light output is aimed properly to meet photometric requirements. Several factors, however, are common to both types of fixtures.

- c. Dirt and other contaminants, particularly rubber on in-pavement lights, reduce light output and require periodic cleaning of the glassware or lens to assure optimum performance. Bases also require maintenance attention on a regular basis to ensure the integrity of the fixture/base assembly.

### **5.3.2 Runway and Taxiway Elevated Edge Lighting Systems.**

- a. Elevated lights, particularly taxiway lights, generally require less maintenance attention than the in-pavement lights such as runway centerline and touchdown zone lights. Incandescent bulb types of taxiway edge lights normally only require periodic re-lamping.
- b. Do not disassemble LED-type light fixtures in the field – follow the manufacturer’s recommendation for maintenance if any is required. Many LED fixtures have a very long service life.
- c. Elevated lights are probably the most likely candidates for other types of damage on the airfield. Aircraft and ground vehicles, snow plows and mowers seem to have a particular affinity for running over elevated taxiway edge lights. It is for this reason that many airports are using in-pavement taxiway edge lights more frequently in areas of high traffic or frequent damage.
- d. The primary problems and hazards associated with the repair of elevated lights, when they have been run over or damaged, is from the glass and bare electrical conductors that may be exposed. Be sure to take proper safety precautions when handling these items (i.e. proper gloves and other safety equipment). Glass from broken taxiway globes is extremely sharp and poses a hazard both to the maintenance electrician and also as a significant Foreign Object Damage (FOD) hazard for aircraft.
- e. The biggest problem with repairing damaged elevated taxiway or runway lights is the removal of the existing frangible coupling. Reduce this problem by applying a coating of anti-seize compound or aluminum anti-oxidant to the threads before installing a new coupling.
- f. Runway edge lights and threshold lights may require more maintenance than taxiway lights; they require periodic cleaning to remove dirt, mud, bird droppings, etc. The lenses of elevated runway edge lights can also become pitted and sand-blasted from sand/gravel driven by jet blast and require replacement.
- g. When re-lamping or repairing runway edge lights, care must be taken to make sure that all lenses and filters are in their proper orientation and that the fixture itself is in the proper orientation relative to the runway. Most elevated runway edge light globes have an arrow on top that must be aimed perpendicular to the runway centerline.
- h. Control the vegetation growing around elevated edge lights. Approved soil sterilants may be used if permitted by local environmental regulations. Do not allow vegetation to grow to the extent that the lights are obscured.

- i. The beams of runway edge lights are aimed toward the runway centerline at 3.5 degrees. The beam is also aimed up 4 degrees from horizontal. Proper orientation of the fixture is necessary for this toe-in and required photometric output to be maintained.
- j. When re-lamping any type of fixture, always check the lamp before installing to make sure that it is the correct type and wattage. Many lamps look alike. Never re-lamp fixtures with the circuit energized. Hazards associated with this practice are covered in Chapter 2 of this document.
- k. Never use any lamp other than the lamp approved by the original equipment manufacturer of the fixture. Failure to do so may affect photometric output of the fixture and cause the fixture assembly to no longer meet FAA requirements.

### **5.3.2.1 Preventive Maintenance Inspection Procedures.**

To perform the PMIs contained in Table 5-5, proceed as follows:

#### **5.3.2.1.1 Daily Checks.**

Applies to both light emitting diode (LED) and incandescent bulb light fixtures.

- a. Perform a visual inspection of the system at twilight or night each day. This inspection consists of a driving patrol to visually check for dimly burning bulbs, burned-out lamps, and fixtures out of alignment. Record the locations of such fixtures and make corrections as soon as possible. Replace or repair light fixtures when the system is deactivated.
- b. Check lenses for cleanliness and clean as required.

#### **5.3.2.1.2 Monthly Checks.**

- a. Check the orientation of all lenses. Make this check by viewing the lights at night or by performing testing as outlined in (b.). Misaligned light units will appear dimmer or brighter than those that are properly aligned. The lenses may get out of adjustment when replacing lamps or when mowers and other vehicles strike the elevated lights.
- b. Intensity Checks / Photometric Testing. Test equipment is now available to allow for the rapid and accurate testing of the output of both in-pavement and elevated runway lighting fixtures (paragraph 4.1.12).
- c. For elevated lighting, this type of testing primarily applies to high intensity runway edge lighting (HIRL). Regular photometric measurements are the only practical way of determining if the lights are emitting the specified amount of light and to determine misalignment errors.
- d. The regular use of photometric measurements identifies light fixture issues early and can save time and resources. This is particularly true for airports that regularly operate in low visibility conditions.

- e. The frequency of photometric measurements will vary from facility to facility and from runway to runway depending upon the amount of traffic and age of the fixtures (see table 5-5). After some experience has been gained, the interval may be adjusted to better suit operational needs.
- f. The frequency of measurement for a precision approach runway should be based on traffic density, the local pollution level, the reliability of the installed equipment and the continuous assessment of the results of the in-field measurements but in any case should not be less than twice a year. Photometric testing should be performed:
  - (1) Before cleaning, re-lamping, or realignment to establish whether maintenance is necessary.
  - (2) After cleaning, realignment or repair, to check the effectiveness of the maintenance action. High intensity elevated runway edge lights that have a light output below 70% of the minimum light output required when operated at maximum intensity per AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures, should be targeted for maintenance. Any light with measured output less than 70% of the minimum light output required per AC 150/5345-46 is ineffective for high background brightness, low visibility conditions. See Appendix A, Standards and Tolerances, Table 8.
  - (3) Straighten, level, and align all lighting units that have been knocked out of alignment.
  - (4) Check lamp sockets for cleanliness and good electrical connections. If moisture is present, replace the fixture gasket.
  - (5) Inspect and clean the weep hole in the frangible coupling of stake-mounted lights.

#### **5.3.2.1.3 Semi-annual Checks.**

- a. Check the ground elevation around lighting fixtures. The frangible point should be approximately 1 inch (2.5 cm) above the ground elevation. Grade around the fixture where necessary to maintain this fixture/grade relationship. Also, maintain the elevation of all lights for the same height above the runway/taxiway pavement edge.
- b. Check the elevation more frequently during times of frequent freeze/thaw cycles. The height of the lights should not exceed 14 inches (35 cm) when located within 5 feet (1.5 m) of the runway or taxiway edge.
- c. In snow regions, where the lights are located beyond 5 feet (1.5 m) from the runway or taxiway edge, the lights may be raised 2 inches (5 cm) for each foot beyond the 5 foot (1.5 m) point. At the 10 foot (3 m) position, the lights may have a maximum height of 30 inches (75 cm). (See AC 150/5340-30, Design and Installation Details for Airport Visual Aids, for additional information about light fixture distance from runway/taxiway edge). The increase in height is permitted only if any overhanging part of an aircraft expected to use the runway or taxiway could clear the light by at least 6 inches (15 cm) when the plane's main landing gear is located on any part of the runway or taxiway.

- d. Check light bases and housings for evidence of moisture penetration. Check gaskets, seals, and clamps for deterioration and damage. Check the torque of light base cover bolts.
- e. Check fixtures, bases, and housing for corrosion, rust and peeling paint.

#### **5.3.2.1.4 Annual Checks.**

- a. Check each light fixture carefully for cracking, corrosion, or shorts.
- b. Clean the contacts and ensure that lamp fits firmly into receptacle.
- c. Check condition of all connections.
- d. Check all gaskets on a leaky light unit and replace with new rubber gaskets.

#### **5.3.2.1.5 Unscheduled Maintenance.**

Remove snow from around the lighting fixtures as soon as possible after a snowfall so the light fixtures are not obscured. If heavy snowfalls are predicted, place red flags or stick markers of sufficient length adjacent to the edge lights to mark the light fixture location. The flags or stick markers will facilitate snow removal and will lessen the damage to fixtures by snow removal equipment.

### **5.3.3 Maintenance Procedures.**

The following paragraphs discuss general maintenance procedures for the runway and taxiway units that are not functioning:

#### **5.3.3.1 Lamp Replacement.**

- a. Always follow the manufacturer's instructions for light fixture repair. Without special equipment, some light mixtures may not be field repairable.
- b. If field maintenance is possible, proceed with the following:

With the lights operating, make a visual check to positively identify the lighting unit or units that are not functioning.

#### **CAUTION:**

**De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Remove S-1 switch cutouts if present.**

- c. Turn off the lights and lock out circuits. Install safety warning signs at appropriate locations.

- d. For incandescent light fixtures, with the replacement lamp at hand, open up the fixture and remove the old lamp.
  - (1) Examine the old lamp to confirm the source of failure.
  - (2) Compare the identification markings on the old and replacement lamps to verify that the replacement lamp is the correct type.
  - (3) Inspect the lamp socket, connections, and wire insulation.
  - (4) Check the light unit and base for evidence of leakage or condensation and remove any water present.
  - (5) Replace fused film disc cutout, if used.
  - (6) Install new lamps, ensuring that the lamp face is clean and free of oils, fingerprints, etc. Use a clean, dry, soft cloth and never touch the lamp with unprotected fingers.
- e. Check filters, when used, for cracking or misalignment and replace or adjust as required.
- f. Clean all reflectors, globes, filters, and covers as required. When hood or shield is used, check adjustment.
- g. When closing the light, confirm that the gaskets are positioned for proper sealing. Tighten all screws, clamps, and fasteners.
- h. Check frangible couplings for cracks.
- i. Check the horizontal and vertical alignment of the lights for proper adjustment.
- j. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

#### **5.3.3.2 Spare Unit Replacement.**

In some instances, it may be more convenient to fix defective edge lights by replacing the entire light with a spare unit. This will minimize the runway downtime and allow troubleshooting and refurbishment of the defective light at a more convenient location. Spare unit replacement is very convenient for repairing lights struck by lightning or vehicles.

#### **5.3.3.3 Film Disc Cutouts.**

Some of the older installations use fused film disc cutouts to bypass failed lamps. Some circuits that have more than one light on the secondary side of each isolating transformer use them to bypass a burned-out lamp and keep the other lamps on the transformer operating. When replacing lamps where film disc cutouts are used, always replace the film disc cutout. Use the disc cutout of proper type and size. The film disc is located within the light enclosure and is installed between spring-loaded terminals.

#### **5.3.3.4 Inspection.**

When replacing the lamp, inspect the light thoroughly for other damage. Check for water in the light bases or lights, cracked and chipped glassware, defective or incorrectly positioned gaskets, loose connections, cracked or deteriorated insulation, and misalignment of lights or shields.

#### **5.3.3.5 Cleaning.**

When changing lamps, clean the light fixture inside and outside, as required. Light surfaces must be kept clean to transmit light satisfactorily. In establishing a cleaning program, first consider the sources of the dirt problem. Many airfield lights are located at or near ground level and are subject to blowing dirt or dust, rain spattering, jet exhaust residue, bird droppings, corrosion, and heat and static attraction of dirt. In some cases, submersion or exposure to water may be a problem. Cleaning procedures will vary depending on the cause of the problem and its effect on the system. Cleaning problems may often be reduced by preventive measures.

#### **5.3.3.6 Cleaning Schedule.**

The cleaning schedule will vary at each location depending on such factors as environment, geographical location, and the types of lighting units. Clean each light thoroughly at least once a year. Regular photometric measurements may indicate a need for a more aggressive cleaning schedule.

#### **5.3.3.7 Cleaning Procedures.**

Wash glassware, reflectors, lenses, filters, lamps, and all optical surfaces. Washing may increase the light output by as much as 15 percent more than wiping with a dry cloth.

- a. Do not use strong alkaline or acid agents for cleaning.
- b. Do not use solutions that leave a film on the surface.
- c. Remove the unit when possible and clean in the shop.
- d. For reflectors or other optical surfaces that cannot be removed for cleaning, use alcohol or other cleaning agents that do not require rinsing or leave a residue.

#### **5.3.3.8 Moisture.**

- a. **Water and Condensation.** Water is the most common cause of problems in airfield lighting fixtures. In bases, water may cause grounding of the lamp or circuit. In the optical assembly it may submerge optical components and cause corrosion and deterioration, form condensation on optical surfaces, and accelerate the accumulation of dirt on optical surfaces. Preventing water from entering light bases is very difficult.
- b. The alternate heating and cooling of the lights can create a strong “breathing” effect, especially when the base is located in water saturated ground. The water may also enter

through conduits, along the conductor or the cable, through gaskets and seals, through damaged glassware, or through fine holes in the walls of the bases.

- c. **Protection From and Removal of Water.** The immediate problem of water in lights and light bases is removal and prevention of reentry. In the light bases, the accumulated water can usually be drained or pumped out. Drain holes, if already present, should be drilled or cleaned out. Gaskets, seals, and clamps that may admit water should be checked.
- d. Chipped, cracked, or broken glassware should be replaced. If water cannot be eliminated from light bases, ensure all electrical connections and insulation are watertight and above the waterline. New conduit and base installations should be designed to drain and have a separate drainage system installed at low elevation points in the system.
- e. Before installing the cover plate, blow out cover bolt holes to make certain that fastening bolts are not anchored in sand or debris that prevents the cover from being torqued sufficiently on the gasket. Make sure the bolt holes have serviceable threads and that the gasket is in good condition and properly placed to minimize the possibility of moisture entry around their threads.
- f. The base flange bolts should be drawn down in opposite pairs until all are tightened to the recommended torque. Avoid excessive torque.
- g. **Strikes and Blast Damage.** Light units damaged by strikes from aircraft, vehicles, or by propeller or jet blasts should be repaired or replaced immediately. Areas where this damage recurs should be checked frequently. A careful check should be made following damage of this type because the attaching cable may also be damaged. At locations where damage is frequent due to vehicular traffic, consider replacing elevated lights with approved in-pavement types.
- h. **Repair and Replacement.** When possible, replace the entire damaged unit. Simple repairs usually consist of the following:
  - (1) Remove the broken frangible coupling from the base cover.
  - (2) Connect the new light to the secondary connector.
  - (3) Install a new light on a new frangible coupling.
  - (4) Check for correct alignment; align as required.
- i. **Frangible Coupling Replacement.** Frangible couplings are used to reduce damage to aircraft in case of a strike. An open-end wrench, pipe wrench, cold chisel, and punch and hammer are usually sufficient to remove and install frangible couplings.

**Table 5-5. Preventive Maintenance Inspection Schedule for Runway and Taxiway Elevated Edge Lights**

| <b>MAINTENANCE REQUIREMENT</b>  | <b>D<br/>A<br/>I<br/>L<br/>Y</b> | <b>W<br/>K<br/>L<br/>Y</b> | <b>M<br/>T<br/>H<br/>L<br/>Y</b> | <b>S<br/>M<br/>A<br/>N<br/>Y</b> | <b>A<br/>N<br/>N<br/>L<br/>Y</b> | <b>U<br/>N<br/>S<br/>C<br/>H</b> |
|---|----------------------------------|----------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1. Inspect for outages; repair as necessary                                     | X                                |                            |                                  |                                  |                                  |                                  |
| 2. Check cleanliness of lenses  | X                                |                            |                                  |                                  |                                  |                                  |
| 3. Perform photometric testing (HIRL) and check light alignment and orientation |                                  |                            | X                                |                                  |                                  | X                                |
| 4. Re-align lights as needed  |                                  |                            | X                                |                                  |                                  | X                                |
| 5. Clean fixtures and sockets   |                                  |                            |                                  |                                  |                                  | X                                |
| 6. Check light elevation  |                                  |                            |                                  | X                                |                                  |                                  |
| 7. Check for moisture in lights   |                                  |                            |                                  | X                                |                                  |                                  |
| 8. Inspect fixture for rust, deterioration                                      |                                  |                            |                                  |                                  | X                                |                                  |
| 9. Check lamp fitting and clean contacts  |                                  |                            |                                  |                                  | X                                |                                  |
| 10. Check gaskets   |                                  |                            |                                  |                                  | X                                |                                  |
| 11. Remove snow and/or vegetation from around lights                            |                                  |                            |                                  |                                  |                                  | X                                |

**5.3.4 Runway and Taxiway In-pavement Lighting Systems.**

In-pavement or inset lights require more maintenance than elevated lights. Rubber deposits on the lens are the main cause of poor performance for fixtures installed in the runway. Jet fuel, deicing fluid, and other contaminants can also collect on the lens and deteriorate the light output, even on lights installed in taxiways.

- a. When maintenance other than simple cleaning is required, the only way to ensure that in-pavement fixtures are properly maintained is to remove them from the runway or taxiway and replace with a refurbished unit. A quantity of spare fixtures equal to 10% of the installed quantity should be maintained for each type of fixture at the airport for this purpose.
- b. Many airports that have a large number of in-pavement lights have either built or specially modified trailers or vehicles to allow for fast, efficient removal and replacement of in-pavement fixtures. The dedicated lighting maintenance vehicles or trailers can be equipped with generators, air compressors, and proper tools to perform almost any task.
- c. A failed light fixture is removed and brought to the maintenance shop by the maintenance vehicle where it is subsequently disassembled and properly refurbished. Equipment is also now available to perform photometric testing in the maintenance shop to verify that a refurbished fixture is performing to specifications prior to being reinstalled in the runway or taxiway.

- d.** The main enemy of in-pavement set lights is water intrusion. More recently designed light fixtures have a much improved ability to keep water out of the optical assembly. Improved gasket materials and lens designs have drastically reduced the amount of maintenance required.

  - (1) When dealing with fixtures where water intrusion has become a problem, the first step is to determine where the water is entering the fixture. This can be in one of several places; the O-ring gasket sealing the light fixture assembly, the gasket or sealing material around the lens, or the seal around the entrance point for the electrical conductors entering the fixture.
  - (2) The best method to determine the source of the problem is to construct a testing jig by using a spare light fixture. The method will vary depending on the type of fixture and the manufacturer. It is best to devise a method of pressurizing the fixture with dry compressed air while submerging it in water. Five to ten pounds per square inch (psi) of air pressure is usually sufficient. The area with the bad seal will be easily identifiable as a trail of air bubbles exiting the fixture.
  - (3) Care must be taken to regulate the pressure used to test the fixture because if too much pressure is applied, the lens can be blown out. NEVER apply air pressure to the fixture before submersing it in water as this could present a safety hazard if one of the lenses is blown out of the fixture.
- e.** Some newer light fixture designs come from the factory with a Schrader valve stem attached to the bottom of the fixture. This fitting is used at the factory to pressure test the fixture during final assembly and can also be used for maintenance. Consult the manufacturer of fixture for recommended air pressure settings.

  - (1) Once the area of the leak is determined, the cause can be found and corrected. On older fixture designs, the lens may be sealed into the fixture using RTV sealant. If replacing this type of lens, be sure to use the appropriate sealant and primer per the light fixture manufacturer's recommendation. -A silicone rubber sealant like Dow Corning RTV 106 or equivalent is used.
  - (2) Most new fixture designs employ a lens with a replaceable gasket. This greatly improves the time and effort required to replace the lens. Inset light lenses should be replaced when they have become scratched or pitted.
- f.** When re-lamping either elevated or inset fixtures, do not touch the lamp with bare hands. Oils found in the skin will cause hot-spots on the lamp and lead to premature failure.
- g.** When installing a new lamp, be sure that it is properly installed. Some lamps have arrows to indicate the proper position in the holder. Improper lamp installation results in poor photometric output from the light fixture.
- h.** When reassembling an in-pavement light fixture, follow all manufacturer's instructions. Remove rust and other deposits from the inside surfaces of the fixture by using an abrasive

blasting cabinet with the proper abrasive. Glass beads or material such as ground walnut shells work well and, as long as proper care is taken, they will not harm the lens or wiring of the fixture. Do not use abrasive materials on reflector assemblies in the fixture. Reassemble the fixture after checking or replacing the gaskets or O-rings. A light coating of silicone grease is sometimes recommended for the O-rings.

- i. When reinstalling the fixture, check the condition of O-ring gaskets installed on the light base upper flange ring (if supplied) and replace if necessary. Lubricate O-rings with a small amount of silicone grease. Make sure that new bolts and locking washers are used to reinstall the light fixture. Never reuse the bolts or locking washers for in-pavement light fixtures.
  - (1) Torque all bolts to the torque specified by the light fixture manufacturer with a calibrated torque wrench. Do not use impact wrenches – they are not designed for the low bolt torques required for in-pavement light fixtures.
  - (2) For more information about types of bolts and bolt torque, see FAA Engineering Brief #83, In-pavement Light Fixture Bolts
  - (3) Always remove and replace any broken bolts. Leaving a broken bolt in place can result in all the bolts breaking from the impact of a landing aircraft. Develop a systematic plan for checking the torque of in-pavement light fixture bolts on a regular basis, particularly on the runway.

#### **5.3.4.1 Preventive Maintenance Inspection Procedures.**

Because in-pavement lights are installed in the airport movement areas and are run over by aircraft and snow removal equipment, they are high maintenance items that require frequent attention to maintain specified performance. Additionally, their location below ground level makes them prone to water infiltration; this also requires frequent attention. These problems should be remembered when performing the PMIs contained in Table 5-6 and per the following sections:

##### **5.3.4.1.1 Daily Checks.**

- a. A driving patrol should be made daily at twilight. The inspector should look for burned-out or dimly burning lamps and record their location.
- b. Because nightly photometric testing is not practical (see 5.3.4.1.3), an airport can develop their own guidance on the level of intensity that constitutes “dim” on a daily check. This makes inspections conducted by different persons can be more uniform or consistent.

##### **5.3.4.1.2 Weekly Checks.**

A field electrician should inspect and service any lights reported as defective in the daily inspections. The preferred service method is to replace the in-pavement light unit with a spare and take the defective unit back to the shop for repair. The lighting circuit must be deactivated,

locked-out and tagged-out before any maintenance is attempted on the lights. The following defects may be the cause of the malfunction:

**a. No light**

- (1) The fixture should be removed and replaced with a refurbished unit and brought to the maintenance shop for re-lamping and refurbishing.
- (2) Electrical Failure. If the replacement light also fails to operate or a string of lights fail, the problem is probably in the series circuit. Troubleshooting procedures are contained in Chapter 6.

**b. Dim light**

- (1) Dirty Light. The exposed optical surface of the in-pavement light gets dirty from exposure to aircraft traffic and weather. Clean the lights periodically, as described in paragraph 5.3.4.1.7b. This can also be a sign of a weak lamp and cause for fixture replacement.
- (2) Light Aiming. Shallow-base in-pavement light fixtures are often twisted out of alignment by aircraft landing or turning. Visually check any dimly burning lights to see if they are merely misaligned.
- (3) Water in the Fixture. Examine the lens for standing water or condensation behind the lens. If water is present, remove and service the fixture.

**5.3.4.1.3 Monthly Checks.**

Until a regular maintenance schedule is established, it may be necessary to perform the checks below on a monthly or even weekly basis at busy facilities. After some experience has been gained, the interval may be adjusted to meet operational needs. The frequency of measurement of lights for a precision approach runway should be based on traffic density, the local pollution level, the reliability of the installed equipment and the continuous assessment of the results of the in-field measurements but in any case should not be less than twice a year.

- a. Cleaning.** Due to their position at ground level, in-pavement lights require frequent cleaning to maintain their specified performance. The frequency with which the lights must be cleaned depends on the light's location, weather conditions, and number of airport operations.
- b.** Both rubber deposits and runway de-icing fluids have been shown to have an extremely detrimental effect on light output. Clean the lights when the light output of the fixture is less than 70 percent of the minimum required output when operated at maximum intensity per AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures. A fixture degraded below this is ineffective for high background brightness, low visibility conditions.

- c. **Intensity Checks/Photometric Testing.** Test equipment is now available to allow for the rapid and accurate testing of the light output of both in-pavement and elevated runway lighting fixtures (paragraph 4.1.12).
- d. Regular photometric measurements are the only practical way of determining if the lights are emitting the specified amount of light and for determining misalignment errors. By the use of regular photometric measurements, maintenance of runway lighting fixtures may be targeted only where needed thereby saving resources and time while allowing the airport to be assured of meeting light output specifications, especially in low-visibility conditions. This aids in providing a consistent lighting pattern to provide the pilot with the best possible, non-ambiguous visual cues when landing. Necessary frequency of photometric measurements will vary from facility to facility and from runway to runway depending on amount of traffic and age of fixtures.
- e. After experience has been gained with the measurement equipment, inspection schedules may be determined or modified. Due to the susceptibility of runway centerline lights to accumulate rubber deposits on the lens, weekly checks may be necessary. This is especially true for CAT II and CAT III runways where low-visibility operations are conducted.
- f. Any in-pavement runway light exhibiting a light output of less than 70% of the minimum output required when operated at maximum intensity per AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures, is ineffective for high background brightness, low visibility conditions and should be targeted for cleaning or maintenance. Photometric testing should be performed:
  - (1) Before cleaning or re-lamping, to establish what maintenance is necessary, and
  - (2) After cleaning, or other maintenance actions, to track the effectiveness of the maintenance and determine the extent of degradation of the optical assembly. Lights that continue to exhibit output minimum levels should be scheduled for removal and servicing. See Appendix A, Standards and Tolerances, Table 8.

#### 5.3.4.1.4 Bi-Monthly Checks.

- a. **Bolt Torque.** The torque of the bolts attaching the light fixture to its base should be checked with a calibrated torque wrench – never use an impact wrench. Follow the light fixture manufacturer's recommendations for bolt torque. Always make sure that two part locking washers are properly installed. The impact of aircraft wheels can loosen mounting bolts and cause misalignment or fixture damage; this is particularly troublesome in the touchdown zone.

#### 5.3.4.1.5 Semi-annual Checks.

- a. Check the shallow light base installations for the presence of water. Any water should be removed and the light base should be sealed to prevent its reentry. This check should be conducted more frequently in winter months because freezing may cause

damage to the light fixture by shearing the fixture hold-down bolts or rupturing the light base.

- b. Having a dry light base is the exception rather than the rule. Water in light bases is very common, resulting from the miles of conduit that leak and slowly fill the system with water.
- c. To avoid water freezing in bases, place ETHA-foam (also known as closed cell polyethylene foam) disks that are 2 inches thick by 8 inches diameter in the bases to displace the water. This prevents ice damage to the base, fixture, and transformer by allowing any remaining water to crush the ETHA-foam disks.

#### **5.3.4.1.6      Unscheduled Maintenance.**

- a. Remove snow from around the lighting fixtures as soon as possible after a snowfall to prevent obscuring the light fixtures. Exercise extra care to prevent striking the lighting fixtures with snowplow blades.
- b. After snow removal operations, inspect all lighting fixtures and replace any damaged light assemblies. Whenever snowplows must traverse over in-pavement light fixtures, they should be traveling at less than 5 miles per hour or should lift the blades clear of the fixture.
- c. Rubber and plastic snowplow blades that are especially suited to plowing wet or slushy snow are available; rotary brooms are also recommended. If snow removal is a frequent winter job, high-strength steel light fixtures may be specified to better withstand the impact of snow plowing.
- d. Check wire ways in saw kerfs. If wires are floating out, reinstall using wedges for anchoring wires. Space wedges 2 feet (60 cm) on center. Seal wire ways using P-606 sealer.

**Table 5-6. Preventive Maintenance Schedule for In-pavement Runway and Taxiway Lighting**

| <b>MAINTENANCE REQUIREMENT</b>                            | <b>D<br/>A<br/>I<br/>L<br/>Y</b> | <b>W<br/>K<br/>L<br/>Y</b> | <b>M<br/>T<br/>H<br/>L<br/>Y</b> | <b>B<br/>I<br/>M<br/>H<br/>Y</b> | <b>S<br/>M<br/>A<br/>N<br/>Y</b> | <b>A<br/>N<br/>N<br/>L<br/>Y</b> | <b>U<br/>N<br/>S<br/>C<br/>H</b> |
|---|----------------------------------|----------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1. Check for burned-out lamps or dimly burning lights     | X                                |                            |                                  |                                  |                                  |                                  |                                  |
| 2. Replace defective lights with refurbished units        |                                  | X                          |                                  |                                  |                                  |                                  |                                  |
| 3. Clean lights with dirty lenses                         |                                  |                            | X                                |                                  |                                  |                                  | X                                |
| 4. Perform photometric testing of runway lighting systems |                                  |                            | X                                |                                  |                                  |                                  | X                                |
| 5. Check torque of mounting bolts                         |                                  |                            |                                  | X                                |                                  |                                  |                                  |
| 6. Check for water in shallow light bases                 |                                  |                            |                                  |                                  | X                                |                                  |                                  |
| 7. Remove snow from around fixtures                       |                                  |                            |                                  |                                  |                                  |                                  | X                                |
| 8. Check wires in saw kerfs                               |                                  |                            |                                  |                                  |                                  |                                  | X                                |

#### 5.3.4.1.7 Maintenance Procedures.

Servicing in-pavement lighting should be scheduled to cause the minimum disruption to normal airport operations. For this reason, it is recommended that a number of spare fixtures be kept for installation in place of defective fixtures. The number of spare fixtures should be about 10 percent of the total number of each type of in pavement lights in use. By replacing the defective light with a spare unit, minimum time is spent on the runway; the defective light may be repaired in the shop. The procedures below give a generalized approach to repair; for more specific information about a particular light, consult the manufacturer's instruction book.

- a. **Light Removal.** The light fixture must be removed for re-lamping or base inspection. When removing the fixture for base inspection, be careful not to damage the connections to the isolation transformers. In cold weather, ice or snow may obstruct the bolt heads and make fixture removal difficult. Some facilities have constructed a wooden box, slightly larger than the fixture and a few inches tall. The box has an electric heating element inside and an open bottom. When it is necessary to remove a frozen fixture, place the box over it and connect the heating element to a power source (usually a generator on the back of a truck). When the box heats the fixture enough to melt the ice, removal may be easily accomplished.
- b. **Cleaning.** Several different techniques are available for cleaning the exterior glassware of inset lights. Some techniques require special equipment and are suited to large scale operations and require runway access with the light installed, while other techniques are more suited to bench cleaning of a light. The maintenance supervisor should select the method best adapted to the facility. Remember that not all techniques may be used with all lights; the manufacturer's recommendations contained in the instruction book are the final authority.

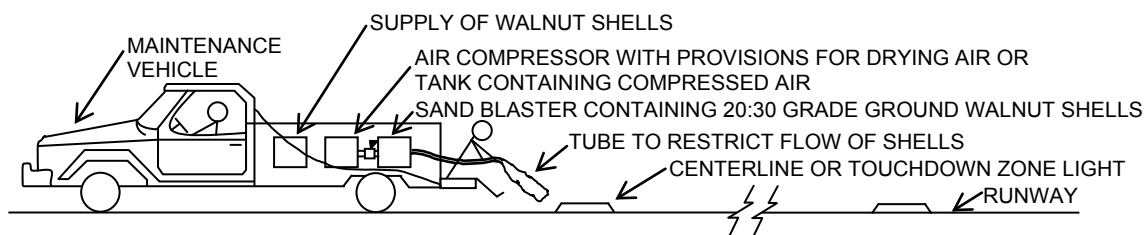
- (1) Manual. Commercially available cleaning detergents and pads can be used for removal of deposits from the lighting fixture lens unless prohibited by the manufacturer. Do not use abrasive materials such as sandpaper or emery cloth because they will scratch the glass. Solvents are available that will clean the lens, but the solvent must be left on for a period of time to dissolve the deposit. The solvent used must be compatible with the lens sealing material. Commercial automotive paint rubbing or polishing compounds have been used successfully but care must be taken to not damage the lens when using abrasive cleaners. While manual techniques are well suited for bench cleaning of lights, they are very time consuming for cleaning lights when installed in pavement.
- (2) Blasting with Ground Shells. Unless not recommended by the light fixture manual the cleaning can be done by using 20/30 grade, clean, ground walnut or pecan shells and clean, dry compressed air or nitrogen (nozzle pressure 85 psi). Figure 5-2 shows a typical example of how to clean the lighting fixture with shells.

An average time of 10 seconds is required for cleaning the external surface of the lens.

The average usage of ground walnut shells is 0.6 pound (0.25 kg) per fixture.

- c. The cleaning system shown is not available as an assembled unit; however, a commercially available air compressor with controls and gauges, a sandblaster unit, and abrasive resistant hoses may be used.

After removal of the deposit from the lens, the fixture's light channel should be cleaned of shells with a blast of air, and the remaining dust wiped off with a clean cloth.



**Figure 5-2. Cleaning Runway Centerline and Touchdown Zone Lights**

- c. **Light Aiming.** The in-pavement lights are aimed as part of the installation procedure. For lights installed on the tops of transformer housings, the aiming is fixed and nonadjustable. For lights installed on shallow bases, the aiming may come out of alignment due to movement of the light bases. The runway centerline lights should be aligned to within 2 degrees of a line parallel to the runway centerline. When reinstalling the base, use an adhesive compatible with the type of pavement. P-606 sealer has compounds that are compatible with both concrete and asphalt pavements; be sure to choose the correct mixture. If mobile photometric testing equipment is not available, the aiming of in-pavement lights may be checked by turning the lights on during foggy weather. The fog makes the light beam visible, and it is easy to tell if a light is properly

oriented in such conditions. For touchdown zone lights, the light beam is offset 4 degrees toward the runway centerline. The aiming of touchdown zone lights may be judged by viewing the barrettes on either side of the runway while standing on the centerline. When viewing the barrettes on either side of the runway from some distance, any light appearing dimmer or brighter than the lights next to it may be improperly aimed and should be checked.

- d. Light Cleaning and Sealing.** The following is recommended for in-shop maintenance only. Unless it is a dire emergency, do not attempt to re-lamp or internally clean an in-pavement light fixture in the field. In-pavement lights gradually get dirty internally, and the internal optical surfaces should be cleaned when the light is disassembled for re-lamping or maintenance.
- (1) Sandblasting equipment using glass beads may be used to clean rubber deposits off the casting after all removable parts have been taken off. Use a cleaning solution that does not leave a residue after drying.
  - (2) When re-lamping a light, be careful to handle the lamp only by the leads; fingerprints on the glass assembly will shorten lamp life. Mount lamps in brackets according to manufacturer's recommendations; using the wrong lamp or mounting it improperly can drastically reduce the light output of the fixture.
  - (3) When reassembling the light, replace all gaskets and O-rings exposed during the re-lamping process. Examine the optical prism to make sure that the sealer around the edges is in good shape. Replace the optical prism if it is cracked, scratched, or badly pitted.
- e. Reinstallation.** If reinstalling a light fixture in a "dry system" (a conduit system without drains which depends on gaskets under the fixtures to keep out water), when mounting an in pavement unit on its base, care must be used to be sure that a watertight seal is obtained. Be sure the gasket and its mating surface are free of sand or grit; this is a common fault in servicing that allows moisture to enter.
- (1) Graphite compound or gasket cement may be used on the gasket surfaces to ensure a watertight seal.
  - (2) When installing an in-pavement light in a "wet system" (a conduit system that employs drains at low points) the fixture is typically mounted directly on the base without a gasket.
  - (3) With either system, a supply of compressed air should be used to blow any sand or dirt out of bolt holes and mating surfaces to assure proper fit and bolt torque. Securely tighten all fixtures to the manufacturer's specified torque.
- f. Photometric Measurements.** Photometric measurement of in-pavement lights is the most direct way of determining if they are emitting the specified amount of light.

## **5.4 Illuminated Runway and Taxiway Guidance Signs.**

### **5.4.1 Cleaning and replacement**

- a. Most signs require minimal maintenance aside from lamp replacement. However, with the intrusion of dust, dirt and water it is necessary to inspect and clean the interior of signs periodically to ensure proper light output. Mice and other rodents are known to set up house-keeping in signs. Frequently, this results in damage to wires and other components and the presence of grass, trash and other bedding material. For these reasons, inspect and clean airfield guidance signs at least twice a year.
- b. If sign panels are faded from sun exposure or damaged to the extent that the message is no longer readable, the sign panel must be replaced. Contact the sign manufacturer for their recommendations for replacement sign panels.

### **5.4.2 Lamp Replacement.**

As with all airport lighting systems, re-lamping should be accomplished with the sign de-energized to prevent the possibility of electric shock. This has been made an easier task by the addition of switches on signs to disconnect the power. The act of re-lamping has also been made easier and quicker by designs of both incandescent and LED types that allow re-lamping without the use of special tools.

### **5.4.3 Current Check.**

At least twice a year, the current through the lamp circuit should be checked to verify that it is correct for the sign in question. If not correct for all steps, make current adjustments on the sign internal regulator board or if a Style 5 sign, check the circuit CCR to make sure it is operating at 5.5A.

## **5.5 Rotating Beacons.**

### **5.5.1 Rotating Beacon Maintenance.**

- a. Many of the older high intensity 36-inch and 24-inch beacons are refurbished and converted from incandescent lamps to metal halide lamps. Most new beacons use metal halide lamps.
- b. The metal halide lamps have the advantage of longer life making the requirement for an automatic lamp changer unnecessary. While this has greatly reduced the amount of maintenance formerly needed to keep the lamp changer assembly in good operation, it has not reduced the amount of attention that should be placed on beacon maintenance.
- c. Metal halide lamps have a 20,000 hour rated life expectancy and should be replaced every 2 ½ years. The standard MVR400/U lamps produce 36,000 lumens of light. The old incandescent 1000 watt lamps produced 22,000 lumens of light.

- d. The metal halide lamps will lose intensity to approximately 22,000 lumens of light after 2 ½ years of service at which time they should be replaced with a new lamp. In the case of the L-801 medium intensity beacons fitted with a 175 watt metal halide lamp, the lamps should be changed every 1 ½ to 2 years.
- e. One other difference in beacons that are fitted with metal halide lamps rather than incandescent is that the lamp takes 4-5 minutes to reach complete brightness. This fact should be pointed out to controllers and operations personnel. If the beacon has been on and is shut off during operation, it will require approximately 12-15 minutes for the lamp to cool off and re-fire.

## **5.5.2 Preventive Maintenance Inspections.**

### **5.5.2.1 Daily Checks.**

- a. Check the operation of the beacon. Verify dusk to dawn operation and operation of controls, either via photoelectric cell or manual.
- b. Count the flashes per minute (rpm) of the beacon.
  - (1) For FAA Type L-801A, L-801S, L-802S, L-802S beacons, the flash rate must be from 24 to 30 flashes per minute (fpm).
  - (2) For FAA Type L-801H and L-802H (heliports) the flash rate must be from 30 to 45 fpm.
- c. Check for proper color and flash sequence.
- d. Check telltale indicator lamp (if equipped) to see if it is illuminated. If it is illuminated, it indicates that the beacon is operating on the reserve lamp (if equipped). The burned-out lamp should be replaced immediately.

### **5.5.2.2 Bi-Monthly Checks.**

- a. **Lamp Changer (if equipped).** Check the operation of the lamp changer. De-energize the beacon circuit and remove the operating lamp from its receptacle. Energize the beacon circuit and observe that the beacon changes to the reserve lamp. De-energize the beacon circuit and re-install the lamp previously removed.
- b. **Slip Rings (if equipped).** Check the condition of the slip rings and brushes. Clean the slip rings and brushes per manufacturer's instructions. If sparking or pitting has occurred, smooth rings according to manufacturer's instructions. Avoid sanding as this produces a raw copper surface which shortens brush life. If the slip rings are deeply pitted, replace or have them turned on a lathe by a qualified repair shop. Replace worn out brushes as soon as possible to avoid damage to the slip rings.

- c. **Clutch.** Test the clutch torque by hooking a spring scale in one of the handles on the side of the housing. The clutch should slip between 8 to 10 pounds or per manufacturer's instructions.
- d. **Lens Retainer.** Check the clamps or screws that secure the beacon lens (or cover) to be sure they are tight and the lens is properly seated.
- e. **Telltale Light.** Check the telltale light for a burned out lamp. Clean glassware if necessary.
- f. **Relays.** Check the operation of the relay and clean relay contacts if they are pitted or show evidence of poor contact. Replace the relay if the contacts are severely pitted.
- g. **Glassware.** Clean and polish all glassware, both inside and outside, using a type of non-abrasive cleaner that will not scratch the lens.

#### 5.5.2.3 Semi-annual Checks.

- a. **Input Voltage.** Check the input voltage and record the reading. It should be within 5 percent of the rated lamp voltage. Voltage levels higher than a lamp's nominal rating will prematurely reduce the lamp's life proportionally to the increased voltage. Conversely, voltage levels lower than a lamp's nominal rating will reduce the lamp's light output proportionally to the reduced voltage. Make the measurement at the beacon lamp terminals, with all field equipment energized, so the voltage reading will reflect operating conditions.
- b. **Lamp Focus and Beam Elevation.** Verify that beacon beam is narrow, well defined and projects horizontally. Check that the elevation setting has not slipped. Normal elevation setting for FAA beacons is 3½ degrees. Beam elevation can be adjusted by lowering the lamp mounting position to elevate the beam or raising the lamp position to lower the beam – follow the manufacturer's instructions.
- c. **Lubrication.** Beacons with a grease fitting on the main shaft should be lubricated twice a year under ordinary operation or as directed by the manufacturer. Motors supplied with oil cups should be lubricated at the same time with SAE 20 oil. If there are no cups, the motor has sealed bearings and requires no lubrication. Ring gears should have a small amount of grease applied per manufacturer's recommendation.

**CAUTION:** Using an excessive amount of grease will result in its dropping down upon the slip rings and causing poor contact and arcing.

- d. **Drive Belt (if equipped).** Check condition and tension of drive belt and adjust or replace if necessary.
- e. **Lightning Protection System.** Check the lightning rod connection for tightness and check the condition of the down conductor for corrosion or damage. Check and record the ground resistance. Compare the reading with the previous ground resistance checks.

Reading must be less than 25 ohms. If the reading exceeds 25 ohms, immediate action must be taken to correct the grounding problem.

#### **5.5.2.4 Annual Checks.**

- a. Base Level.** Check the level of the beacon in four directions. Make corrections as necessary.
- b. Gears.** Clean the old grease from the gears. When installing new grease, observe the caution statement in paragraph 5.5.2.3c.
- c. Wiring.** Inspect all wiring, electrical connections and relays for abrasions, breaks and loose connections. Check terminal lugs for tight electrical connection. Inspect conduit for loose supports and connections. Replace broken brackets.
- d. Weatherproofing and gaskets.** Check the condition of the weather-proofing and gaskets. Replace gaskets when cracked or deteriorated. Before installing new gaskets, clean the gasket channels and seats thoroughly. When it is necessary to secure the gasket with rubber cement, coat both the gasket and seat with appropriate cement and permitted to dry until tacky before the gasket is positioned.

**Table 5-7. Preventive Maintenance Schedule for Rotating Beacons**

| Maintenance Requirement                                   | D<br>A<br>I<br>L<br>Y | W<br>K<br>L<br>Y | M<br>T<br>H<br>L<br>Y | B<br>I<br>M<br>H<br>Y | Q<br>T<br>R<br>L<br>Y | S<br>M<br>A<br>N<br>Y | A<br>N<br>N<br>U<br>A<br>L |
|---|-----------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------------|
| 1. Check for beacon operation and proper color sequence.  | X                     |                  |                       |                       |                       |                       |                            |
| 2. Count rpm of beacon.                                   | X                     |                  |                       |                       |                       |                       |                            |
| 3. Check telltale indicator lamp for reserve lamp status. | X                     |                  |                       |                       |                       |                       |                            |
| 4. Check operation of the lamp-changer.                   |                       |                  |                       | X                     |                       |                       |                            |
| 5. Check slip rings and brushes.                          |                       |                  |                       | X                     |                       |                       |                            |
| 6. Test the clutch torque.                                |                       |                  |                       | X                     |                       |                       |                            |
| 7. Check lens retainers.                                  |                       |                  |                       | X                     |                       |                       |                            |
| 8. Check telltale indicator lamp.                         |                       |                  |                       | X                     |                       |                       |                            |
| 9. Check operation of relays.                             |                       |                  |                       | X                     |                       |                       |                            |
| 10. Clean and polish glassware.                           |                       |                  |                       | X                     |                       |                       |                            |
| 11. Check and record input voltage.                       |                       |                  |                       |                       |                       | X                     |                            |
| 12. Check lamp focus and beam elevation.                  |                       |                  |                       |                       |                       | X                     |                            |
| 13. Lubricate main shaft, motor, ring gear, and padlocks. |                       |                  |                       |                       |                       | X                     |                            |
| 14. Check operation of electrical switches and contacts.  |                       |                  |                       |                       |                       | X                     |                            |
| 15. Check lightning arresters and grounding system.       |                       |                  |                       |                       |                       | X                     |                            |
| 16. Check power meter.                                    |                       |                  |                       |                       |                       | X                     |                            |
| 17. Check level of base.                                  |                       |                  |                       |                       |                       |                       | X                          |
| 18. Clean and re-grease gears.                            |                       |                  |                       |                       |                       |                       | X                          |
| 19. Inspect wiring, lugs, and conduit.                    |                       |                  |                       |                       |                       |                       | X                          |
| 20. Check weatherproofing and gaskets.                    |                       |                  |                       |                       |                       |                       | X                          |

**5.6 Lighted Wind Cone Assemblies.****5.6.1 Preventive Maintenance Inspections.****5.6.1.1 Daily Checks.**

- a. Visually check to see that all the lights are burning properly each night. If the lamps burn dimly, the voltage is probably too low. If the lamps burn out too frequently, the voltage is probably too high. The voltage should be 120 volts  $\pm$  5 percent volts AC or per the manufacturer's specifications. For wind cones that are illuminated by LEDs, follow the manufacturer's instructions to check proper voltage.
- b. Many supplemental wind cones are powered from the runway edge light series circuit via a power adapter and consequently, the voltage to the lamps and the brightness of the lamps may vary slightly with a change in runway light intensity.

- c. If a photocell is used, cover it and verify that the wind cone lights turn on.

#### **5.6.1.2 Monthly Checks.**

- a. Check the cone assembly to see that it swings freely throughout the 360 degree travel.
- b. Check the condition of the wind cone fabric. The fabric of the cone should be carefully examined. The fabric should be replaced when it is badly worn, rotted, soiled, or faded.
- c. Check to make sure that the movement of the wind cone is not impeded by vegetation.

#### **5.6.1.3 Bi-monthly Checks.**

- a. All the lamps may be replaced after 80 percent of the rated life and prior to 90 percent of the rated lamp life (LED illuminated wind cones are excepted). However, if daily operational checks are being made, this may not be necessary but it would be advisable to change all of the lamps at the same time to prevent recurring maintenance visits.
- b. The globes should be cleaned when replacing the lamps.

#### **5.6.1.4 Semi-annual Checks.**

- a. Check the bearings to see if they need lubricating. An application of light grease should be sufficient. In areas exposed to extreme dust, clean the bearings and repack with light grease. In freezing weather, the grease becomes very viscous and action of the wind cone in light winds will often become sluggish. During such weather, it may be necessary to completely clean the bearings or grease and lubricate them with light oil.
- b. Take an insulation reading on the underground feeder if wired from a parallel source and record the results. Compare results to previous readings to look for signs of insulation deterioration. If powered from a power adapter connected to a series lighting circuit, check the voltage at each output step of the series circuit to make sure the power adapter is still functioning within manufacturer's parameters.

#### **5.6.1.6 Annual Check.**

- a. Check the assembly base securing bolts for tightness. Tighten as required.
- b. Check the wiring at the hinged area or check the slip ring connections if internally lighted. If frayed, loose, or pitted, repair or replace.
- c. Check the ground system for loose connections.
- d. Test the resistance of the grounding system. It should measure 25 ohms to ground or less.
- e. Check the condition of the paint on the wind cone structure. Touch up or repaint as required.

**Table 5-8. Preventive Maintenance Schedule for Lighted Wind Cones**

| Maintenance Requirement                                  | D<br>A<br>I<br>L<br>Y | W<br>K<br>L<br>Y | M<br>T<br>H<br>L<br>Y | B<br>I<br>M<br>H<br>Y | S<br>M<br>A<br>N<br>Y | A<br>N<br>N<br>L<br>Y | U<br>N<br>S<br>C<br>H |
|--|-----------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Check lamp operation.                                 | X                     |                  |                       |                       |                       |                       |                       |
| 2. Check photocell operation.                            | X                     |                  |                       |                       |                       |                       |                       |
| 3. Check for freedom of motion of wind cone frame.       |                       |                  | X                     |                       |                       |                       |                       |
| 4. Check condition of wind cone fabric.                  |                       |                  | X                     |                       |                       |                       |                       |
| 5. Check lamp age for scheduled replacement.             |                       |                  |                       | X                     |                       |                       |                       |
| 6. Clean glassware.                                      |                       |                  |                       | X                     |                       |                       |                       |
| 7. Check paint on segmented circle.                      |                       |                  |                       | X                     |                       |                       |                       |
| 8. Clean and grease bearings.                            |                       |                  |                       |                       | X                     |                       |                       |
| 9. Read insulation resistance.                           |                       |                  |                       |                       | X                     |                       |                       |
| 10. Check mounting bolts.                                |                       |                  |                       |                       |                       | X                     |                       |
| 11. Check wiring at hinge.                               |                       |                  |                       |                       |                       | X                     |                       |
| 12. Check grounding system resistance.                   |                       |                  |                       |                       |                       | X                     |                       |
| 13. Check paint on wind cone structure.                  |                       |                  |                       |                       |                       | X                     |                       |
| 14. Remove vegetation and check condition at foundation. |                       |                  |                       |                       |                       |                       | X                     |

## 5.7 Precision Approach Path Indicator (PAPI) System.

### 5.7.1 Preventive Maintenance Inspection Procedures.

A typical layout of the PAPI system is shown in Figure 5.3.

#### 5.7.1.1 Daily Checks.

Confirm all lamps are burning and are of equal brightness. Spare lamps should be available to permit a complete replacement of all lamps in the system. Spare bypass fuses, if used, should also be stocked. Lamps should be replaced immediately if they burn out or become darkened. If the PAPI uses bypass fuses, never replace a lamp until the associated fuse is checked.

#### 5.7.1.2 Monthly Checks.

- a. Check operation of controls. Check photocell brightness control and runway light circuit interlock (if used), radio control (if used), and/or remote control switch.
- b. Check for damage by mowers, snowplows, etc.
- c. Clean lamps and filters.
- d. Visually check mechanical parts for cleanliness, burned wires or connections, cracked insulators, lamps or filters, etc.

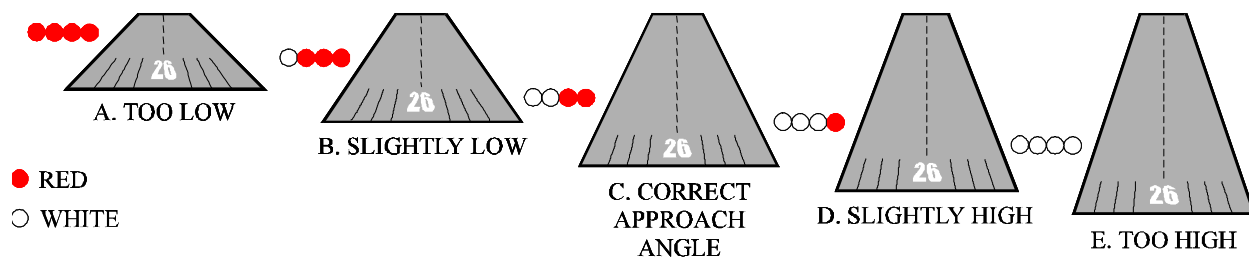
- e. Check if the lightning arresters and/or surge suppressors are scorched or show other signs of being burned out, and replace as necessary. Also, check after electrical storms.
- f. Check the lamp boxes and adapter units for damage or debris from water and local wild life and clean or repair as needed.
- g. Check for burrows or other signs of rodent activity in vicinity of cables; take steps to discourage their presence to minimize likelihood of cable damage.
- h. Check the horizontal and lateral alignment of the light boxes, and check the aiming (vertical angle) with the PAPI aiming instrument. Record the angle setting and the date in a maintenance log. It is particularly important to check aiming frequently whenever the soil freezes or thaws or has a change in moisture content (especially clay soils).
- i. Check the aiming of visual glide slope indicators (VSGI) after any contact with mowing equipment or agricultural activities.
- j. Check that vegetation growth is not obscuring VSGI equipment.
- k. Check leveling and operating of tilt switch if applicable.

#### **5.7.1.3 Quarterly Checks.**

Check the obstacle free clearance surface plane (OCS) for clearance from tree growth, new towers, pole lines, or other obstacles. The OCS extends 10° on either side of the runway centerline to a distance of 4 miles (6.44 km) from the point of origin. See AC 150/5340-30, Design and Installation details for Airport Visual Aids, for additional information

#### **5.7.1.4 Semi-annual Checks.**

- a. Check insulation resistance of underground cables and record the results.
- b. Check resistance of the grounding system and record the results.



## PAPI PATTERNS AS SEEN FROM THE APPROACH ZONE

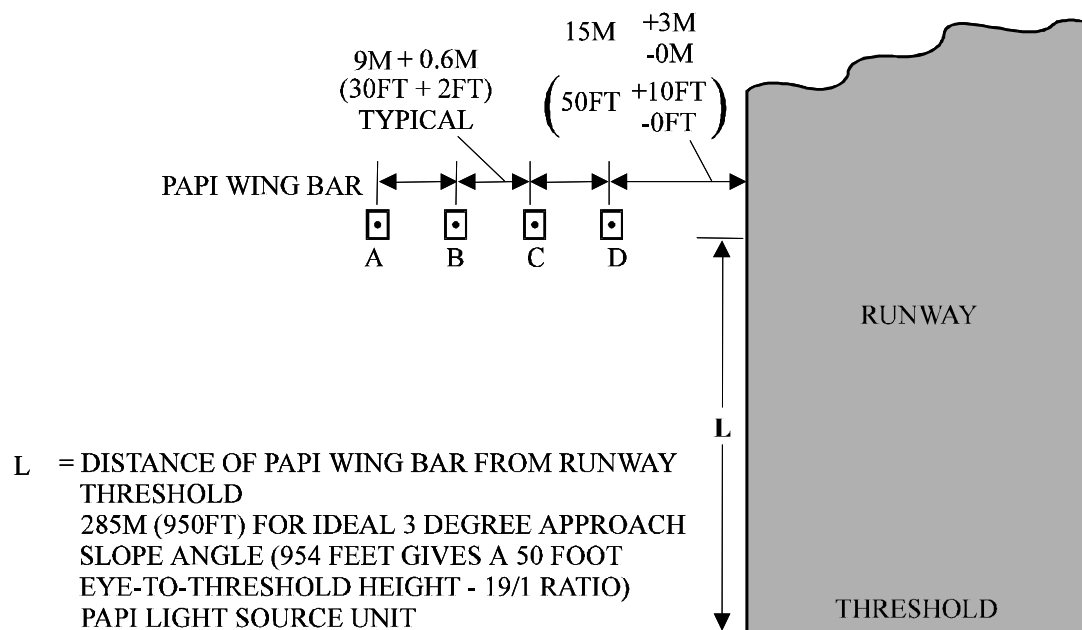


Figure 5-3. PAPI Configuration

**Table 5-9. Preventive Maintenance Schedule for PAPI (Precision Approach Path Indicator)**

| Maintenance Requirement  | D<br>A<br>I<br>L<br>Y | W<br>E<br>E<br>K<br>L<br>Y | M<br>O<br>N<br>T<br>H<br>L<br>Y | Q<br>U<br>A<br>R<br>T<br>E<br>R<br>L<br>Y | S<br>E<br>M<br>I<br>A<br>N<br>N<br>U<br>A<br>L | A<br>N<br>N<br>U<br>A<br>L | U<br>N<br>S<br>C<br>H<br>E<br>D<br>U<br>L<br>E<br>D |
|--|-----------------------|----------------------------|---------------------------------|---|--|----------------------------|---|
| 1. Check lamps for operation.                                    | X                     |                            |                                 |   |  |                            |   |
| 2. Check operation of controls.                                  |                       |                            | X                               |   |  |                            |   |
| 3. Check for damage by service vehicles or aircraft.             |                       |                            | X                               |   |  |                            |   |
| 4. Clean lamps and filters.                                      |                       |                            | X                               |   |  |                            |   |
| 5. Check mechanical parts for damage.                            |                       |                            | X                               |   |  |                            |   |
| 6. Check lightning arresters.                                    |                       |                            | X                               |   |  |                            |   |
| 7. Check for water damage or insect infestation.                 |                       |                            | X                               |   |  |                            |   |
| 8. Check for presence of rodents.                                |                       |                            | X                               |   |  |                            |   |
| 9. Record output current and input voltage of adapter (if used). |                       |                            | X                               |   |  |                            |   |
| 10. Check alignment and aiming of light boxes.                   |                       |                            | X                               |   |  |                            |   |
| 11. Check leveling and operation of tilt switch.                 |                       |                            | X                               |   |  |                            |   |
| 12. Check integrity of obstacle-free approach plane.             |                       |                            |                                 | X   |  |                            |   |
| 13. Check insulation resistance of underground cables.           |                       |                            |                                 |   | X  |                            |   |
| 14. Check resistance of grounding system.                        |                       |                            |                                 |   | X  |                            |   |

## 5.7.2 Maintenance Procedures.

### 5.7.2.1 Adjustment of the Vertical Aiming.

This adjustment is performed by using a clinometer. Clinometers are normally supplied with the PAPI or may be purchased from the PAPI manufacturer. Handle these precision instruments carefully. Make sure the aiming device used is the one supplied with the current manufacturer's PAPI light units.

- a. Check the manufacturer's manual (supplied with the units) for the procedures used to check each PAPI unit for proper aiming angle. Follow the procedures recommended for using the manufacturer's leveling device.
- b. Stand in front of the PAPI units (approximately 50 feet away) and check that the light changes color simultaneously along the whole width of each unit. If not, horizontal leveling was not done properly, the red filters are out of position, or the box is warped.
- c. Check the tilt switch on all units (where provided) by placing the small level on the marked top surface of the tilt switch and adjusting the tilt switch if necessary. If the tilt switch shuts off the power when it is level, the tilt switch should be replaced. The main switch may have to be toggled off and on to reset tilt switch circuit. For tolerances, refer to the manufacturer's installation manual.

### 5.7.2.2 Check of Adapter Unit Current Output.

**Note:** This section is retained in the event that any legacy PAPI units with power adapters are still in operation. PAPI equipment is now furnished by manufacturers in Style A, voltage powered systems, and Style B, current powered (series lighting circuit) systems. **Do not attempt** to apply the procedures detailed in this paragraph to modern PAPI systems. Always follow the manufacturer's instructions to make any adjustments.

- a. With system on, adjust day current to 6.4 to 6.6 amperes.
- b. Cover photocell with a heavy glove or other dark material, wait for time delay to de-energize, and read current. If the system has a night adjustment, set current to 4.8 to 5.0 amperes.
- c. Remove covering from photocell. The lights should switch back to day brightness after a short time delay (15 seconds to 1 minute).

## 5.8 Visual Approach Slope Indicator (VASI).

Some facilities may still use VASI systems. The procedures in Table 5-9 are applicable, for the most part, for VASI. Check the manufacturer's maintenance manual for unique procedures that are applicable for the system installed. Be aware that replacement parts may not always be available for older VASI systems.

### 5.8.1 Preventive Maintenance Inspection Procedures.

To perform the PMIs contained in Table 5-10, proceed as follows:

#### 5.8.1.1 Daily Checks.

Check that all lamps are illuminated and are of equal brightness. Adequate spare lamps should be available to permit a complete replacement of all lamps in the system. Spare bypass "grasshopper" fuses, if used, should also be stocked. Lamps should be replaced immediately if they burn out or become darkened. If the VASI uses bypass fuses, never replace a lamp until the associated fuse is checked.

#### 5.8.1.2 Monthly Checks.

- a. Check operation of controls. Check photocell brightness control and runway light circuit interlock (if used), radio control (if used), and/or remote control switch.
- b. Check for damage by mowers, snowplows, etc.
- c. Clean lamps and filters.
- d. Visually check mechanical parts for cleanliness, burned wires or connections, cracked insulators, lamps or filters, etc.

- e. Check if lightning arresters and/or surge suppressors are scorched or show other signs of being burned out and replace as necessary. Also, check after electrical storms.
- f. Check for damage or debris from water, mice, wasps, bird nests, spider webs, etc., in lamp boxes and adapter units and clean or repair as needed.
- g. Check for burrows or other signs of rodent activity in vicinity of cables; take steps to discourage their presence to minimize likelihood of cable damage.
- h. If an adapter unit is used, read and record the output current and the input voltage to the adapter unit
- i. Check the horizontal and lateral alignment of the light boxes, and check the aiming (vertical angle) with the VASI aiming bar. Record the angle setting and the date in a maintenance log. It is particularly important to check aiming frequently whenever the soil freezes or thaws or has a change in moisture content (especially clay soils).
- j. Check leveling and operation of tilt switch (used in VASI-2 and some VASI-4 installations).

#### **5.8.1.3 Quarterly Checks.**

Check the obstacle clearance surface (OCS) plane for clearance from tree growth, new towers, pole lines, or other obstacles. See AC 150/5340-30 for details about OCS and clearing obstacles.

#### **5.8.1.4 Semi-annual Checks.**

- a. Check insulation resistance of underground cables and record the results.
- b. Check resistance of the grounding system and record the results.

### **5.8.2 Maintenance Procedures.**

#### **5.8.2.1 Adjustment of the Vertical Aiming.**

This is normally done with an aiming bar, calibration bar, and small (machinist's) level. Handle these precision instruments carefully. Make sure the aiming bar is the one supplied with the VASI light units. The following steps should be followed each time the VASI is checked.

- a. Place the calibration bar on a rigid surface that is approximately level, such as a concrete floor or a table or counter that is sitting on a concrete floor. Most wooden floors will deflect enough under one person's weight to make it impossible to level accurately the calibration bar.
- b. Place the small level on the calibration bar and level it with the adjustable feet, both in the linear and transverse directions.

- c. Turn the small level 180 degrees to check for centering of the bubble. If it does not check when reversed, adjust the small level so that the bubble will remain centered when the small level is reversed.
- d. Place the aiming bar on the calibration bar and check that its spirit level remains centered in the 0-degree, 3-degree, and 6-degree positions and settings. Adjust spirit level if necessary to center the bubble. If the bubble cannot be centered at each of the three angles, the aiming bar should be replaced.
- e. Place the instruments in the carrying case for transporting out to the VASI boxes.
- f. Place the small level on the bottom center of the aperture (light slot) at the front of the box and level the box transversely with the two front adjusting (mounting) screws.
- g. Set the proper angle on the aiming bar (usually 2½ degrees for light bar No. 1, closest to runway end, and 3 degrees for light bar No. 2) and insert through the aperture so the end of the aiming bar rests on the transition bar.
- h. With aiming bar in line with left-hand lamp, adjust left rear adjusting screw. Move the aiming bar to the right side of box and adjust right rear screw. Repeat for left and right side until bubble is centered at each position.
- i. Recheck transverse leveling, and recheck longitudinal leveling with the aiming bar in center of light box.
- j. Stand in front of the VASI box (approximately 50 feet away) and check that the light changes color simultaneously along with the whole width of the unit. If not, either the leveling was not done properly, the box is warped, or the transition bar is not in its proper place.
- k. Check the tilt switch on all VASI-2 systems and VASI-4 systems (where provided) by placing the small level on the marked top surface of the tilt switch and adjusting the tilt switch if necessary. If the tilt switch shuts off the power when it is level, the tilt switch should be replaced. The main switch may have to be turned off, and back on, to reset tilt switch circuit.

#### **5.8.2.2 Check of Adapter Unit Current Output.**

- a. With system on, adjust day current to 6.4 to 6.6 amperes.
- b. Cover photocell with a heavy glove or other dark material, wait for time delay to de-energize, and read current. If the VASI has a night adjustment, set current to 4.8 to 5.0 amperes.
- c. Remove covering from photocell. The lights should switch back to day brightness after a short time delay (15 seconds to 1 minute).

**Table 5-10. Preventive Maintenance Schedule for VASI (Visual Approach Slope Indicator)**

| <b>MAINTENANCE REQUIREMENT</b>                                  | <b>D<br/>A<br/>I<br/>L<br/>Y</b> | <b>M<br/>T<br/>H<br/>L<br/>Y</b> | <b>Q<br/>R<br/>T<br/>L<br/>Y</b> | <b>S<br/>M<br/>A<br/>N<br/>Y</b> |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1. Check lamps for operation                                    | X                                |                                  |                                  |                                  |
| 2. Check operation of controls                                  |                                  | X                                |                                  |                                  |
| 3. Check for damage by vehicles or aircraft                     |                                  | X                                |                                  |                                  |
| 4. Clean lamps and filters                                      |                                  | X                                |                                  |                                  |
| 5. Check mechanical parts for damage                            |                                  | X                                |                                  |                                  |
| 6. Check lightning arrester                                     |                                  | X                                |                                  |                                  |
| 7. Check for water damage or insect infestation                 |                                  | X                                |                                  |                                  |
| 8. Check for presence of rodents                                |                                  | X                                |                                  |                                  |
| 9. Record output current and input voltage of adapter (if used) |                                  | X                                |                                  |                                  |
| 10. Check alignment and aiming of light boxes                   |                                  | X                                |                                  |                                  |
| 11. Check leveling and operation of tilt switch                 |                                  | X                                |                                  |                                  |
| 12. Check integrity of obstacle-free approach plane             |                                  |                                  | X                                |                                  |
| 13. Check insulation resistance of underground cables           |                                  |                                  | X                                |                                  |
| 14. Check resistance of grounding systems                       |                                  |                                  |                                  | X                                |

## **5.9 Runway End Identifier Lights (REILs).**

### **5.9.1 Preventive Maintenance Inspection Procedures.**

A typical layout of the REIL System is shown in Figure 5-4. To perform the PMIs contained in Table 5-11, proceed as follows:

#### **5.9.1.1 Daily Checks.**

Check that lamps are operating and are flashing in proper sequence.

#### **5.9.1.2 Bi-monthly Checks.**

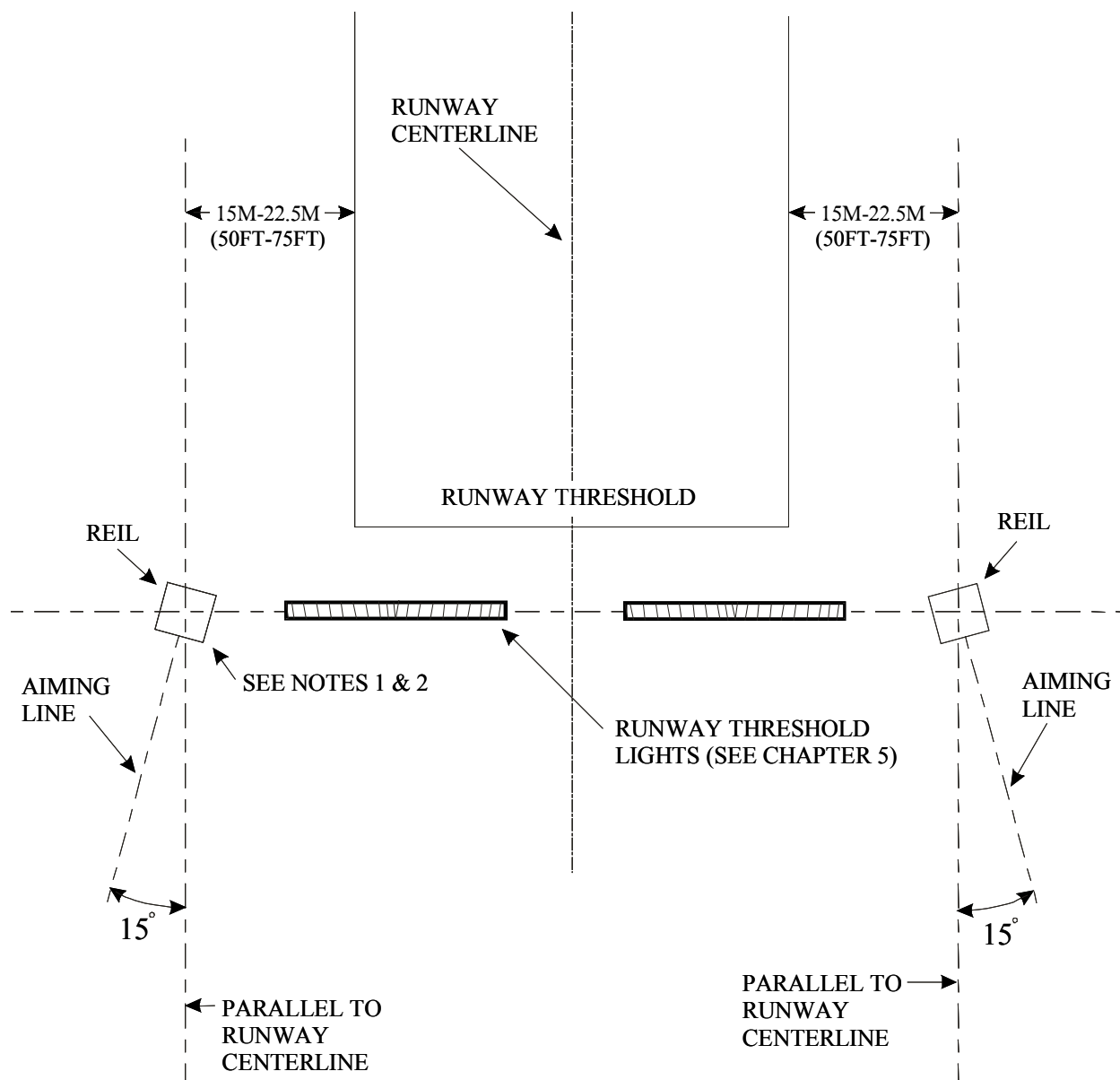
- a. Check the controls for proper operation. Observe operation on each intensity step.
- b. Check cleanliness of optical surfaces, both interior and exterior.
- c. Check for damage or misaligned lights.
- d. Check interlock device on door of each cabinet. Verify that shutdown occurs when each door is opened.
- e. Check for vegetation or other obstruction around lights.

**5.9.1.3 Semi-annual Checks.**

- a. Check the interior of control panel and flasher cabinets for cleanliness and moisture.
- b. Check electrical contacts and connections to ensure tightness.
- c. Check and adjust alignment and elevation of light units. For omnidirectional units, check only the elevation. For unidirectional REILs, check alignment and elevation using the following tools:
  - (1) A plywood triangle cut to angles of 15 degrees, 80 degrees, and 85 degrees.
  - (2) A 4-inch line level.
- d. The procedure to align the unidirectional REIL is as follows:
  - (1) To check the 15-degree toe-out, hold the triangle horizontally against the face with the 15-degree angle pointed toward the other light unit. By aligning the outside edge of the triangle to point at the opposite light unit, 15-degree toe-out is achieved.
  - (2) To attain the 10-degree vertical aiming, the 80-degree angle is placed against the flat portion of the REIL face with the 15-degree point-down. When the line level shows the upper edge of the triangle level, the REIL is 10 degrees up from the horizontal (see Figure 5.5).
- e. Check baffles if used on REIL. Where baffles are installed, the light units should be aimed at an angle of 3 degrees vertical and 10 degrees toed out. The louvers should be sloped down 10 degrees toward the runway and down 5 degrees toward the approaching aircraft. The louvers should be painted black to lower the reflected light.

**5.9.1.4 Annual Checks.**

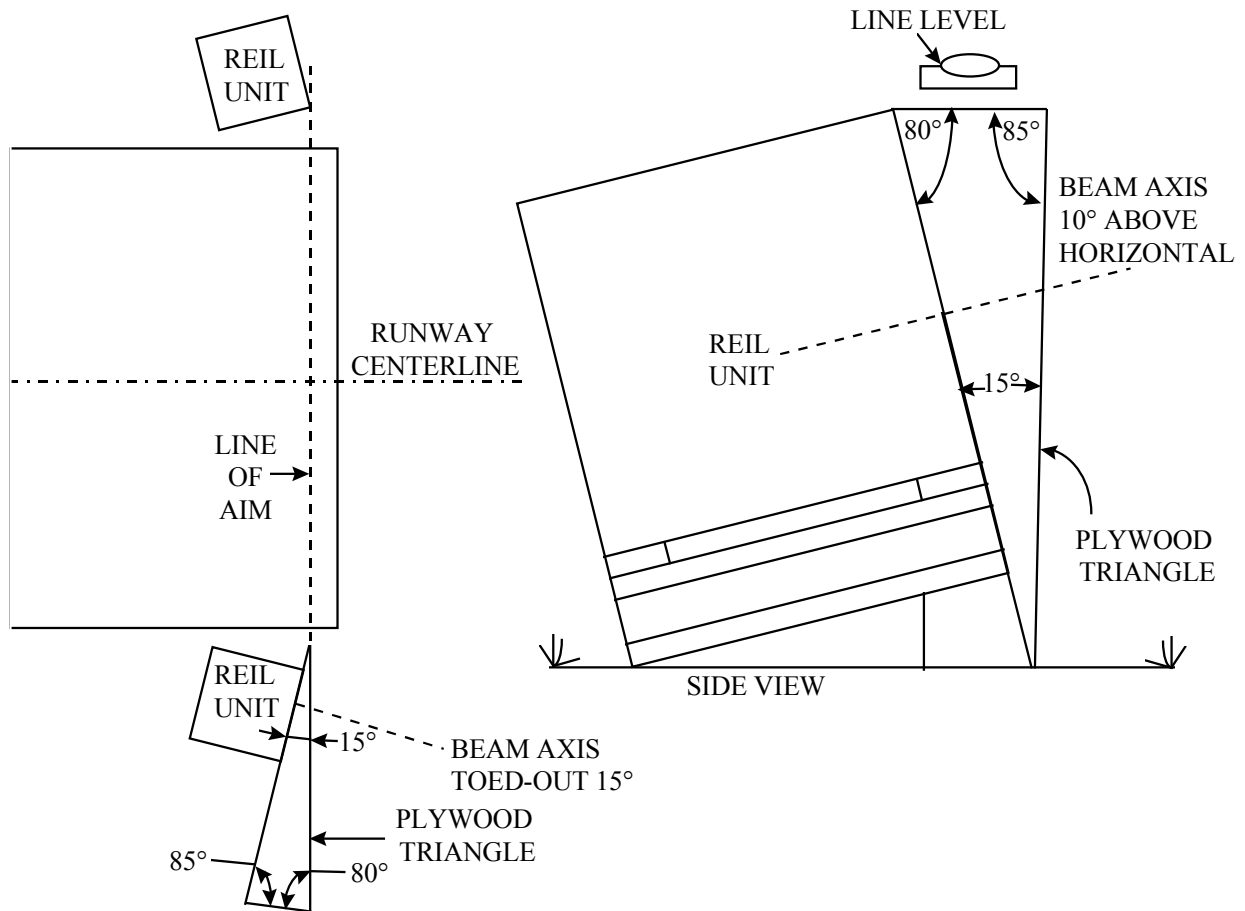
- a. Make a careful inspection of all power distribution equipment and protective devices at terminal pole and lights.
- b. Check insulation resistance of power cables.
- c. Check the ground resistance at the terminal pole and each light fixture.
- d. Service timer motor and contacts (if used).
- e. Repaint as required.



NOTES:

1. LONGITUDINAL LOCATION OF REIL FIXTURES MAY BE VARIED FROM IN LINE WITH THRESHOLD TO 15M (50FT) DOWNWIND OF THRESHOLD. BOTH FIXTURES WILL BE AT THE SAME DISTANCE.
2. UNIDIRECTIONAL FIXTURE IS ILLUSTRATED; FOR OMNIDIRECTIONAL FIXTURE IGNORE HORIZONTAL AIMING.

### Figure 5-4. REIL Layout



**Figure 5-5. REIL Aiming**

**Table 5-11. Preventive Maintenance Schedule for REIL (Runway End Identifier Lights)**

| Maintenance Requirement                                  | D<br>A<br>I<br>L<br>Y | W<br>K<br>L<br>Y | M<br>T<br>H<br>L<br>Y | B<br>I<br>M<br>H<br>Y | S<br>M<br>A<br>N<br>Y | A<br>N<br>N<br>L<br>Y | U<br>N<br>S<br>C<br>H |
|--|-----------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Check operation of lamps.                             | X                     |                  |                       |                       |                       |                       |                       |
| 2. Check the operation of controls.                      |                       |                  |                       | X                     |                       |                       |                       |
| 3. Check cleanliness of optical system.                  |                       |                  |                       | X                     |                       |                       |                       |
| 4. Check for mechanical damage or misaligned parts.      |                       |                  |                       | X                     |                       |                       |                       |
| 5. Check operation of interlocks.                        |                       |                  |                       | X                     |                       |                       |                       |
| 6. Check for vegetation around lights.                   |                       |                  |                       | X                     |                       |                       |                       |
| 7. Check cabinets for cleanliness and moisture.          |                       |                  |                       |                       | X                     |                       |                       |
| 8. Check electrical connections.                         |                       |                  |                       |                       | X                     |                       |                       |
| 9. Check alignment and elevation of unidirectional REIL. |                       |                  |                       |                       | X                     |                       |                       |
| Check only elevation of omnidirectional units.           |                       |                  |                       |                       |                       |                       |                       |
| 10. Realign unidirectional REILs, as required.           |                       |                  |                       |                       | X                     |                       |                       |
| 11. Check baffles on REIL (if used).                     |                       |                  |                       |                       | X                     |                       |                       |
| 12. Check power distribution equipment.                  |                       |                  |                       |                       |                       | X                     |                       |
| 13. Check insulation resistance of cable.                |                       |                  |                       |                       |                       | X                     |                       |
| 14. Check resistance of grounding systems.               |                       |                  |                       |                       |                       | X                     |                       |
| 15. Service timer motor and contacts (if used).          |                       |                  |                       |                       |                       | X                     |                       |
| 16. Check need for painting.                             |                       |                  |                       |                       |                       | X                     |                       |

**5.10 Medium Approach Lighting System (MALS, MALSF, MALSR).****5.10.1 Preventive Maintenance Inspection Procedures.**

A typical layout of the MALSR System is shown in Figure 5-6. To perform PMIs contained in Table 5-12, proceed as follows:

**5.10.1.1 Daily Check.**

- a. Check and record burned-out lamps.

**5.10.1.2 Weekly Checks.**

- a. Request air traffic control tower personnel to turn on the system and cycle through each brightness step from the remote control panel. If the system is equipped with air-to-ground radio control, check each brightness step for proper operation. During the sequence, the maintenance technician should be in a position to observe the system operation.
- b. Replace burned-out lamps as necessary to meet the criteria in Appendix A, Table 2.
- c. Check the exterior optical surface of all lights. Clean as required.

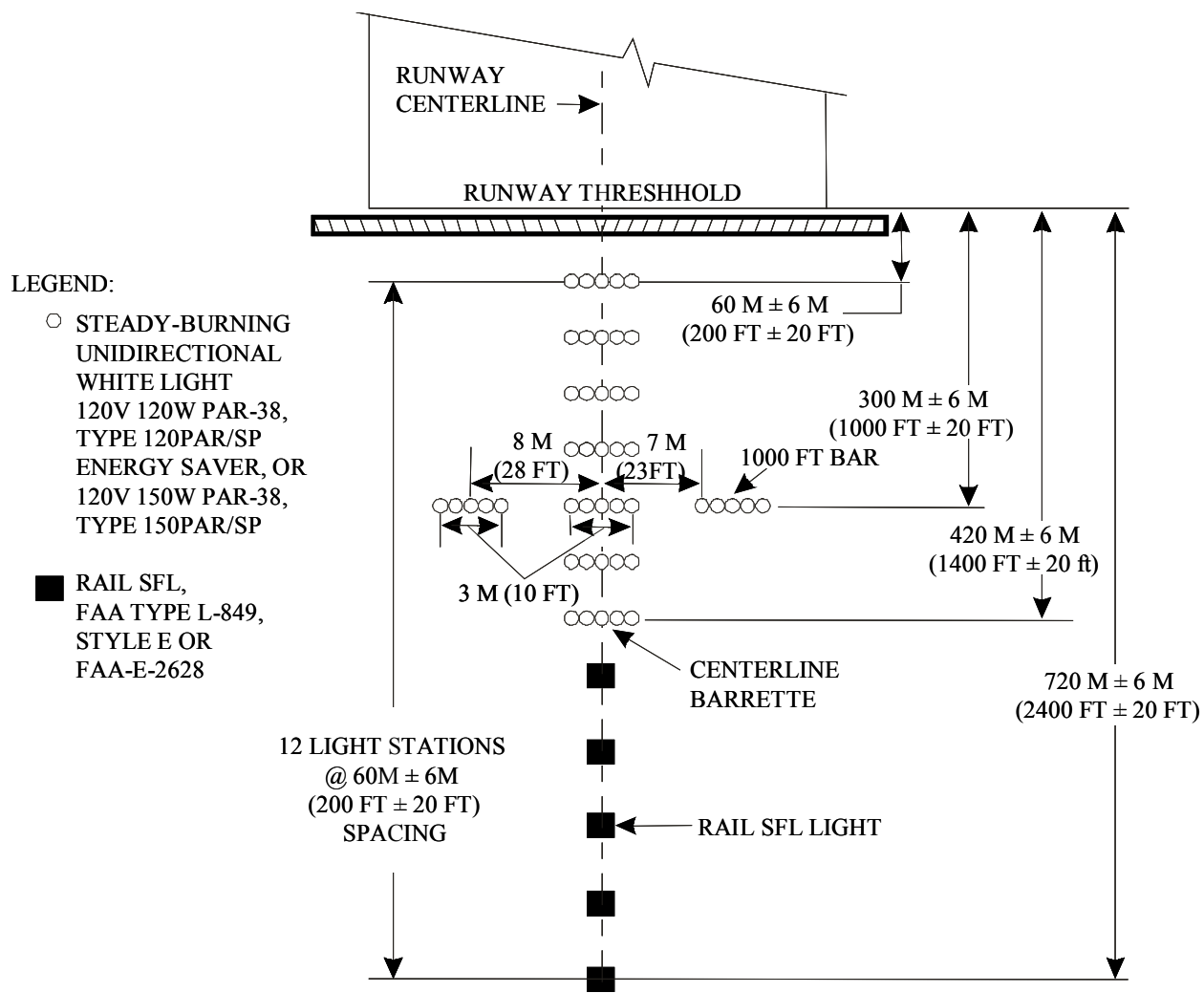


Figure 5-6. MALSR Configuration

**Table 5-12. Preventive Maintenance Schedule for MALSR (Medium Intensity Approach Light System with Runway Alignment Lights)**

| Maintenance Requirement                                 | DAILY | WEEKLY | MONTHLY | BI-MONTHLY | SEMI-ANNUALLY | ANNUALLY | UNUSUAL |
|---|-------|--------|---------|------------|---------------|----------|---------|
| 1. Check for burned-out lamps.                          | X     |        |         |            |               |          |         |
| 2. Check system operation.                              |       | X      |         |            |               |          |         |
| 3. Replace burned-out lamps.                            |       | X      |         |            |               |          |         |
| 4. Check in pavement lights for cleanliness.            |       | X      |         |            |               |          |         |
| 5. Record input and output voltages of control cabinet. |       |        | X       |            |               |          |         |
| 6. Clear any vegetation obstructing the lights.         |       |        | X       |            |               |          |         |
| 7. Check angle of elevation of lights.                  |       |        |         |            | X             |          |         |
| 8. Check structures for integrity.                      |       |        |         |            | X             |          |         |
| 9. Check approach area for new obstructions.            |       |        |         |            | X             |          |         |
| 10. Check photoelectric controls (if used).             |       |        |         |            | X             |          |         |
| 11. Check electrical distribution equipment.            |       |        |         |            |               | X        |         |
| 12. Check insulation resistance of cable.               |       |        |         |            |               | X        |         |
| 13. Check fuse holders, breakers, and contacts.         |       |        |         |            |               | X        |         |

#### 5.10.1.3 Monthly Checks.

- a. Record the input and output voltages of the control cabinet and compare with previous readings to ascertain the rate of deterioration of the system.
- b. Clear vegetation or obstructions from the front of all lights to ensure adequate visibility. Approved chemicals can be used to help control the growth of vegetation around the lights.

#### 5.10.1.4 Semi-annual Checks.

- a. Check light fixtures for alignment. The elevation angle settings of the lamps differ at each light bar station. These angles should be permanently displayed at each station to facilitate maintenance.
- b. Check structures carefully for hidden corrosion. Special attention should be paid to wood-to-wood, wood-to-steel, wood-to-earth, and steel-to-earth contacts.
- c. Check the approach area for new structures or for growth of vegetation which may violate the approach clearance criteria. A clear line-of-sight is required from any point on a plane 1/2 degree below the glide slope extending 250 feet (75 m) from each side of centerline for a distance up to 1,600 feet (500 m) in advance of the outermost lights in the system. If objects block a view of the lights and cannot be removed, refer the problem to appropriate airport authorities.

- d. If used, check and adjust the photoelectric controls. Use a photometer to verify the photoelectric control is adjusted to turn the lights on at a North sky light intensity level of 35 foot candles and turn off at 58 foot candles. If the unit is properly adjusted, the system will operate on the high brightness position on a relatively clear day from approximately 1/2 hour before sunset to 1/2 hour after sunrise. Also, check the orientation of the photoelectric cell. The cell should be oriented by aiming at the North sky at or slightly above the northern horizon. If adjustments are required, refer to the applicable manufacturer's instruction book for detailed adjustment procedures.

#### **5.10.1.5 Annual Checks.**

- a. Check pole-top-mounted or termination switches.
- b. Check all main power and control cable insulation resistance. Record reading on the insulation resistance form. Compare the current reading with previous readings to determine if cables are deteriorating.
- c. Check fuse holders, breakers, and contacts. Contacts in the control cabinet should be carefully inspected. If the contacts are badly worn, they should be replaced. Do not file or burnish contacts. Discoloration of contacts or some roughness due to normal arcing is not harmful. The contacts should be wiped to remove the dust. Blown fuses should be replaced with the correct size and type. Do not assume that the old fuse is the correct size and type.

#### **5.10.1.6 Unscheduled Maintenance.**

Consideration should be given to group changing of all PAR 38, 150-watt lamps after 1800 hours of operation on maximum brightness, recorded on an elapsed time meter.

### **5.11 Obstruction Lights.**

**Note:** Some may use the term “flashing hazard beacon” when referring to a particular obstruction light, it is the same as an L-864 obstruction lights.

#### **5.11.1 Preventive Maintenance Inspection Procedures.**

To perform the PMIs contained in Table 5-13, proceed as follows:

##### **5.11.1.1 Daily Checks.**

Verify that all obstruction lights are burning each night. Replace burned-out lamps.

##### **5.11.1.2 Monthly Checks.**

- a. For L-864 obstruction lights, count the number of flashes of the hazard beacon over a full 2-minute period. The flashing rate may range from 20 to 40 per minute; the beacon “OFF” time should be about half the “ON” time.

- b. Check the operation of the photocell or other automatic control devices.

#### **5.11.1.3 Semi-annual Checks.**

Test the insulation resistance of power cables and ground resistance of the ground system.

#### **5.11.1.4 Annual Checks.**

- a. Check the condition of the wire, insulation, splices, switches, connections, and fuses. Check the fuse size (should not be more than 120 percent of rated load). The fuse holder should be tight with clean, non-corroded contacts. Check the wiring for loose connections and the insulation for breaks or fraying. Check switches for loose, burned, or misaligned contacts.
- b. Check the lamp voltage at the obstruction light lamp socket and record the voltage. Compare the voltage with the previous reading. If the voltage reading is more than 10 percent different from the nominal value, determine the cause and correct the problem. If a booster transformer is used, check the input and output voltage levels.

**Note:** Do not attempt to disassemble LED obstruction light fixtures to measure the voltage. The majority of obstruction lights are rapidly becoming LED-based because of their long service life.

- c. Check gaskets and seals for leaks. Adequate weatherproofing is necessary for the protection of obstruction lights. All gaskets should be renewed when cracked or deteriorated. Before installing a new gasket, thoroughly clean the gasket channel to make the gasket seat properly. When it is necessary to secure the gasket with rubber cement, coat both gasket and seal with cement and permit to dry until tacky before the gasket is placed in position.
- d. Visually check the lightning-protection system. Check all connections for tightness and continuity. Check lightning arresters for cracked or broken porcelain and for missing mounting brackets. Repair as required.
- e. Check the power company meter. The meter should be checked for creeping under no-load conditions. If it is creeping with the obstruction light off, carefully check for grounds. If none are found, notify the power company to correct the problem. Check the leads for tightness and keep the meter surface clean.
- f. When the obstruction lights are mounted on disconnect hangers and are equipped with lowering devices, wire guides, and pulleys, all fittings, supports, and cables should be cleaned and lubricated. The contact surfaces of the electrical disconnect should be cleaned.
- g. The duplex obstruction lights should be serviced as described above. In addition, if a changeover relay is used, it should be cleaned and the relay housing gasket should be kept in good condition. Replace all missing cover screws to prevent water, moisture, and dust from entering the relay enclosure. Only one light in the double obstruction light is

energized when a transfer relay is used. Upon failure of the first lamp, the relay should transfer power to the second or standby lamp. The relay is mounted in the fixture base. A pilot lamp is normally provided across the standby lamp to provide a remote indication that one lamp has burned out. Check the operation of this remote lamp.

**Note:** Follow the manufacturer's instructions for LED-based duplex L-810 obstruction lights.

- h.** The L-864 obstruction light should be cleaned and reconditioned yearly or when a lamp is replaced. Follow the procedures below:

**Note:** Follow the manufacturer's instructions for LED-based L-864 obstruction lights – do not attempt disassembly or cleaning using the procedures per this section.

- (1) Clean and polish the globes and lenses using a glass cleaner or ammonia and water. Wipe the globes dry before reassembling. Remove dust and dirt from grooves. A stenciling brush or a small paint brush is especially useful for this purpose. Remove all paint spots and streaks from along the edge of glass.
- (2) Using a brush or cloth, clean the dirt and dust from fixture and open all drain holes. Check the condition of sockets. Look for burned or galled screw bases, loose connections, and frayed or broken insulation.
- (3) Check the load contactor for pitted, burned, or misaligned contacts. Ensure that the armature moves freely and that the spring tension is sufficient to pull the armature away from the coil when de-energized.

#### **5.11.1.5    Unscheduled Maintenance.**

Change the lamp when the burning time has attained 80 percent and not more than 95 percent of its rated life. Make certain that the correct lamp is installed. Allow the new lamp to burn for a few minutes to make certain that the lamp is not defective.

**Note:** Not applicable to LED-based obstruction lights.

**Table 5-13. Preventive Maintenance Inspection Schedule for Hazard Beacons and Obstruction Lights**

| Maintenance Requirement   | D<br>A<br>I<br>L<br>Y | W<br>K<br>L<br>Y | M<br>T<br>H<br>L<br>Y | B<br>I<br>M<br>H<br>Y | S<br>M<br>A<br>N<br>Y | A<br>N<br>N<br>L<br>Y | U<br>N<br>S<br>C<br>H |
|---|-----------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Check operation of lamps.                                      | X                     |                  |                       |                       |                       |                       |                       |
| 2. Check flash rate of L-864 obstruction lights.                  |                       |                  | X                     |                       |                       |                       |                       |
| 3. Check operation of photocell.                                  |                       |                  | X                     |                       |                       |                       |                       |
| 4. Check insulation resistance and ground resistance.             |                       |                  |                       |                       | X                     |                       |                       |
| 5. Check wire and connections.                                    |                       |                  |                       |                       |                       | X                     |                       |
| 6. Check voltage at lamp socket. <sup>1</sup>                     |                       |                  |                       |                       |                       | X                     |                       |
| 7. Check weatherproofing of the fixture. <sup>2</sup>             |                       |                  |                       |                       |                       | X                     |                       |
| 8. Check lightning protection system.                             |                       |                  |                       |                       |                       | X                     |                       |
| 9. Check power meter.   |                       |                  |                       |                       |                       |                       |                       |
| 10. Service lowering device and other supporting hardware.        |                       |                  |                       |                       |                       | X                     |                       |
| 11. Check changeover relay in dual fixture. <sup>1</sup>          |                       |                  |                       |                       |                       | X                     |                       |
| 12. Clean and recondition L-864 obstruction light. <sup>1</sup>   |                       |                  |                       |                       |                       | X                     |                       |
| 13. Install new lamp after 80 percent of rated life. <sup>1</sup> |                       |                  |                       |                       |                       |                       | X                     |

<sup>1</sup> Not applicable to LED lights – follow manufacturer's instructions

<sup>2</sup> For LED lights, check with manufacturer for cleaning procedures

## 5.12 Airport Lighting Control and Monitoring Systems (ALCMS).

### 5.12.1 Maintenance.

While the maintenance of computer based control and monitoring systems is beyond the scope of this document, there are basic aspects of the control system that may be addressed, particularly at the time of installation.

### 5.12.2 Maintenance Training.

When installing a new system, the control system designer should specify the number and length of training classes required for the electrical maintenance and other airport personnel (i.e. Operations). All persons who may be called upon to troubleshoot or maintain an ALCMS should be properly trained. The training material should be reviewed at a minimum once per year. Training classes for maintenance personnel should be limited to a maximum of 4-6 people per class to ensure hands-on training.

The key to successful training is the availability of well-written comprehensive manuals from the manufacturer that assume that maintenance personnel will not retain a day-to-day knowledge of key maintenance procedures. Today's control systems are fairly maintenance-free and the

maintenance person does not use their expertise on a daily basis. The maintenance manual and training should, at a minimum, include the following subjects:

- System-level block diagram and theory of operation-
- System drawing package - system sub-assembly detailed block and wiring diagrams. Include schematic diagrams if available.
- LCD touch screen operation

Overall system maintenance includes computer system housekeeping, software updates, unique site configuration/optimization requirements, and system backup/restore.

Hands-on troubleshooting:

- Procedure in transferring control from Air Traffic Controllers (ATC) to maintenance personnel and return to ATC.
- Control system power-up and power-down sequences
- Failsafe scenarios and what to do during failsafe operation
- System reporting capabilities
- Control and monitoring capabilities

### **5.12.3 Technical Support.**

It is very important that the airport maintenance people have adequate technical support from the system manufacturer. This support is not just needed during the warranty period but for the years after expiration of the warranty. It is in the best interest of the airport to always have ready access to manufacturer or site experienced back-up support available. This support should include the following:

- Technical phone assistance
- Technical support telephone line available 7 days a week, 24 hours a day, 365 days a year
- On-site technical field service as required

### **5.12.4 Maintenance Manuals.**

The ALCMS manufacturer must supply maintenance manuals that are hard-covered and suitable for the daily operation and maintenance of the system. The manuals should include:

- overall system operation using block diagrams with text,
- assembly and sub-assembly detailed block level/wiring,

- assembly and sub-assembly schematic diagrams,
- graphical user interface (GUI) commands and operation

### **5.12.5 FAA ATC Manuals.**

The airport should have copies of the ALCMS manufacturer's operation manuals that are designed for Air Traffic Controller use. The manuals should be hard-covered and suitable for daily use. At a minimum, the manuals should include overall ALCMS operation, touch screen operation, and touch screen cleaning procedures.

### **5.12.6 As-Installed Drawing Package.**

The airport should ensure that a complete set of As-Built drawings is obtained from the ALCMS manufacturer. The As-Installed drawings should reflect the final installation design of the ALCMS including System Block Diagram (1-line drawings), System External Wiring Diagrams, Assembly Drawings, and Assembly Wiring Diagrams.

## **5.13 Runway Status Lights (RWSL).**

### **5.13.1 Maintenance.**

Routine maintenance is conducted periodically because ~~since~~ properly scheduled inspections, testing, and calibrations are essential to the proper functioning of the RWSL systems. Emergency maintenance is required whenever critical components fail and render the RWSL system inoperative. Failure of an individual light fixture does not necessarily render a Runway Entrance Light (REL) or Takeoff Hold Light (THL) array inoperative. A significant number of lights of lights must fail to require shutdown as specified below.

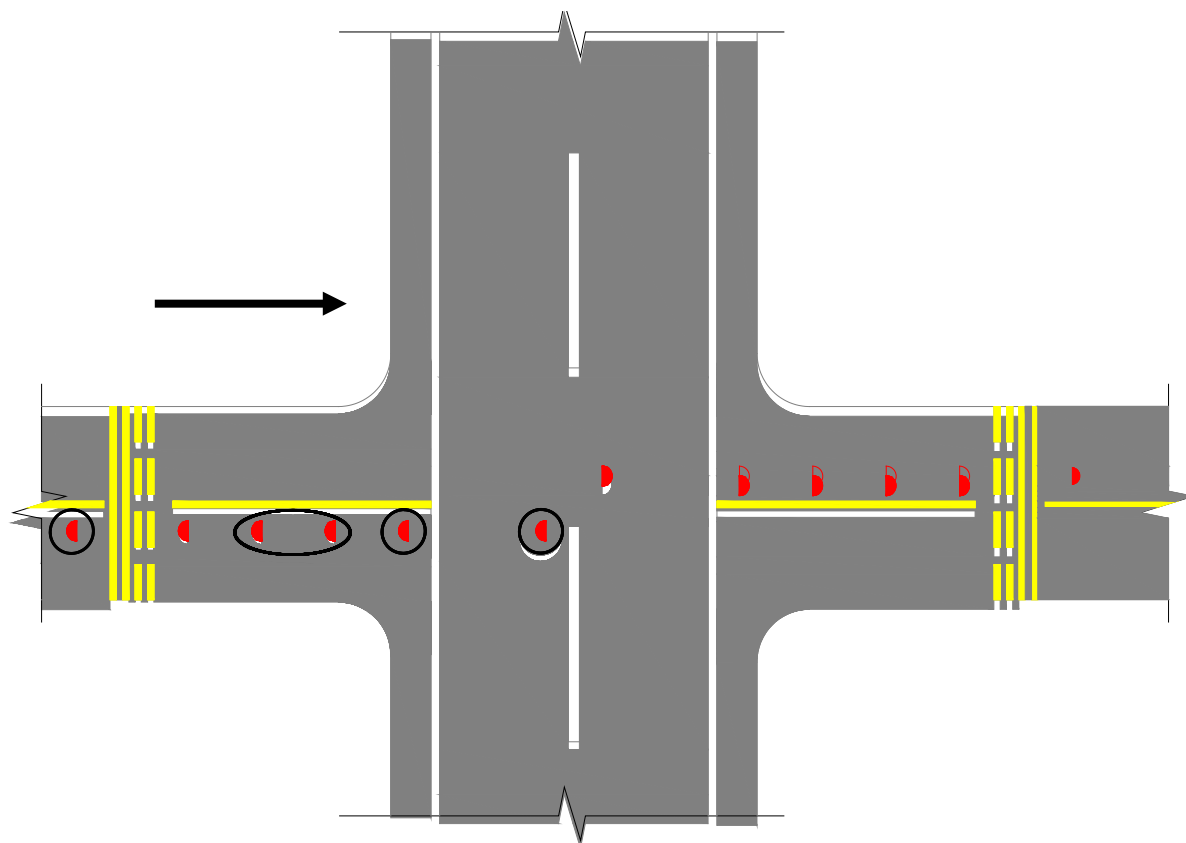
### **5.13.2 Fixture Inspection.**

Airport maintenance personnel will visually inspect REL and THL fixtures during routine inspection tours and report any damaged or malfunctioning fixtures. Arrays of REL or THL must be shut down by maintenance personnel if certain key fixtures or maximum numbers of fixtures are inoperative. ATC personnel do not have capability to shut down individual fixtures or light arrays of REL or THL.

### **5.13.3 Shutdown Criteria.**

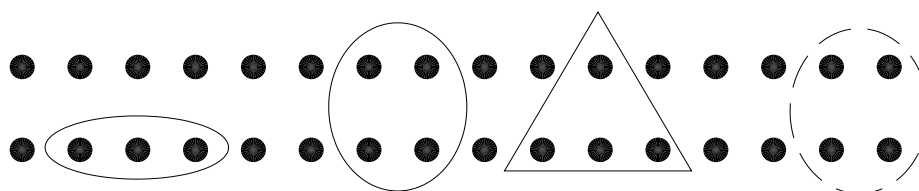
Malfunctions requiring shutdown of light arrays:

- a. A REL array must be shut down if the hold line fixture, runway edge fixture, or runway centerline fixture is not illuminating. If two adjacent fixtures of the remaining lights of an array are not illuminating, the array must be shut down. See Figure 5.7a below.
- b. A THL array must be shut down-if any three (3) consecutive, longitudinal fixtures are not illuminating. Four (4) contiguous fixtures (other than the initial ones closest to the departure end of the runway) not illuminating is also cause to shut down the THL array.



a. REL Array (enclosed by circle or oval)

← TAKEOFF DIRECTION



b. Enclosed by solid oval or triangle

**Figure 5-7. Light Fixtures Inoperative Requiring THL Shutdown**

Reference Figure 5-7b. Use the following for a guide to shutting down a THL array: the elongated, horizontal oval in the figure applies for any three lights in the figure. The nearly circular oval applies for any four lights in the array. The triangle applies for any four lights in the array.

**Note:** Exception: If the four fixtures enclosed by the dashed oval are inoperative, the THL system may remain operational because the array of lights at the beginning of the THL array will not impact the remaining ones in the array necessitating shutdown.

- c. Whenever any RWSL array is shutdown, inform Air Traffic Control of the location (associated runway or taxiway) and the expected duration of the outage. In addition, a NOTAM should be coordinated with Air Traffic.

#### **5.13.4 Maintenance Training.**

When installing a new RWSL system, the system designer should specify the number and length of training classes required for the electrical maintenance and other airport personnel (i.e. Operations). All personnel who may be called upon to troubleshoot or maintain the system should be properly trained. The training material should be reviewed at a minimum of once per year. Training classes for maintenance personnel should be limited to a maximum of 4-6 people per class to insure hands-on training. The key to successful training is the availability of well-written manuals from the manufacturer with the assumption that maintenance personnel do not retain a day-to-day knowledge of key maintenance procedures. The maintenance manual and training should, at a minimum, include the following subjects:

- System block diagram and theory of operation
- System drawing package - system assemblies and wiring diagrams
- Overall system maintenance
- Hands-on troubleshooting
- System power-up and power-down sequences
- Failure scenarios and what to do
- System reporting capabilities
- Control and monitoring capabilities

#### **5.13.5 Maintenance Manuals.**

The RWSL manufacturer should supply copies of the operation and maintenance manuals that are hard-covered and suitable for the daily operation and maintenance of the system. The manuals should include operational overview, system theory of operation, and any graphical user interface operation and commands necessary for maintenance and control of the system.

#### **5.13.6 As-Installed Drawing Package.**

The airport should ensure that a complete set of As-Installed drawings is on hand. The As-Installed drawings should reflect the final installation design of the RWSL including System Block Diagrams (1-line drawings), System External Wiring Diagrams, Assembly Drawings, and Assembly Wiring Diagrams.

#### **5.14 Standby and Emergency Power Systems.**

See AC 150/5340-30, The Design and Installation of Airport Visual Aids, for detailed information about non-FAA standby power systems.

### **5.14.1 General Engine Maintenance Notes.**

The following are some general and miscellaneous maintenance inspections for emergency generator systems. Instructions in the manufacturer's instruction manuals will always take precedence over the maintenance instructions in this AC.

### **5.14.2 Engine and Generator Mounts.**

Follow the manufacturer's instructions. If none are available, perform the following

Always check engine and generator mounting bolts and the condition of the mounting pads every 1000 hours or annually (whichever comes first) and tighten or repair as required.

### **5.14.3 Load Test.**

Start and exercise the generator set under load on a monthly basis. (per NFPA recommendations). When exercising the generator set, load should be at least 35% of nameplate rating. Operate the generator at that load or higher until coolant temperature becomes stable. This will evaporate any moisture that may have condensed in the crankcase and prevent wet-stacking.

Load test all standby generators at 100% rated load for 4 hours once each year to eliminate carbon buildup in the cylinders and as a means of indicating any potential problems with the unit. If the airport does not possess load bank equipment suitable for performing this test, contact the local supplier of the generator equipment to supply the load testing service.

### **5.14.4 Cooling System.**

- a. Change coolant system antifreeze annually; however, coolant with manufacturer recommended supplemental inhibitors may be operated up to two years or 4000 hours, whichever comes first.
- b. Inspect coolant system hoses at least every 500-600 hours for signs of deterioration and replace if necessary.
- c. Inspect the water pump drain hole for plugging every 500-600 hours and clean out if necessary.
- d. Replace the bearings in the fan hub assembly with new bearings at major engine overhaul.
- e. Check drive belts daily for prime power applications and monthly for standby applications. Adjust as required. At this time, inspect belts for splits, cracks, and glazing and replace as required.

#### **5.14.5 Turbocharger, Exhaust Connections.**

Visually inspect the mountings, intake and exhaust ducting, and connections for leaks daily. Check the oil inlet and outlet lines for leaks or restrictions to oil flow. Check for unusual noise or vibration and, if excessive, stop the engine and do not operate until the cause is determined.

Check the exhaust manifold retaining nuts, exhaust flange clamp, and other manifold connections for leakage and tighten, if necessary. Check heat-insulating exhaust system, turbocharger, and turbocharger riser blankets for damage daily. Replace torn, matted, crushed, oil-soaked, or otherwise damaged insulation blankets immediately.

#### **5.14.6 Battery.**

- a. Check the hydrometer “eye” of maintenance-free batteries for charge. If lead-acid or low maintenance batteries are used, check the specific gravity of each cell every 150 hours. This check may also be made each time a weekly inspection is made prior to starting the generator.
- b. Check more frequently in warm weather due to more rapid loss of water through evaporation. Maintain the electrolyte level according to the battery manufacturer’s recommendations, but do not overfill. Overfilling can cause poor performance or early failure. Keep the terminal side of the battery clean. When necessary, wash with a solution of baking soda and water. Rinse with fresh water. Do not allow the soda solution to enter the cells.
- c. Inspect the cables, clamps, and hold-down brackets regularly. Clean and re-apply a light coating of petroleum jelly when needed. Replace corroded or damaged parts. Keep batteries fully charged. Replace any battery that fails to hold a charge. By checking each battery cell with a hydrometer, a weak cell can be detected and the battery replaced before a failure occurs.
- d. Periodically check battery connections for corrosion and tightness. If necessary, remove connections and wire brush corrosion from terminals and cable ends. Replace damaged wiring. Replace batteries every two years to assure proper operation.

#### **5.14.7 Air Cleaners.**

- a. A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine. This in turn can result in high operating temperatures, increased fuel consumption, inefficient engine operation, and engine malfunction or damage.
- b. Replace dry type air cleaner elements, if used, with new elements after one year of service. Inspect the entire air system for leaks. Look especially for air inlet piping or boots that are loose and for loose or damaged clamps.

**5.14.8 Lubricating Oil and Filters.**

- a. Check the oil level weekly for standby or daily for prime power generator sets, with the engine stopped. If necessary, add sufficient oil to raise the level to the proper mark on the dipstick. All diesel engines are designed to use some oil, so the periodic addition of oil is normal.
- b. Lubricating oil filters should be changed whenever the engine oil is changed, normally a minimum of once a year or every 150 hours of operation for standby units. Under normal operation, note oil pressure each time the engine is started as well as during load test.

**5.14.9 Fuel Lines, Flexible Hoses.**

- a. Check hoses as part of the pre-start inspection. Examine hoses for leaks, and check all fittings, clamps, and ties carefully. Make sure that hoses are not resting on or touching shafts, coupling, heated surfaces including exhaust manifolds, any sharp edges, or other obviously hazardous areas.
- b. Because all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with age. To ensure continued proper support, inspect fasteners frequently and tighten or replace them as required.
- c. Examine leaks immediately to determine if fittings have loosened or cracked or if hoses have ruptured or worn through. Take corrective action immediately. Hoses have a finite service life. With this in mind, thoroughly inspect all hoses at least every 500 operating hours and/or annually. Look for cover damage and/or indications of twisted, worn, crimped, brittle, cracked, or leaking lines. Hoses with their outer cover worn through or with damaged metal reinforcement should be considered unfit for further service.

**5.14.10 Electrical Generator Maintenance Notes.**

- a. Dirt, heat, moisture, and vibration are common enemies of a generator. Keeping the generator clean and dry, maintaining proper alignment of the generator and its prime mover, and preventing overloads will result in efficient operation and long life.
- b. Protect generators that are outdoors from the elements by suitable houses or enclosures. Dirt and dust will conduct electricity between points of different electrical potential. Moisture will aggravate the problem further. Insulation system failure can result if corrective action is not taken. The condition of the insulation system can be tested by measuring the insulation resistance.
- c. Accumulations of dust and dirt not only contribute to insulation breakdown, but they can also increase temperature by restricting ventilation and by blocking the dissipation of heat.
- d. The presence of rodents such as mice around the generator enclosure can be a cause for premature failure. Mice have been known to enter the generator housing through a

missing or damaged screen and chew through windings causing a short circuit and failure.

#### **5.14.11 Preventive Maintenance Inspection Procedures.**

##### **5.14.11.1 Weekly Checks.**

**a.** Before starting the engine, check the following:

- Battery water level.
- Specific gravity of battery electrolyte (check all battery cells)
- Immersion heater operation
- Engine oil level.
- Governor oil level if equipped with hydraulic/mechanical governor.
- Engine generator coolant level.
- Fuel level in main storage tank.
- Battery trickle-charge current

**Note:** If necessary to add oil, water, or fuel, record amount. Do not operate diesel engines without load as it results in fouling the cylinders and injectors.

**b.** Load-test the engine generator for 1 hour. Turn on the airport lights and visual aids before beginning the test. Load on generator should be at least 35% of generator rated load.

Start the generator by one of the two methods below. Alternate the method of starting the generator on successive load tests.

- (1) Start the generator by using the remote control in the tower or other remote location. If there is no remote control, use the controls in the vault located on the emergency transfer switch.
- (2) Start the engine by simulating a power failure. This may be done by switching off incoming commercial power. This procedure should be used only after coordination with the tower, flight service station, or other authority in charge of air traffic control.
  - Record the time for engine generator to start and transfer switch to operate.

- Take a reading of the following after engine generator has operated for 15 minutes under load:

Output voltage      Phase: 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_

Output current      Phase: 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_

Output frequency \_\_\_\_\_

Engine oil pressure \_\_\_\_\_

Coolant temperature \_\_\_\_\_

- Check room ventilation louvers for freedom of operation and manual and automatic operation of fan.
- For starting method (1), reset control switch from “run” to “automatic.” After the set time delay, normally 15 minutes, the transfer switch should operate and transfer the load back to commercial power. Check time for load transfer and check time for engine to shut down after programmed engine “cool down” cycle, normally 5 minutes.
- For starting method (2), turn the commercial power back on, and measure the delay from the resumption of commercial power until transfer of load to commercial power. Then measure the delay from load transfer until shutoff of the engine.

(3) Clean the engine generator set, its accessories, control compartments, and do necessary housekeeping of the immediate area.

#### **5.14.11.2 Quarterly Checks and Annual Checks.**

- a. Perform checks and record readings same as those noted on weekly checks.
- b. In addition to the weekly checks, perform the checks listed in Table 5-14.

#### **5.14.11.3 Bi-annual Checks.**

- a. Perform all checks covered in Table 5-14.
- b. Drain and flush engine-cooling system after operating the engine under load for 1 hour.
- c. Remove covers and inspect generator bearings for wear and condition of lubrication.
- d. Replace batteries.

**Table 5-14. Quarterly and Annual Preventive Maintenance Checklist for Standby Generator Sets**

|   | <b>Quarterly</b> | <b>Annually</b> |
|---|------------------|-----------------|
| <b>Engine – Lubricating System</b>                                    |                  |                 |
| 1. Check for leaks  | X                | X               |
| 2. Check engine oil level and pressure                                | X                | X               |
| 3. Check hydraulic/mechanical governor oil level                      | X                | X               |
| 4. Change engine oil and filters every 150 hours of operation or      |                  | X               |
| 5. Change hydraulic/mechanical governor oil                           |                  | X               |
| <b>Engine – Cooling System</b>  |                  |                 |
| 1. Check for leaks  | X                | X               |
| 2. Check radiator for air restriction                                 | X                | X               |
| 3. Check operation of coolant heater                                  | X                | X               |
| 4. Check hoses and connections  | X                | X               |
| 5. Check coolant level and temperature                                | X                | X               |
| 6. Check belt condition and tension                                   | X                | X               |
| 7. Check heat exchanger corrosive water treatment plugs (if equipped) | X                | X               |
| 8. Check motor operated louvers                                       | X                | X               |
| 9. Check radiator duct work and fan shroud                            | X                | X               |
| 10. Check antifreeze and additive concentration                       |                  | X               |
| 11. Check fan hub, drive pulley and water pump                        |                  | X               |
| 12. Change coolant filter (if equipped)                               |                  | X               |
| 13. Check thermostat and radiator cap                                 |                  | X               |
| <b>Engine – Air Intake System</b>                                     |                  |                 |
| 1. Check for leaks  | X                | X               |
| 2. Check air cleaner restriction                                      | X                | X               |
| 3. Check all piping connections                                       | X                | X               |
| 4. Clean air cleaner element and housing                              | X                |                 |
| 5. Change air filter element  |                  | X               |
| 6. Clean crankcase breather element                                   |                  | X               |
| <b>Engine – Fuel System</b>   |                  |                 |
| 1. Check for leaks  | X                | X               |
| 2. Check governor control linkage                                     | X                | X               |
| 3. Check fuel lines and connections                                   | X                | X               |
| 4. Drain sediment from day tank                                       | X                | X               |
| 5. Drain water separators   | X                | X               |
| 6. Check day tank fuel level  |                  | X               |
| 7. Check fuel transfer pump   |                  | X               |
| 8. Check diesel engine primer pump                                    |                  | X               |
| 9. Change fuel filters  |                  | X               |
| 10. Change day tank supply filter (or clean)                          |                  | X               |

|   | Quarterly | Annually |
|---|-----------|----------|
| 11. Change water separator filter (if equipped)           |           | X        |
| 12. Check float tank breather element (if equipped)       |           | X        |
| 13. Check fuel tanks for contamination                    |           | X        |
| <b>Engine – Exhaust System</b>                            |           |          |
| 1. Check for leaks  | X         | X        |
| 2. Check exhaust restriction                              | X         | X        |
| 3. Drain exhaust condensation trap (if equipped)          | X         | X        |
| 4. Torque exhaust manifold and turbocharger cap screws    |           | X        |
| 5. Torque exhaust flange bolts                            |           | X        |
| <b>Electrical System</b>                                  |           |          |
| 1. Check battery – charging system                        | X         | X        |
| 2. Check battery – electrolyte level                      | X         | X        |
| 3. Check engine safety controls, alarms and wiring        | X         | X        |
| 4. Check battery connections and terminals                | X         | X        |
| 5. Check engine starting motor cranking current           |           | X        |
| <b>Engine Related Systems</b>                             |           |          |
| 1. Check for vibration and metal cracks                   | X         | X        |
| 2. Check engine mounting hardware and tighten             |           | X        |
| 3. Check fuel injector pump and injector timing           |           | X        |
| 4. Check engine for dirt/debris and clean vent screens    |           | X        |
| 5. Grease fan pillow block bearing (if equipped)          |           | X        |
| <b>Main Generator</b>                                     |           |          |
| 1. Check air inlet and outlet restrictions                | X         | X        |
| 2. Grease generator bearing (if equipped)                 |           | X        |
| 3. Clean generator per manufacturer's instructions        |           | X        |
| 4. Perform 4 hour full load test                          |           | X        |
| <b>Switchgear</b>   |           |          |
| 1. Check operation of transfer switch and timing relays   | X         | X        |
| 2. Inspect transfer switch contacts for pitting or arcing | X         | X        |

## 5.15 Omnidirectional Approach Lighting System (ODALS).

### 5.15.1 Preventive Maintenance Inspection Procedures.

To perform the PMIs in table 5-15, proceed as follows:

#### 5.15.1.1 Monthly Checks.

Make visual operational checks of all lights, on all brightness steps.

#### 5.15.1.2 Quarterly Checks.

- a. Check remote control functions.

- b. Record meter readings.
- c. Visually check for damaged or misaligned lights, mirrors (if installed), or baffles (if installed).
- d. Check for approach line-of-sight clearance for the intrusion of vegetation or other new obstructions.

#### **5.15.1.3 Semiannual Checks.**

Check all fixtures, including mirrors if installed, for proper alignment and elevation.

#### **5.15.1.4 Annual Checks.**

- a. Check for the cleanliness and condition of all glassware and reflectors.
- b. Check all structures for signs of rot or corrosion. Check all light supports for rigidity and obvious misalignment.
- c. Inspect and clean, if required, the interior of all cabinet-mounted flashing units. Check the condition of the door gaskets and replace if necessary.
- d. Check safety devices, ground connections, lightning arrestors, and the overall safety condition of power distribution equipment at terminal poles, light supports, and substation pads.

#### **5.15.1.5 Every Three Years.**

Check the conductor and insulation resistance of all power and control cables. Record all measurements and compare them with previous readings for signs of degradation.

#### **5.15.1.6 As Required.**

Change all ODALS strobe lamps after they operate 500 hours at maximum brightness.

### **5.15.2 Maintenance Procedures.**

#### **5.15.2.1 Visual Checks.**

Observe system operation on all brightness steps. Log strobe lamp failures and note the flashing (or strobe) rates. Ensure that the flashing rate is consistent with the manufacturer's instruction book (supplied with the units), or 60 flashes per minute (10% tolerance). Verify that all strobe lamps are operating and the controls operate per function.

### **5.15.2.2 Alignment Vertical and Horizontal.**

Check the manufacturer's instruction book (supplied with the units) for the procedure used to perform an overall system alignment.

### **5.15.2.3 Operational Checks.**

- a. Request local control of the ODALS system.
- b. With the ODALS under local control, rotate the local control switch in the control unit from OFF to LOW, OFF to MEDIUM, OFF to HIGH. The selected intensity level of the strobe lights should be reached within 1.5 seconds.
- c. With the ODALS operating at low intensity, rotate the control switch to MEDIUM and then to HIGH. The intended intensity level of the strobe lights should be reached within 1.5 seconds.
- d. Observe the ODALS operation. All strobe lights should be at the selected intensity level and should operate sequentially from the outermost strobe light. The cycle should repeat once per second.
- e. Request ODALS operation in the remote (auto) mode. Observe the ODALS operation and verify operation as specified in steps (b), (c), and (d) above.
- f. At the switch assembly cabinet, turn the lights on with low intensity by depressing ground-to-ground (G/G) and ODALS 1.
- g. Change the lights to medium intensity by depressing ODALS 2.
- h. Change the lights to high intensity by depressing ODALS 3.
- i. Turn the lights off by depressing ODALS OFF.
- j. Put the lights in air-to-ground mode by depressing A/G.
- k. Using a transmitter located at least a mile away, turn the lights on low intensity by keying the transmitter three times (transmitting three bursts of carrier energy) within a 5-second period of time.
- l. Change the lights to medium intensity by keying the transmitter five times within a 5-second period.
- m. Change the lights to high intensity by keying the transmitter five times within a 5-second period.
- n. Let the system time-out and the lights turn off by leaving it in the A/G mode. This should take approximately 15 minutes.

- o.** Place the system in ground-to-ground mode by depressing G/G. If the system has an interface unit attached, the lights will come on in high intensity. Otherwise the system will stay turned off.
- p.** If the lights are off, turn them on with high intensity by depressing ODALS 3.
- q.** Change the lights to medium intensity by depressing ODALS 2.
- r.** Change the lights to low intensity by depressing G/G and ODALS 1.
- s.** Turn the lights off by depressing ODALS OFF.
- t.** This concludes the check.
- u.** Return the system to normal operation.

#### **5.15.2.4 Meter Reading.**

Using portable instruments measure and record the normal operating parameters listed in the manufacturer's instruction book. Record the readings on the maintenance log.

#### **5.15.2.5 Lamp Replacement.**

Replace all flash tubes after 500 hours of operation on high brightness per manufacturer's instruction book.

**Table 5-15. Preventive Maintenance Schedule for ODALS (Omni directional Approach Light System)**

| <b>Maintenance Requirements</b>  | <b>M<br/>T<br/>H<br/>L<br/>Y</b> | <b>Q<br/>T<br/>R<br/>L<br/>Y</b> | <b>S<br/>M<br/>A<br/>N<br/>Y</b> | <b>A<br/>N<br/>N<br/>L<br/>Y</b> | <b>T<br/>R<br/>I<br/>E<br/>N<br/>N<br/>L</b> | <b>A<br/>S<br/>R<br/>E<br/>Q<br/>D</b> |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--|--|
| 1. Make visual operational checks of all lights on all brightness steps.   | X                                |                                  |                                  |                                  |  |  |
| 2. Check remote control functions.   |                                  | X                                |                                  |                                  |  |  |
| 3. Record meter reading.   |                                  | X                                |                                  |                                  |  |  |
| 4. Visually check for misaligned lights or mirrors.  |                                  | X                                |                                  |                                  |  |  |
| 5. Check for approach line-of-sight clearance for the intrusion vegetation and other obstructions.   |                                  | X                                |                                  |                                  |  |  |
| 6. Check all fixtures, including mirrors if installed, for alignment and elevation   |                                  |                                  | X                                |                                  |  |  |
| 7. Check for cleanliness and condition of all glassware and reflectors.  |                                  |                                  |                                  | X                                |  |  |
| 8. Check all structures for rot or corrosion. Check all light supports for rigidity, guy tensions, and obvious misalignment.   |                                  |                                  |                                  | X                                |  |  |
| 9. Inspect and clean, if required, interior of all cabinet mounted flashing units.   |                                  |                                  |                                  | X                                |  |  |
| 10. Check safety devices, ground connections, lightning arrestors, and safety conditions of power distribution equipment at terminal poles, light supports, and substation Pads. |                                  |                                  |                                  | X                                |  |  |
| 11. Check conductor and insulation resistance of all power and control cables. Record all measurements and compare them with previous readings.                                  |                                  |                                  |                                  |                                  | X  |  |
| 12. Change all ODAL lamps after 500 hours of maximum brightness.   |                                  |                                  |                                  |                                  |  | X                                      |

## **Chapter 6. Troubleshooting Procedures for Series Lighting Circuits.**

### **6.0 Initial Fault Investigation – Safety.**

- a.** Troubleshooting tests contained in this chapter may involve voltages that are dangerous. Safety precautions must be exercised for the protection of personnel and property (see paragraph 2.3, Electrical Hazards of Series Lighting Circuits).
- b.** Personnel performing the testing and troubleshooting procedures must be experienced in high-voltage techniques and must be adequately supervised. All maintenance personnel should be thoroughly trained in emergency procedures for treatment of electrical shock.
- c.** Series circuits are subject to two primary types of malfunctions: shorts to ground or opens.
  - (1) Keep in mind that an airfield lighting series circuit powered by a constant current regulator is an ungrounded circuit. Therefore, the circuit and CCR will function normally with one ground on the circuit.
  - (2) It is only when two or more grounds appear and a “short circuit” path is created that the current begins to flow through the earth, around the lighting load, and a section of lights appears out. In the case of an open in the primary field circuit, no current can flow and the entire circuit goes out.
- d.** Constant current regulators larger than 10kW are required to have open circuit protection that will shut the CCR down within two seconds after current flow has been interrupted. Most manufacturers, however, provide this protection on all their CCRs. When in doubt, check your CCR’s operating manual. Open circuits can exist in conjunction with grounds and if the CCR can develop enough voltage to overcome whatever resistance exists in the circuit, it will establish current flow and continue operating.
- e.** In most instances, we learn of a malfunctioning lighting circuit from a report made by the control tower or through an operations report. Sometimes it is noticed by an electrician making a routine daily runway inspection or light check. Either way, the complaint may consist of a section of lights out or an entire circuit not functioning.
  - (1) The first step in an initial fault investigation is to make a quick visual inspection of the affected lighting on the airfield. This will provide information as to whether an entire circuit is out or just a portion of the lighting on a specific circuit is affected. This gives an electrician a good idea as to the possible cause of the malfunction.
  - (2) If an entire circuit is out, the problem could be an open circuit in the field wiring or a malfunctioning CCR. If only a portion of the lights on a circuit is out, the problem is most likely due to a short to ground at each end of the affected section. Keep in mind that if the malfunction is due to a short to ground in the field circuit,

the longer the circuit remains energized, the more damage will result at the location of the ground faults due to arcing.

- f. In the vault, once the exact malfunctioning circuit has been determined, the regulator supplying the circuit can be located. Turn the regulator local control to the “OFF” position and shut down and lock out the power supply to the regulator. If a standard Style S1 cutout is present, disconnect the S1 and separate the blades of the cutout switch on the field side of the switch. This will allow you to check both the continuity and insulation resistance in the field circuit. After separating the ends of the field circuit by either separating the blades of the S1 or disconnecting at least one end of the field circuit from the regulator, prepare to take a measurement for continuity in the circuit.
- g. If using a volt-ohm-meter (VOM), the first step is to set the meter to the  $R \times 1$  scale and “zero” the meter (if using a digital multimeter, these steps are not necessary). This is accomplished by setting the meter to the desired scale ( $R \times 1$  in this case) and touching the two meter leads together. Make sure the leads are plugged into the correct sockets in the meter (on most VOMs, this is the + and common sockets) and adjust the “zero ohms” knob until the meter needle is at the zero point (usually on the right side of the meter scale). After this adjustment has been made, take a reading of the resistance in the field circuit by checking between the two separated conductors of the field circuit. If no continuity can be read in the circuit, check for a short to ground in each side of the circuit and then proceed to paragraph 6.2, Locating Open Circuit Faults. If the circuit shows continuity (a measurable amount of resistance) normally between 20 to 70 ohms, the circuit is not open. If a much higher resistance is measured (1000 ohms +), then a high resistance open circuit fault has occurred. Many times this is indicative of a transformer with a faulty primary winding that has not completely burned open yet. It could also be due to a cut cable which has both ends in contact with the earth.
- h. If the resistance in the circuit checks normal, proceed to check the resistance to ground from each end of the circuit to ground. If any resistance can be read to ground with the meter set at  $R \times 1$ , then one or more low resistance shorts to ground exist and troubleshooting procedures are moved to the field (see paragraph 6.1). If the meter reads no continuity (no meter movement) when the circuit is checked to ground, set the meter for the  $R \times 100$  and  $R \times 10,000$  scales respectively and, after zeroing the meter, check for a short to ground on these two scales. Remember that the positive (red) lead should always be connected to the circuit or conductor under test and the negative (black) lead should be connected to ground. Also be aware that on the  $R \times 10,000$  scale, merely touching the meter leads with your fingers will produce a reading. Most ground faults serious enough to cause the lights to go out will be reading less than 1000 ohms to ground, usually less than 100 ohms to ground and will be easily indicated on the  $R \times 1$  scale. If no ground fault is detected on the circuit with the VOM or DMM, use an insulation resistance tester to test the circuit. Insulation resistance testers operate at much higher voltages, 500 to 5000 volts, and are more useful in locating a high resistance ground fault.
- i. If no problems are detected in the field circuit, the next step is to try to energize the CCR using the manual control on the front of the CCR. After reconnecting the field circuit to

the CCR, or reinstalling the S1 and turning the primary power back on to the regulator, begin by putting the switch in the step 1 position and note if the CCR comes on. If it does not, the problem may be as simple as a tripped breaker or blown fuse and you should proceed to check for proper input voltage to the CCR. If the CCR energizes for about 2 seconds and then shuts off, the fault is likely a malfunction of the open circuit or over current protection circuitry in the CCR. If the field circuit appears normal, disconnect and lock out the primary power source to the CCR and perform a short circuit test by shorting the output of the regulator with a #10 or larger wire, and test the operation of the regulator again. If the regulator still shuts off after a few seconds, there is an internal problem with the regulator or its controls. Consult the operation and maintenance manual for the CCR for specific troubleshooting instructions.

- j. If the CCR remains on and appears to be operating normally on the lowest brightness setting, continue switching the CCR up through the brightness steps while noting the increase in current output on the meter until the maximum brightness is reached, either step 3 or step 5 depending on the style of the regulator. If the regulator has a normal output on the lower steps, but the output is low on the highest step, the regulator may be overloaded or there may be too much inductance in the field circuit.
- k. Perform a short circuit test of the regulator by turning the regulator off and disconnecting and locking out the primary power to the regulator. Then connect a #10 wire across the output and re-energize the regulator. If the regulator operates normally with the output shorted, this would indicate an overload is present in the field circuit. If there have been no additional loads added to the field circuit, check for burnt out lamps or otherwise open secondary connections on the field transformers. Newer regulators are required to withstand up to 30% open-circuited isolation transformers. Older regulators may only tolerate 10%. When a large number of open-circuited transformers exist on the output of a regulator, it increases the inductive loading on the regulator and will cause the regulator to act strangely and many times appear overloaded. One cause of this condition may be a lightning strike that has blown out a large number of lamps in the circuit.

## **6.1 Locating Ground Faults in the Field.**

- a. Once it has been established that the circuit is shorted to ground, the troubleshooting procedures can be moved to the field. Keep in mind that if there is a section of lights out on the circuit, there will ALWAYS be at least two shorts or ground faults in the circuit.
  - (1) At this time the circuit may be energized and a visual inspection can be made to try to locate the faults. If the circuit is a simple loop configuration, a visual inspection can sometimes be an effective means to find the problem.
  - (2) It is best to have someone at the vault with a radio so that as soon as the good to bad transition areas in the circuit are located, word can be sent to the vault to shut off the regulator and lock it out so that repairs can be made.
  - (3) Drive the circuit looking for any section of lights that are out or appear to be extremely dim and mark this area by putting a surveyor's flag or a paint mark at the

locations of the last light burning and the first light out as shown in Figure 6-2. After the circuit has been de-energized and locked-out, check the lights at each end of these “transition areas” for burned transformers, connectors, etc.

- (4) Always remember that there will be at least two shorts in the circuit and both must be repaired. In some instances, especially in the case of direct buried cables or when the circuit has been energized for a long period of time while ground faults are present, more than two shorts to ground may have occurred.
- b. The best method for finding ground faults after the initial visual inspection has been made is to locate them using the VOM. Leave the ends of the circuit separated at the vault and suspend the ends of the cables in free air if disconnected from the S1 or other connection. Refer to as-built plans if available to locate the center of the circuit and break the circuit at that point by disconnecting the cable at one side of the transformer. (See Figures 6-3a and 6-3b). Take a reading to ground in both directions from this point and determine which way the fault is located. It is entirely possible that the meter may indicate a fault in both directions from this point or only in one direction as there may be two or more faults in the same section of cable. Leaving this connection open (if possible), proceed to a point in the circuit approximately halfway between the midpoint and the vault in the direction of the fault and break the circuit again. As before, take a reading on the circuit in each direction to determine the location of the fault. Continue until each fault is located and corrected.
- c. During the course of troubleshooting, you may find that when you remove a transformer from the can or the ground that the fault seems to disappear. When this happens the fault is located at that transformer; normally you can visually see the burned transformer. However, in the case of an internal primary to secondary short in the transformer, there may not be anything readily apparent. Look at the fixture attached to the transformer and check to see if the socket or secondary plug is burned. This is usually a good sign of a primary to secondary short. A short of this nature can be confirmed by touching one lead of the VOM to one of the primary leads of the transformer and touching the other to one of the sockets on the secondary connector. If the transformer is shorted, continuity will be indicated on the meter. Sometimes checking between one of the primary connectors and the outside body of the transformer will indicate a transformer with a significant leak to ground. This can be performed with an insulation resistance tester for better results. If checking the insulation integrity of transformers, you can also submerge the transformer in a bucket of water and connect the positive lead of the Megger to one of the primary leads and the negative lead to a bare wire dropped into the bucket. If any leakage is shown, the transformer is suspect or bad depending on the reading. Reasonably new transformers should read over 1000 megohms, with readings decreasing with age.

## **6.2 Locating Open Circuit Faults.**

Open circuits can be successfully located using similar tactics as those used for locating short circuits or ground faults. If the circuit appears to be grounded in conjunction with an open, the troubleshooting procedure used for finding ground faults may be used because the open and ground will likely be located at the same place. Many times a cable will burn in two if left

operating after a short to ground has developed. If the initial fault investigation has revealed an open in the field circuit and the circuit does not appear to be grounded, de-energize the regulator and lock out the regulator power supply and proceed to the field and locate the approximate center of the circuit.

**TIP:** Any time an open circuit is indicated, the first question to ask is: “Has anyone been doing any excavating in the vicinity of the airfield?” If so, go out and look for a pile of fresh dirt and you will likely find your problem.

For this type of troubleshooting where you are looking for continuity, it is helpful to have the ends of the circuit connected together at the vault via the S1 cutout or some other means --- see Figure 6-5. That way, when the problem is corrected, it can be verified by being able to read a loop from any point in the circuit. Proceed to the approximate midpoint of the circuit and disconnect the circuit at the transformer and ground the circuit in both directions. Check for continuity to ground at another point in the circuit by disconnecting the transformer. If the circuit is connected together at the vault and you have only one open in the circuit, you should read continuity in one direction but not the other back to the grounded midpoint of the circuit. When the grounded conductor is identified, have someone at the midpoint connection make and break the connection to ground in one direction and then the other until you have established which section of the circuit is open. Then proceed to a point halfway between your present location and the grounded midpoint in the section of the cable that is open and take another reading. If this time you can read to ground in the direction of the midpoint of the circuit, then you know that the open is behind you or between you and the last point you tested. By moving the intentional ground point and looking for continuity in each section of the circuit, the open(s) can be quickly located. See Figure 6-5 for details.

### 6.3 Interconnected Circuit Faults.

It is common for airfields with multiple circuits to experience interconnecting faults. There are two main types of interconnecting faults. The first occurs when two or more circuits contain grounds and/or opens in a manner that electrically connects the circuits together. The second type occurs when two or more circuits do not contain any faults, but they become capacitively coupled together.

When multiple circuits contain faults that connect them together, a section of primary cable is common to all circuits involved. (See Figures 6-6 and 6-7.) Multiple ground faults are the most common cause of this problem. A continuity check between the suspected circuits will confirm if they are electrically connected. To troubleshoot this condition, disconnect and isolate the output leads of regulator “B,” then locate the circuit fault on regulator “A” circuit. This will usually locate the common fault area of both circuits.

A capacitive coupling fault occurs when two or more series circuits run parallel and in close proximity to each other. This situation becomes a problem if the circuits have monitors on them because the induced currents can simulate field faults. A continuity check between the suspect circuits confirms they are not electrically connected together. To correct a capacitive coupling fault, simply swap the output leads of one of the regulators involved. This will cancel the capacitive coupling effect.

**WARNING:**

**The troubleshooting methods and procedures outlined in the following paragraphs involve dangerous voltages and should only be attempted by qualified personnel using appropriate safety procedures. Also, while sometimes helpful or necessary, be aware that these methods are by their nature “destructive testing” and if performed indiscriminately can result in more damage occurring in the field circuit.**

The following troubleshooting methods are best described as “destructive testing.” These methods can be used when either time constraints or difficulty testing using an ohm meter or insulation resistance tester makes traditional troubleshooting impractical. One such instance might be in the case of direct buried circuits where traditional troubleshooting is difficult and time consuming due to having to dig up each connection to perform testing. Another case when this type of troubleshooting might be considered is when a runway circuit is out of service, and time is of the essence due to disrupting air traffic operations at your facility. These methods do require that the circuit have a significantly low resistance to ground at the point of the fault, preferably less than 1000 ohms to ground, the less the better. It should also be noted that small regulators (10kW or less) may not develop sufficient voltage to be effective.

**6.4 Intentional Ground Test.**

**6.4.1** The Intentional Ground Test is another method used to find a single ground fault. (See Figures 6-8a and 6-8b.) If an insulation resistance test indicates a ground in the circuit, but a visual inspection is inconclusive, this test method will help locate the problem.

First, shut off and lock out the regulator. Next, label the two regulator output leads “1” and “2.” Connect a 45-watt isolation transformer and light fixture between regulator output “1” and ground as shown in Figure 6-8a. The ground resistance of the test connection must be very small. Next, energize the regulator. Keep away from the test setup. If the test lamp illuminates, there is at least one ground fault on the circuit. The brighter the test lamp glows, the lower the resistance of the ground fault(s). With the regulator energized, conduct a visual inspection of the circuit.

**6.4.2** If there is a section of dim or out light fixtures, a ground fault exists between the last light operating properly and the first dim or out light. Mark this area.

**6.4.3** If all the lights are dim or out, the ground fault is between output “2” and the first light fixture on that side of the circuit.

**6.4.4** If all the lights appear to be OK, the ground fault is between output “1” and the first light fixture on that side of the circuit.

**6.4.5** De-energize and lock out the regulator. Switch the test transformer/light assembly from output “1” to output “2” (See Figure 6-8b). Energize the regulator. The test lamp should illuminate. Conduct a visual inspection of the circuit.

**6.4.6** If there is a section of dim or out light fixtures, and the location of the “good to bad” lights is in the same spot as marked in paragraph 6.4.2, the circuit has a single ground fault at

that location. (The transition area is the same, but the lights that were on in paragraph 6.4.2 should now be off, and the lights that were off in paragraph 6.4.2 should now be on.) De-energize and lock out the regulator. Check the connector kits, cable splices, etc., between the two adjacent light fixtures of the marked area and repair or replace suspected faults as necessary. At this point a VOM or insulation resistance tester may be used to verify faulty transformers, etc. Once the single ground fault is cleared, the test lamp will not illuminate when the regulator is energized. Remember, stay away from the primary cable while the regulator is on.

**6.4.7** If there is a section of dim or out light fixtures and the location of the “good to bad” lights is not in the same spot as marked in paragraph 6.4.2, there are at least two ground faults on the circuit. Mark this new transition area. De-energize and lock out the regulator. Check the connector kits, cable, transformer, etc., between the two adjacent light fixtures of the newly marked area and repair or replace suspected faults as necessary. As each fault is cleared, energize the regulator and perform a visual inspection of the circuit. Keep away from the energized primary cable and always lock out the regulator when handling the cable. The “good to bad” transition area should move toward the spot marked in paragraph 6.4.2. Continue troubleshooting the faults in this manner until the last ground is repaired and the test lamp does not illuminate when the regulator is energized.

**6.4.8** If all the lights appear to be operating correctly, the ground is between output “2” and the first light on that side of the circuit. (The same as found in paragraph 6.4.3.) De-energize and lock out the regulator. Work from the light fixture towards output “2.” Check the cable, connector kits, splices, etc., and repair or replace suspected faults as necessary. The ground fault has been fixed when the test lamp does not illuminate when the regulator is energized.

**6.4.9** If all the lights are dim or out, the ground fault is between output “1” and the first light fixture on that side of the circuit (the same as found in paragraph 6.4.4). De-energize and lock out the regulator. Work from the light fixture towards output “1.” Check the cable, connector kits, splices, etc., and repair or replace suspected faults as necessary. The ground fault has been fixed when the light fixtures operate properly and the test lamp does not illuminate when the regulator is energized. Remove the fault marker(s) from the field.

**6.4.10** If a Megger is not available, the intentional ground test can be modified to become a valuable preventive maintenance tool. (See Figure 6-9.) Connect the transformer/light assembly to the regulator output through an S-1 cutout, as shown in Figure 6-9. When the S-1 handle is removed, the intentional ground is connected to the circuit. Once a month, shut off the regulator and pull the S-1 handle out. Energize the regulator to the high step and observe the test lamp. If the circuit has developed a ground fault, the lamp will illuminate. The lower the resistance of the fault, the brighter the lamp will glow. The main advantage of performing this check regularly is that a single ground fault can be detected and located easily, before multiple faults affect the visual appearance of the circuit. The general rule of thumb is, if the test lamp glows, the ground needs to be located and repaired. Add this procedure to your preventive maintenance routine and you will always stay one step ahead of grounding troubles.

## **6.5 Grounded Output Test for Locating Open Circuits.**

**6.5.1** The grounded output test is similar to the intentional ground test used to locate ground faults (paragraph 6.4). In order for this test to work, the open fault needs to be grounded. (See Figure 6-10.) If the open is not grounded or the ground resistance of the fault is too great, this method may only work with large kW rated regulators. Make sure the regulator is off. Refer to Figure 6-10a and b. Mark the regulator leads “1” and “2.” Remove lead “1” from the regulator. Cap or tape the bare end of lead “1.” Make sure it does not touch anything, and stay away from it when the regulator is energized. Next, connect the regulator output terminal, from which “1” was removed, to earth ground. Once again, the ground resistance of this connection must be as low as possible. Energize the regulator to the highest step. Stay away from the test connection to ground.

**6.5.2** If the regulator trips off on open circuit protection, do not attempt to energize the regulator a second time. Either the regulator is too small or the ground resistance of the fault is too large. In most cases, 4 and 7.5 kW regulators do not have enough power to drive a grounded output test that has any ground resistance at the fault location. Ideally, the best regulator to use would be a 30kW for 6.6 amp circuits, and a 70 kW for 20 amp circuits. If possible, connect the circuit to the largest regulator in the vault and try again. If the circuit cannot be turned on, troubleshoot the open fault with the ohm meter/megohm test. (See paragraph 6.2.)

**6.5.3** If the regulator stays on and is registering output current, the open circuit fault can be found using the grounded output test. It is common for the regulator output current to fluctuate with this test set up. This condition will not damage the regulator, but continue to operate the regulator only long enough to locate the fault. Once the fault is cleared, the regulator should return to normal operation. With the regulator energized, conduct a visual inspection of the field circuit. There should be a section of lighted fixtures and a section of out fixtures. Mark the “good to bad” transition area. The open fault will be between the last light fixture operating and the first non-illuminated fixture. If all the lights are on, the open is between output “1” and the first fixture on that side of the circuit. If all the lights are out, the open is between output “2” and the first fixture on that side of the circuit. De-energize and lock out the regulator.

**6.5.4** Remove the ground connection from the regulator output terminal. Reconnect lead “1” to the regulator output terminal. Next, remove lead “2” from the regulator. Cap or tape the bare end of lead “2,” making sure it does not touch anything and stay away from it when the regulator is energized. Next, connect the regulator output terminal from which “2” was removed, to earth ground. Energize the regulator to the highest step. Stay away from the test connection to ground. Conduct a visual inspection of the field circuit. This time the fixtures that were on in the last test should be out and the fixtures that were out in the last test should be on. The visual appearance of the circuit now should be the exact opposite of paragraph 6.5.3 with the “good to bad” transition area in the same location. If this is true, the open is between the two light fixtures adjacent to the fault marker. De-energize and lock out the regulator. Start at one light fixture and work toward the other checking isolation transformer windings, connections, splices, and the primary cable for opens. Repair or replace any defects as necessary. To verify the open fault has been corrected, measure the resistance across output “1” and “2” with an ohmmeter. If the resistance is less than 700 ohms, the circuit is free of all opens. Anything over 700 ohms indicates the presence of an open or high resistance fault somewhere on the circuit. Remember,

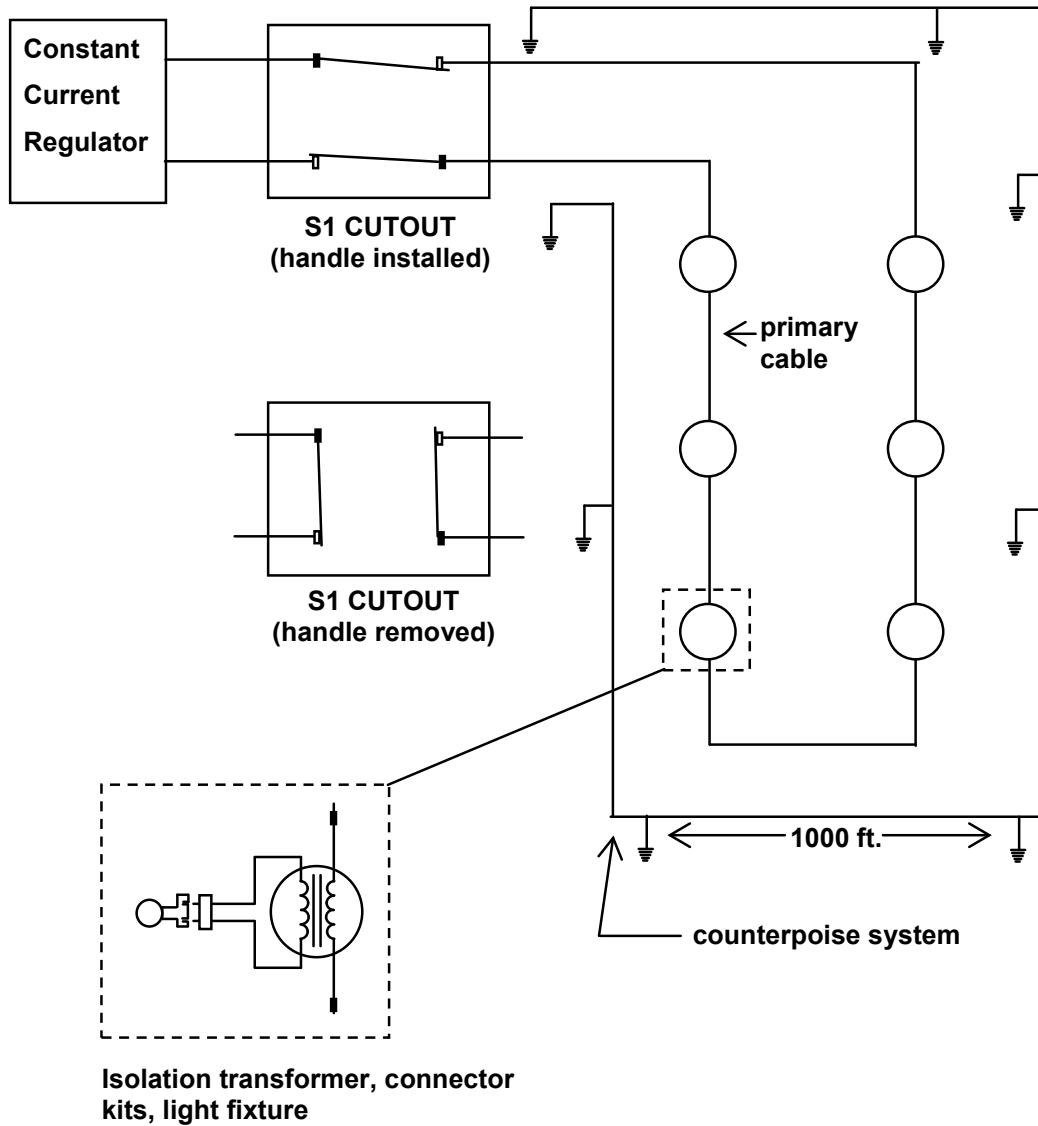
every circuit will have a different resistance value depending on the number and wattage of the light fixtures, but 700 ohms is the maximum for any airfield circuit. Remove the ground connection from the regulator and reconnect output “2” to the regulator. Energize the regulator to the high step for approximately thirty minutes. This will double check that the repair work was done correctly. Perform a visual inspection of the circuit and remove the fault marker(s) from the field.

#### **6.6 Using Heat Sensing Equipment to Locate Ground Faults.**

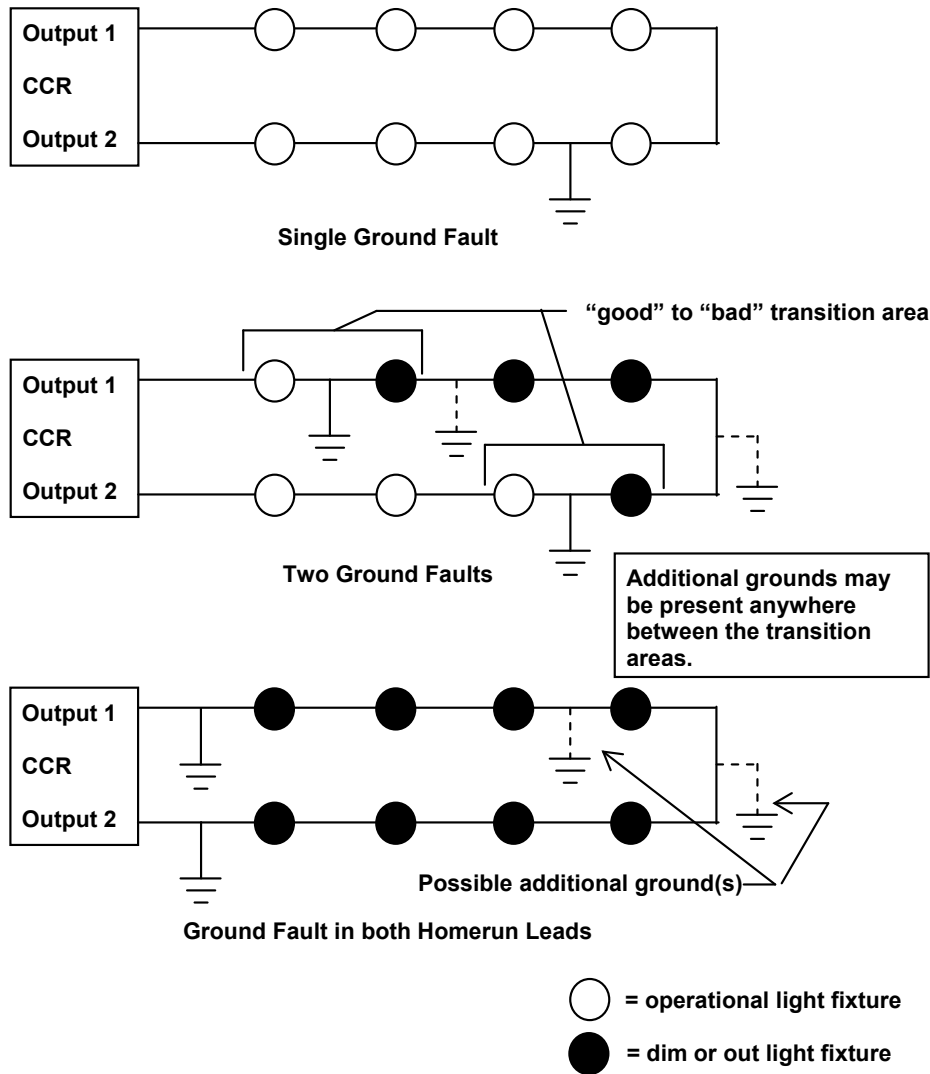
Any time there are two shorts to ground in a series circuit, the current flowing to ground through the breach in the cable or transformer insulation produces heat. This is caused by the arcing that occurs when a good solid connection is not present in an electrical circuit. In the case of series circuits operated by constant current regulators, the regulator can produce very high voltages and damage and heat from arcing can be great. Some airports have learned to use this unfortunate circumstance to their advantage. By utilizing economical infrared thermometers, the electrician is able to measure the difference between the temperatures of a “normal” light can or fixture and one that is running an abnormally high temperature. Infrared thermometers are available that use laser sighting and are effective at distances long enough to allow their use from a moving vehicle. Using this equipment, an electrician can drive down the runway or taxiway checking the temperature of each light/can until one is found that exhibits a higher temperature than the rest and then investigate that light. This method has proven to be a great time saver at several airports. See Chapter 4, Test Equipment, for more information on this equipment.

#### **6.7 Using Cable Fault Locating Equipment to Locate Ground Faults.**

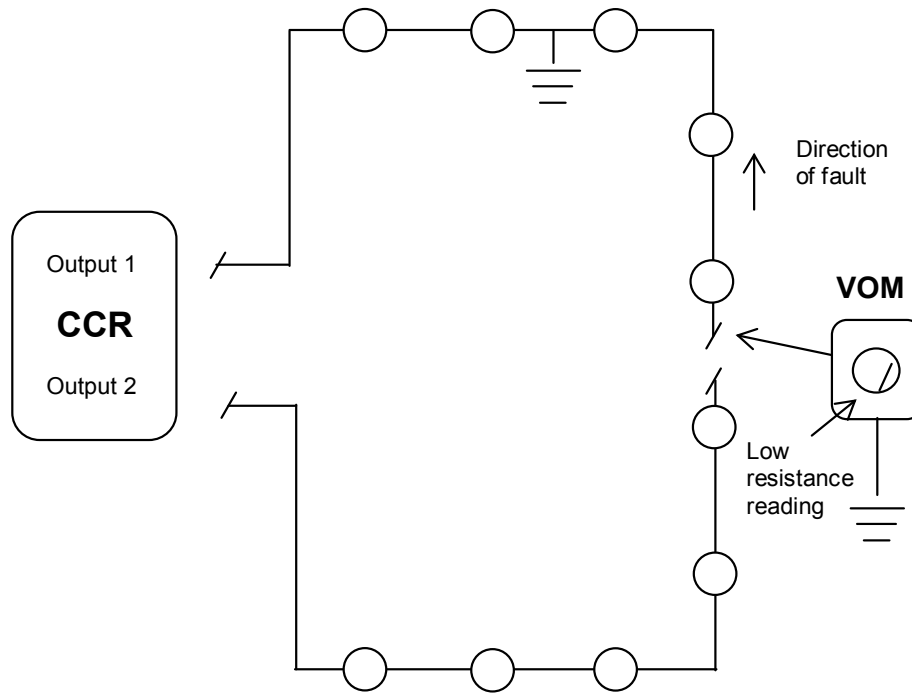
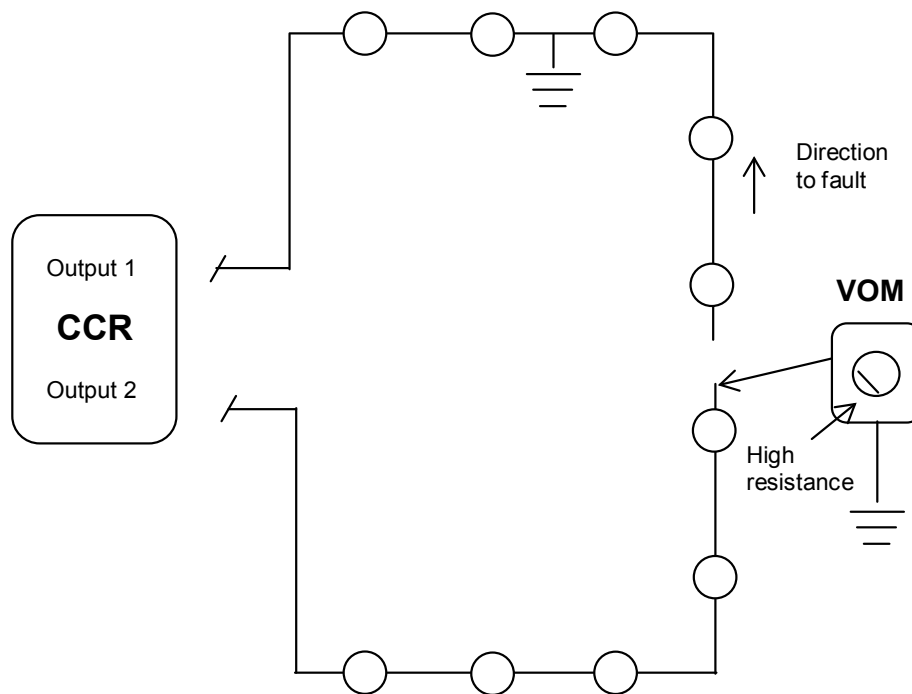
Cable locating and fault finding technology has improved vastly over the years with many manufacturers offering equipment capable of locating underground cable and ground or shield faults. These units consist of a transmitter and receiver and if equipped for fault finding, usually have an optional A-frame pickup unit for use with the receiver. They are able to detect the location of ground faults in direct buried cables and can be highly accurate. See Chapter 4, Test Equipment, for more information on this equipment.

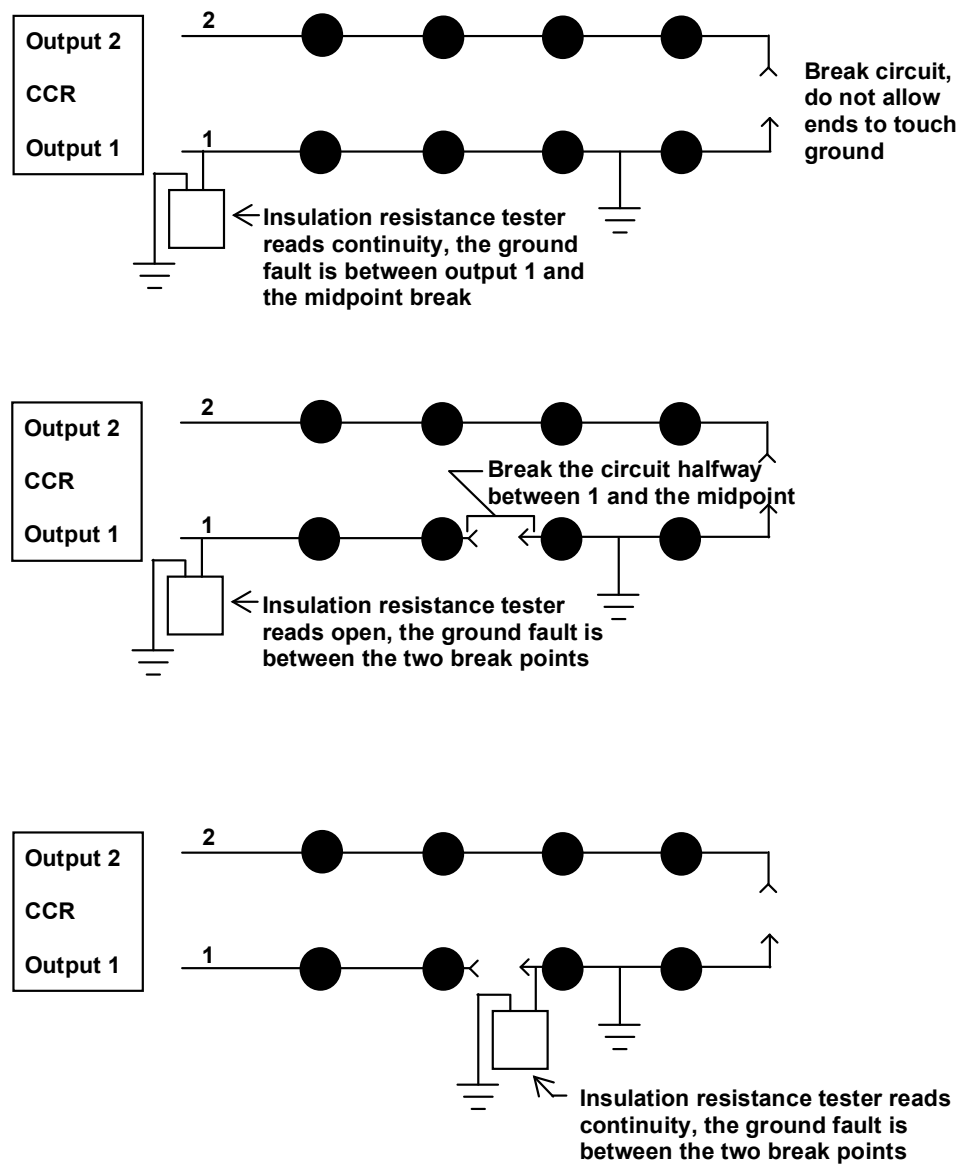


**Figure 6-1. Typical Series Lighting Circuit**

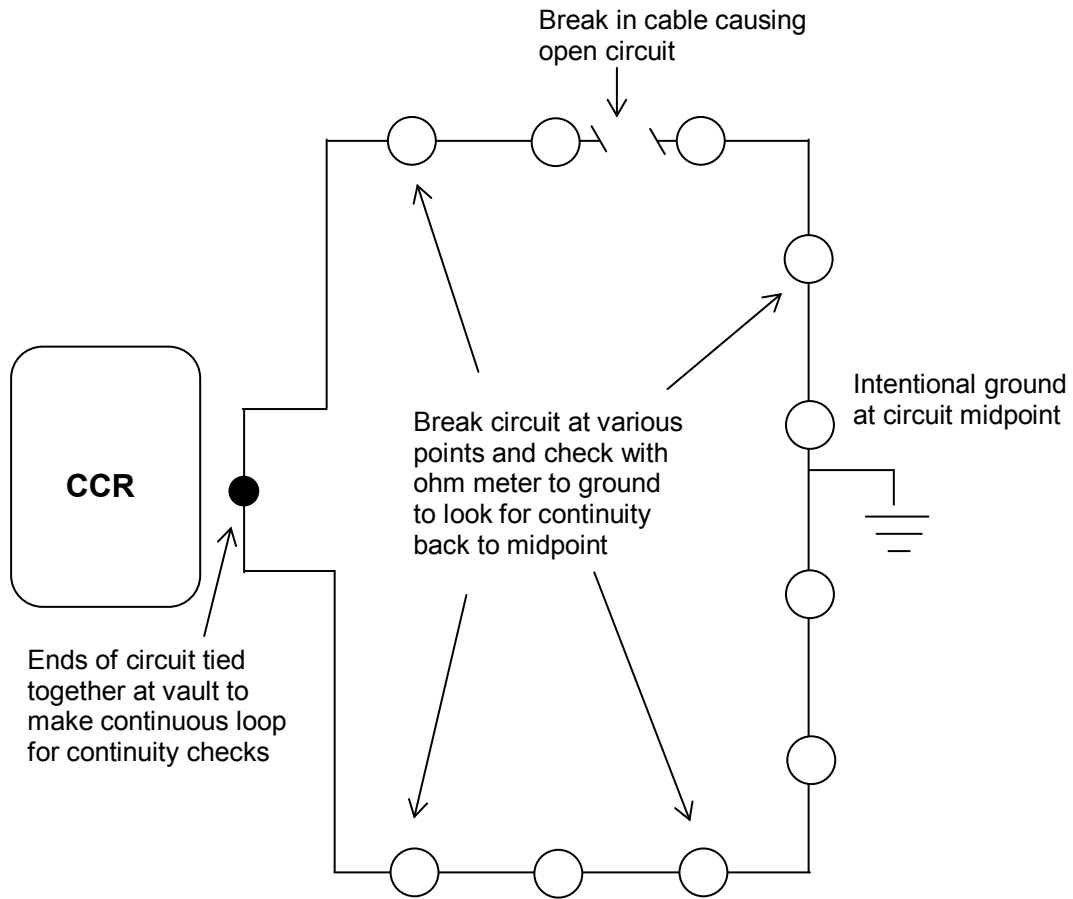


**Figure 6-2. Typical Ground Faults**

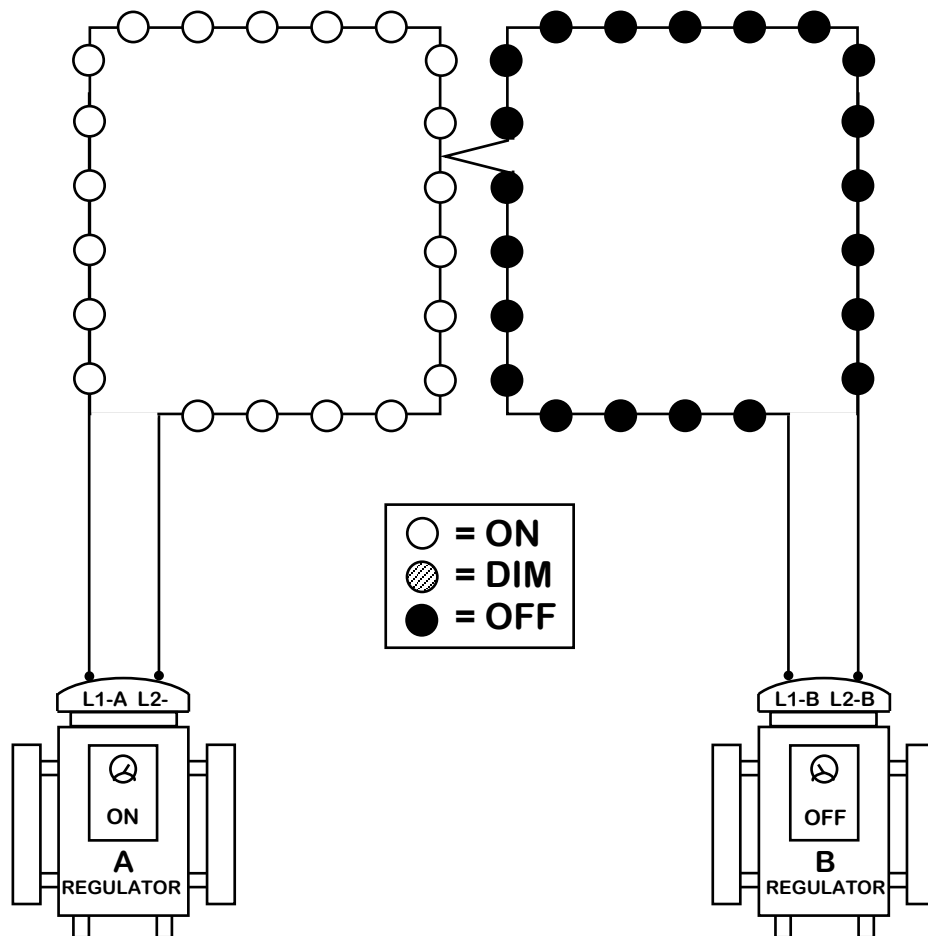
**a. Low resistance****b. High resistance****Figure 6-3. Locating Ground Faults with the VOM**



**Figure 6-4. Alternative Method of Finding Ground Fault Using VOM or Insulation Resistance Tester**



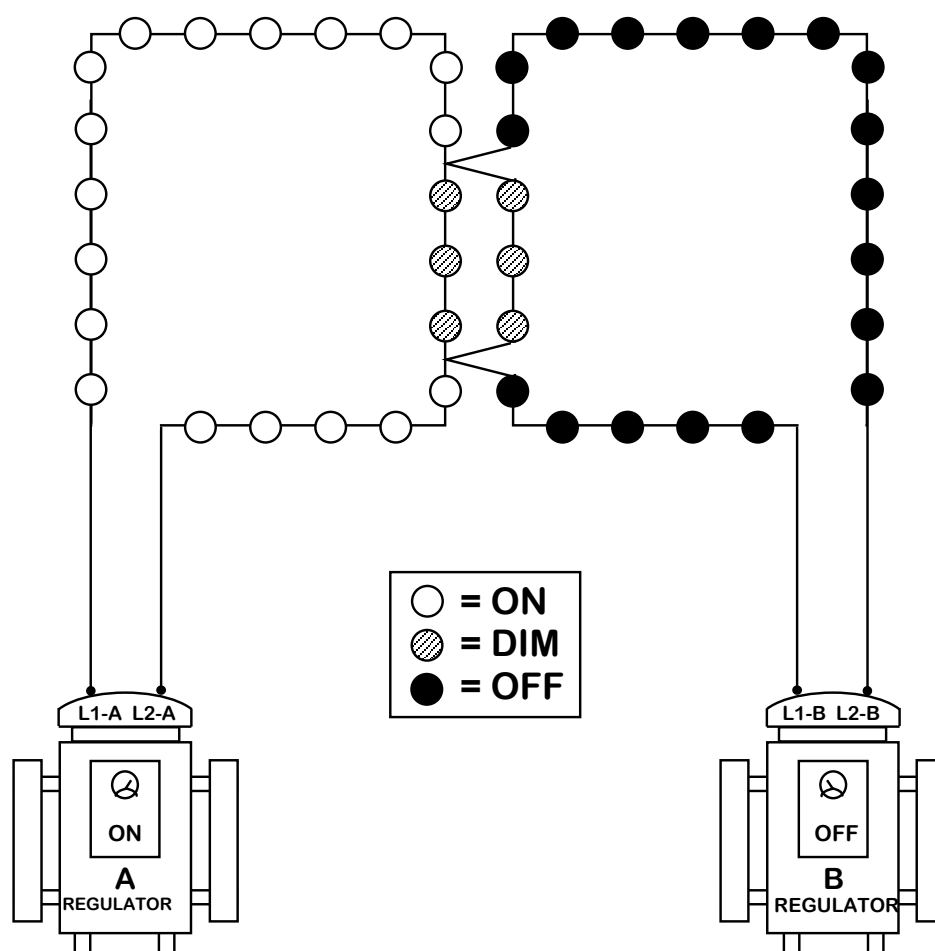
**Figure 6-5. Locating Open Circuit Faults**



**THIS CONDITION CAN BE DETECTED BY OHMMETER TESTING RESISTANCE BETWEEN LOAD "A" AND LOAD "B".**

**HAZARD EXISTS TO PERSONNEL WORKING ON EITHER LOAD "A" OR "B" WHEN THE OTHER LOAD IS ENERGIZED.**

**Figure 6-6. Single Load-to-Load Fault**



**THIS CONDITION CAN BE DETECTED BY OHMMETER TESTING RESISTANCE BETWEEN LOAD "A" AND LOAD "B."**

**HAZARD EXISTS TO PERSONNEL WORKING ON EITHER LOAD "A" OR "B" WHEN THE OTHER LOAD IS ENERGIZED.**

**Figure 6-7. Two Load-to-Load Shorts**

This figure illustrates what may happen when there are two load to load shorts on the circuits. Notice that the lights in this condition are affected, causing the area between the two shorts to dim on both circuits. If the illuminated lights on the B load were to go unnoticed, the presence of this condition could easily be confused with symptoms of two grounds on a single circuit. The give-away is the portion of the B load lights that are on. Driving the circuit would locate the bright/dim transitions and the location of the shorts. Had the load between the shorts of load A been much larger (more lights) than the load in between the shorts of load B, the smaller load would have been brighter. In the illustration, the loads between the shorts are equal and the current is divided equally between the two loads.

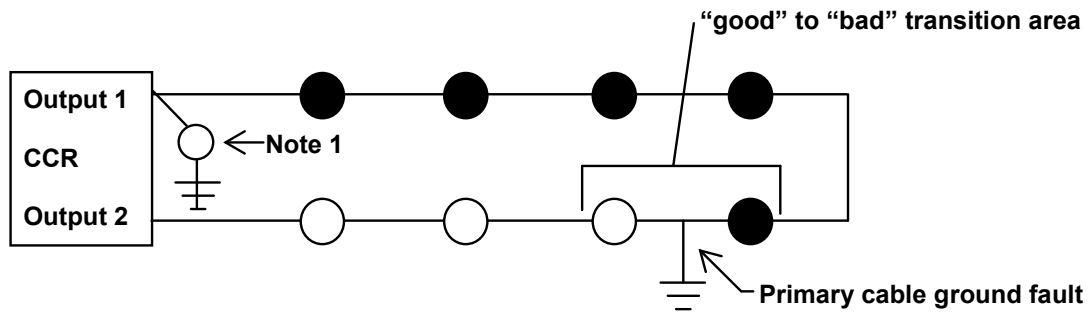


Figure 6-8a

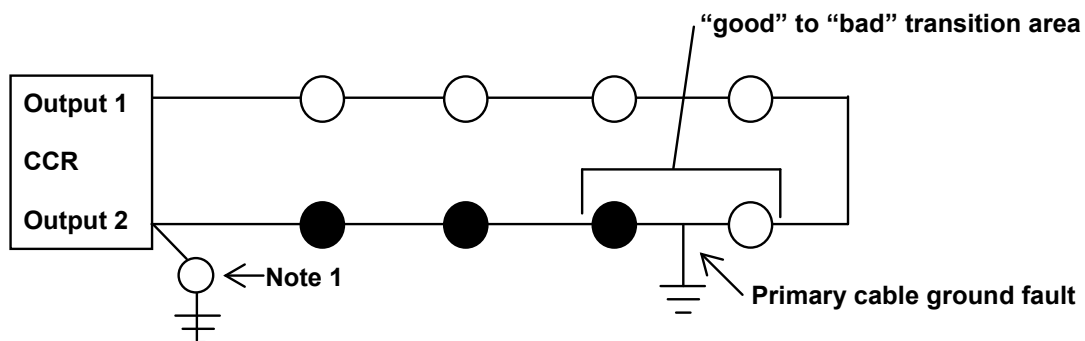


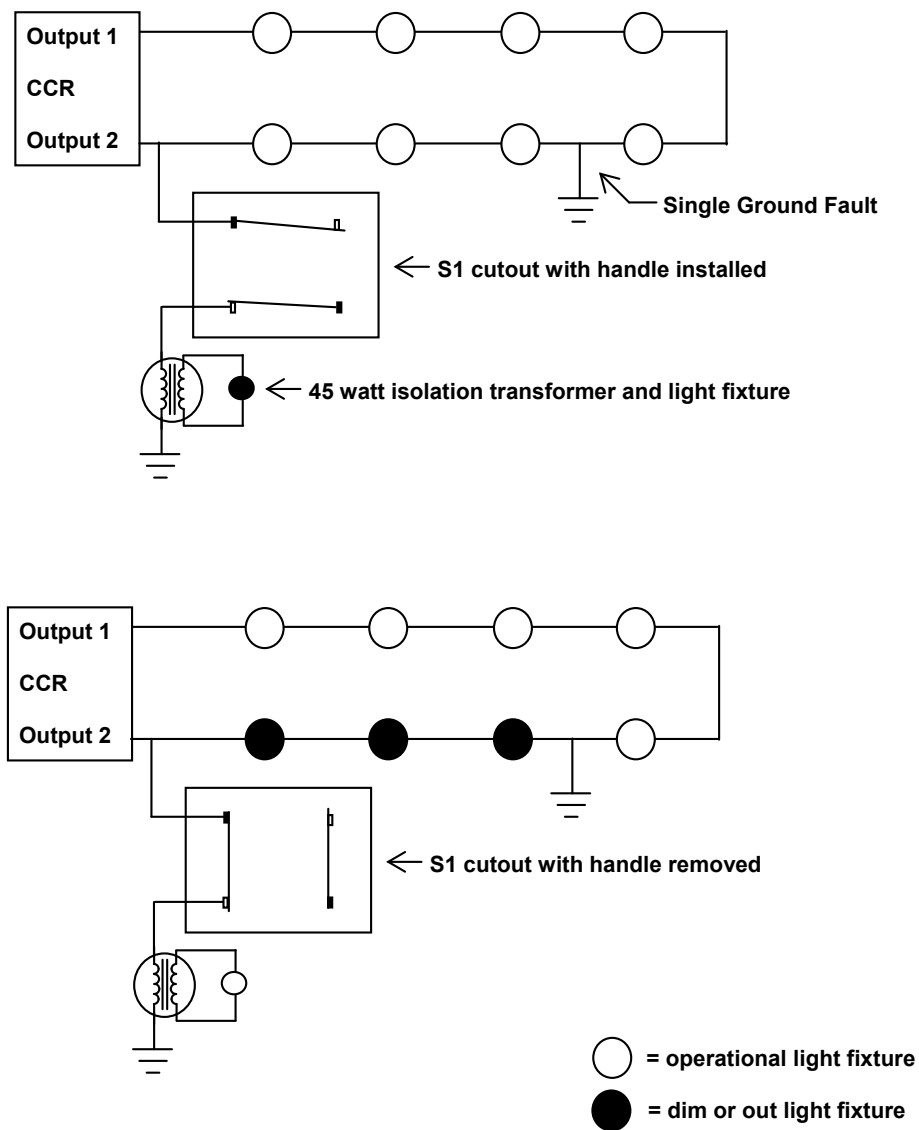
Figure 6-8b

## NOTES:

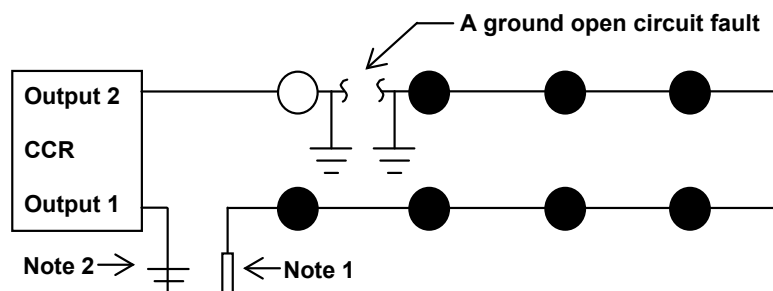
1. 45 watt isolation transformer and light fixture connected between a regulator output terminal and earth ground. The ground resistance of the earth ground connection must be low.
2. When the circuit contains a single ground fault, the "good" to "bad" transition area will be in the same location with the test connection on either output 1 or output 2.

○ = operational light fixture  
 ● = dim or out light fixture

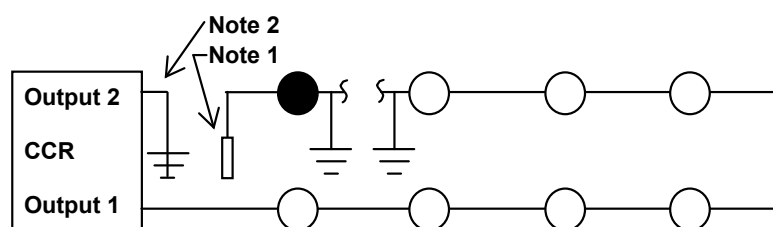
Figure 6-8. Intentional Ground Test



**Figure 6-9. Intentional Ground Preventive Maintenance Tool**



**Figure 6-10a. Grounded Output Test  
on CCR Output 1**



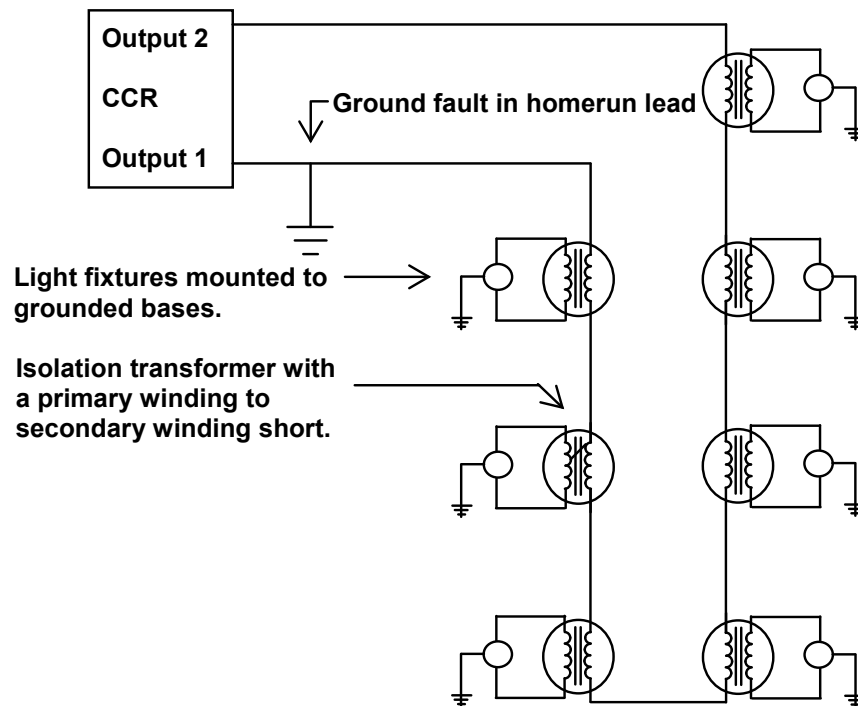
**Figure 6-10b. Grounded Output Test  
on CCR Output 2**

**NOTES:**

1. Insulate and stay clear of the removed primary cable lead, lethal voltages may be present.
2. The ground resistance of this connection must be low.
3. If the regulator trips off on open circuit, the open circuit fault is not grounded or the regulator does not have the power to drive circuit.

○ = operational light fixture  
● = dim or out light fixture

**Figure 6-10. Grounded Output Test**



In this failure mode, the light fixture connected to the shorted isolation transformer could produce lethal voltages to anyone touching it.

**Figure 6-11. Dangerous Isolation Transformer/Circuit Ground Faults**

## Appendix A. Standards and Tolerances.

### A.0 Purpose.

This appendix contains standards and tolerances for visual aid equipment and systems as contained in the following tables:

#### Table    Equipment or System

- A-1    Beacons
- A-2    Medium intensity approach lighting systems (MALS, MALSF, MALSR)
- A-3    Omnidirectional approach lighting system (ODALS)
- A-4    Lead-in lights
- A-5    Runway end identifier lights (REIL)
- A-6    Visual approach slope indicators (VASI)
- A-7    Precision approach path indicators (PAPI)
- A-8    Runway and taxiway lighting systems
- A-9    Photoelectric devices
- A-10   Standby engine generators

**Table A-1. Beacons**

| <b>Parameter</b>   | <b>Standard</b>                                | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance /<br/>Limit:<br/>Operating</b> |
|--------------------|--|---------------------------------------|---|
| 1. Rotation speed  |  |                                       |   |
| a. 10-inch         | 6 rpm  | Same as standard                      | ±1 rpm                                      |
|                    | 12 rpm   | Same as standard                      | ±1 rpm                                      |
| b. 36-inch         | 6 rpm  | Same as standard                      | ±1 rpm                                      |
| 2. Input voltage   | Same as lamp<br>voltage rating                 | ±3 percent                            | ±5 percent                                  |
| 3. Vertical aiming | Locally established<br>between 2-10<br>degrees | ± ½ degree from<br>established angle  | Same as initial                             |

**Table A-2. Medium Intensity Approach Light Systems (MALS, MALSF, MALSR)**

| <b>Parameter</b>                        | <b>Standard</b>               | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance / Limit:<br/>Operating</b>                                |
|---|-------------------------------|---------------------------------------|--|
| 1. Light units operational              |                               |                                       |  |
| a. Steady burning                       | All                           | All                                   | 15% lamps out (random) – 2 lamps out; in 5-light bar – 1 light bar out |
| b. Flashing                             | All                           | All                                   | 1 unit out   |
| 2. Flashing rate                        | 120 fpm                       | ±2 fpm                                | ±2 fpm   |
| a. Input voltage                        | 120V or 240V                  | ±3%                                   | ±5%  |
| 3. Light unit alignment                 |                               |                                       |  |
| a. Vertical                             | Locally established           | ±1 degree                             | ±2 degrees   |
| b. Horizontal                           | Parallel to runway centerline | ±1 degree                             | ±2 degrees   |
| 4. Obstructions due to vegetation, etc. | No obstruction                | Same as standard                      | Same as standard   |

**Table A-3. Omnidirectional Approach Light System (ODALS)**

| <b>Parameter</b>                        | <b>Standard</b> | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance / Limit:<br/>Operating</b> |
|---|-----------------|---------------------------------------|---|
| 1. Light units operational              | All             | All                                   | 1 unit out                              |
| 2. Input voltage                        | 120V or 240V    | ±3%                                   | ±5%                                     |
| 3. Flashing rate                        | 60 fpm          | ±2 fpm                                | ±2 fpm                                  |
| 4. Light unit alignment                 | Level           | ±1 degree                             | ±2 degrees                              |
| 5. Obstructions due to vegetation, etc. | No obstruction  | Same as standard                      | Same as standard                        |

**Table A-4. Lead-in Lights**

| <b>Parameter</b>                        | <b>Standard</b>     | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance / Limit:<br/>Limit:<br/>Operating</b> |
|---|---------------------|---------------------------------------|--|
| 1. Light units operational              | All                 | All                                   | 1 unit out in 3-light cluster                      |
| 2. Flashing rate                        | Locally established | $\pm 2$ fpm                           | $\pm 2$ fpm  |
| 3. Input voltage                        | 120V or 240V        | $\pm 3\%$                             | $\pm 5\%$  |
| 4. Light unit alignment                 |                     |                                       |  |
| a. Vertical                             | Locally established | $\pm 1$ degree                        | $\pm 2$ degrees                                    |
| b. Horizontal                           | Locally established | $\pm 1$ degree                        | $\pm 2$ degrees                                    |
| 5. Obstructions due to vegetation, etc. | No obstruction      | Same as standard                      | Same as standard                                   |

**Table A-5. Runway End Identifier Lights (REILs)**

| <b>Parameter</b>                        | <b>Standard</b>                                   | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance /<br/>Limit:<br/>Operating</b> |
|---|---|---------------------------------------|---|
| 1. Light units operational              | All   | All                                   | All   |
| 2. Flashing rate                        |   |                                       |   |
| a. Unidirectional type                  | 120 fpm   | ±2 fpm                                | ±2 fpm                                      |
| b. Omnidirectional type                 | 60 fpm  | ±2 fpm                                | ±2 fpm                                      |
| 3. Input voltage                        | 120V or 240V                                      | ±3%                                   | ±5%   |
| 4. Alignment (unidirectional)           |   |                                       |   |
| a. Vertical                             |   |                                       |   |
| (1) With baffles                        | 3 degrees   | ±1 degree                             | -1 degree<br>+2 degrees                     |
| (2) Without baffles                     | 10 degrees  | ±1 degree                             | ±2 degrees                                  |
| b. Horizontal                           |   | ±1 degree                             | ±2 degrees                                  |
| (1) With baffles                        | 10 degrees  | ±1 degree                             | ±2 degrees                                  |
| (2) Without baffles                     | 15 degrees<br>(away from<br>runway<br>centerline) | ±1 degree                             | ±2 degrees                                  |
| 5. Obstructions due to vegetation, etc. | No obstruction                                    | Same as standard                      | Same as standard                            |

**Table A-6. Visual Approach Slope Indicator (VASI)**

| <b>Parameter</b>                        | <b>Standard</b>   | <b>Tolerance / Limit:<br/>Initial</b>                 | <b>Tolerance /<br/>Limit:<br/>Operating</b> |
|---|---|---|---|
| 1. Lamps burning                        |   |   |   |
| a. VASI                                 | All   | All   | Not more than one lamp out per box          |
| b. SAVASI                               | All   | All   |   |
| 2. Vertical aiming (VASI and SAVASI)    |   |   |   |
| a. Downwind bar (bar no. 1)             | ½ degree below established glide path angle                             | ±2 minutes  | ±6 minutes                                  |
| b. Upwind bar (bar no. 2)               | Established glide path angle  | ±2 minutes  | ±6 minutes                                  |
| 3. Vertical aiming (3-bar VASI)         |   |   |   |
| a. Downwind bar (bar no. 1)             | 2.75 degrees  | ±2 minutes  | ±6 minutes                                  |
| b. Middle bar (bar no. 2)               | 3.0 degrees   | ±2 minutes  | ±6 minutes                                  |
| c. Upwind bar                           | 3.25 degrees  | ±2 minutes  | ±6 minutes                                  |
| 4. Horizontal alignment                 | Parallel to runway centerline   | ± ½ degree  | ± ½ degree                                  |
| 5. Tilt switch                          | ¼ to ½ degree below and ½ to 1 degree above established light bar angle | Same as standard                                      | Same as standard                            |
| 6. Lamp current (current-regulated)     | Rated current of lamps  | Same as regulator currents for type of regulator used |   |
| 7. Lamp voltage (voltage-regulated)     | Rated voltage of lamps  | ±3%   | ±5%   |
| 8. Obstructions due to vegetation, etc. |   | Same as standard                                      | Same as standard                            |

**Table A-7. Precision Approach Path Indicator (PAPI)**

| <b>Parameter</b>                        | <b>Standard</b>                                       | <b>Tolerance /<br/>Limit:<br/>Initial</b>             | <b>Tolerance /<br/>Limit:<br/>Operating</b> |
|---|---|---|---|
| 1. Lamps burning                        |   |   |   |
| a. PAPI                                 | All   | All   | Not more than one lamp out per box          |
| 2. Vertical aiming <sup>1</sup>         |   |   |   |
| a. Unit D (close to runway)             | 3° 30'  | ±2 minutes  | ±6 minutes                                  |
| b. Unit C (2nd from runway)             | 3° 10'  | ±2 minutes  | ±6 minutes                                  |
| c. Unit B                               | 2° 50'  | ±2 minutes  | ±6 minutes                                  |
| d. Unit A (farthest from runway)        | 2° 30'  | ±2 minutes  | ±6 minutes                                  |
| 3. Horizontal alignment                 | Parallel to runway centerline                         | ± ½ degree  | ± ½ degree                                  |
| 4. Tilt switch                          | ¼ below to ½ degree above established light bar angle | Same as standard                                      | Same as standard                            |
| 5. Lamp current (current-regulated)     | Rated current of lamps                                | Same as regulator currents for type of regulator used |   |
| 6. Lamp voltage (voltage-regulated)     | Rated voltage of lamps                                | ±3%   | ±5%   |
| 7. Obstructions due to vegetation, etc. | No obstruction  | Same as standard                                      | Same as standard                            |

<sup>1</sup> Unless a different standard is established locally, angles shown are for a 3 degree glide path.

**Table A-8. Runway and Taxiway Lighting Systems**

| <b>Parameter</b>                    | <b>Standard</b>     | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance / Limit:<br/>Operating</b>  |
|-------------------------------------|---------------------|---------------------------------------|--|
| 1. Runway lights                    |                     |                                       |  |
| a. Threshold lights                 | All on              | All on                                | 75% on for VFR and non-precision IFR runways   |
| b. End lights                       | All on              | All on                                | 75% on   |
| c. Edge lights                      | All on              | All on                                | 85% on except for CAT II and CAT III runways which require 95% serviceable                 |
| d. Centerline lights                | All on              | All on                                | 95% serviceable  |
| e. Touchdown Zone lights            | All on              | All on                                | 90% serviceable  |
| 2. Taxiway lights                   |                     |                                       |  |
| a. Edge lights                      | All on              | All on                                | 85% on - see note 3 for CAT III taxi routes  |
| b. Centerline lights                | All on              | All on                                | 90% on - see note 3 for CAT III taxi routes  |
| c. Elevated Runway Guard Lights     | All on              | All on                                | No more than one light in a fixture unserviceable  |
| d. In-pavement runway guard lights  | All on              | All on                                | No more than three lights per location unserviceable nor two adjacent lights unserviceable |
| e. Runway stop bar lights           | All on              | All on                                | No more than three lights per location unserviceable nor two adjacent lights unserviceable |
| 3. Lamp current                     | Amperes             | Amperes                               | Amperes  |
| a. 3 step, 6.6A                     | 6.6                 | 6.50 - 6.70                           | Same as initial  |
|                                     | 5.5                 | 5.40 - 5.60                           | Same as initial  |
|                                     | 4.8                 | 4.80 - 4.90                           | Same as initial  |
| b. 5 step, 6.6A                     | 6.6                 | 6.50 - 6.70                           | Same as initial  |
|                                     | 5.2                 | 5.10 - 5.30                           | Same as initial  |
|                                     | 4.1                 | 3.98 - 4.22                           | Same as initial  |
|                                     | 3.4                 | 3.30 - 3.50                           | Same as initial  |
|                                     | 2.8                 | 2.70 - 2.90                           | Same as initial  |
| c. 5 step, 20A                      | 20.0                | 19.70 - 20.30                         | Same as initial  |
|                                     | 15.8                | 15.50 - 16.10                         | Same as initial  |
|                                     | 12.4                | 12.10 - 12.70                         | Same as initial  |
|                                     | 10.3                | 10.00 - 10.60                         | Same as initial  |
|                                     | 8.5                 | 8.20 - 8.80                           | Same as initial  |
| 4. Lamp voltage (parallel circuits) | Lamp voltage rating | ±3%                                   | ±5%  |

## Appendix A

1. To provide continuity of guidance, the allowable percentage of unserviceable lights should not be in a pattern that would alter the basic pattern of the lighting system. Additionally, an unserviceable light should not be adjacent to another unserviceable light except in a barrette or a crossbar where two adjacent unserviceable lights may be permitted. With respect to barrettes, crossbars and runway edge lights, lights are considered to be adjacent if located consecutively and:
  - Laterally - in the same barrette or crossbar; or
  - Longitudinally - in the same row of the edge lights or barrettes.

2. Threshold lights for precision runways are part of the approach lighting system and are not included in this table.
3. Taxiway lighting on low-visibility (SMGCS) taxi routes.
  - a. Taxiway edge lights, taxiway edge reflectors and taxiway centerline lights along the low-visibility route – no two adjacent lights or reflectors unserviceable.
  - b. Taxiway clearance bar lights – no more than one light at a location unserviceable.

**Table A-9. Photoelectric Devices**

| <b>Parameter</b>   | <b>Standard</b>          | <b>Tolerance / Limit:<br/>Initial</b> | <b>Tolerance /<br/>Limit:<br/>Operating</b> |
|--|--------------------------|---------------------------------------|---|
| 1. Photocell operation (PAPI)                            |                          |                                       |   |
| a. Turn-on to high setting                               | 55 foot candle (fc)      | ±5 fc                                 | Same as initial                             |
| b. Turn-on to low setting                                | 30 fc                    | ±5 fc                                 | Same as initial                             |
| 2. Photocell operation (windsock, beacon, runway lights) |                          |                                       |   |
| a. Turn-on   | Below 55 fc              | ±5 fc                                 | Same as initial                             |
| b. Turn-off  | Above 30 fc              | ±5 fc                                 | Same as initial                             |
| 3. Vertical orientation                                  | 25 degrees from vertical | ±5 degrees                            | Same as initial                             |
| 4. Horizontal orientation                                | True north               | ±5 degrees                            | Same as initial                             |

**Table A-10. Standby Engine Generators**

| <b>Parameter</b>                                  | <b>Standard</b>               | <b>Tolerance / Limit:<br/>Initial</b>       | <b>Tolerance / Limit:<br/>Operating</b>                                  |
|---|-------------------------------|---|--|
| 1. Starting time (1)                              | 15 seconds or less            | Same as standard                            | Same as standard   |
| 2. Potential relays commercial power              |                               |   |  |
| a. 120V system<br>Dropout<br>Pickup               | 108V<br>114V                  | $\pm 3V$<br>$\pm 3V$                        | Same as initial<br>Same as initial                                       |
| b. 208V system<br>Dropout<br>Pickup               | 191V<br>191V                  | $\pm 3V$<br>$\pm 3V$                        | Same as initial<br>Same as initial                                       |
| c. 240V system<br>Dropout<br>Pickup               | 200V<br>210V                  | $\pm 3V$<br>$\pm 3V$                        | Same as initial<br>Same as initial                                       |
| d. 480V system<br>Dropout<br>Pickup               | 455V<br>465V                  | -0, +5V<br>-0, +5V                          | Same as initial<br>Same as initial                                       |
| 3. Potential relay engine power                   |                               |   |  |
| a. Pickup voltage<br>120V<br>208V<br>240V<br>480V | 112V<br>197V<br>210V<br>465V  | $\pm 3V$<br>$\pm 3V$<br>$\pm 3V$<br>-0, +5V | Same as initial<br>Same as initial<br>Same as initial<br>Same as initial |
| b. Dropout voltage                                | N/A                           | N/A   | N/A  |
| 4. Pickup frequency                               | 60 Hz                         | 57-60 Hz                                    | Same as initial  |
| 5. Time delay setting (2)                         | 15 minutes                    | 15-20 minutes                               | Same as initial  |
| 6. Voltage regulator                              | Set to match commercial power | $\pm 3V$                                    | Same as initial  |

## Appendix A

| Parameter                   | Standard                     | Tolerance / Limit:<br>Initial | Tolerance / Limit:<br>Operating |
|-----------------------------|------------------------------|-------------------------------|---------------------------------|
| 7. Frequency sensing device | Contacts to open below 57 Hz | Same as standard              | Same as standard                |
| 8. Transfer relay (3)       | 1-3 seconds                  | Same as standard              | Same as standard                |
| 9. Frequency                | 60 Hz                        | ±5 Hz                         | Same as initial                 |
| 10. Output voltage (4)      |                              |                               |                                 |
| a. 120V system              | 114-126V                     | Same as standard              | Same as standard                |
| b. 280V system              | 197-218V                     | Same as standard              | Same as standard                |
| c. 240V system              | 228-252V                     | Same as standard              | Same as standard                |
| d. 480V system              | 456-504V                     | Same as standard              | Same as standard                |

- (1) For CAT II operations, the engine generator is normally started and used for prime power. In the event of generator failure during this time, it is required that the CAT II lighting load be switched back to commercial power within 1.0 seconds.
- (2) Maximum before transfer to commercial power – not valid where manual transfer to commercial power is made.
- (3) At facilities where the commercial power source has a record of momentary transience resulting in voltage drops, unnecessary engine starts and power transfer may be eliminated by increasing the tolerances of the PR relays or under-voltage devices dropout and pickup voltage settings shown in this table. The tolerances may be extended to, but not exceed, the acceptable frequency and voltage characteristics of the facility equipment. Any voltage regulators installed to stabilize the commercial voltage to the facility will be considered facility equipment. The TR relay or device time delay may be extended beyond 3 seconds to where, under normal starting conditions, the power from the engine generator will be available to the facility within 15 seconds after commercial power failure. The locally established tolerances must be posted on the inside of the engine generator control panel door near the PR and TR relays.
- (4) Adjust output voltage to match service entrance voltage or facility requirements.

## Appendix B. Maintenance Log Preparation Guide

**Note:** This appendix is included to provide an example of a log form and examples of instances where log entries are appropriate. This guidance is only applicable to the lighted visual aids in this AC.

Entries in the log should clearly identify the subject facility and provide a complete historical account of activities related to facility status, operation, or performance. Examples of instances for such entries include:

- Physical arrivals and departures at facilities. At least one entry needs to include the purpose of the visit.
- All system and subsystem interruptions and related activities.
- Start and completion time of periodic or corrective maintenance actions performed.
- Technical evaluations, inspections of any kind, and aircraft accident/incident investigations.
- Equipment changes, replacement, or adjustment of parameters.
- Modification, commissioning, or decommissioning activities.
- Pilferage, vandalism, or related events.
- Adverse weather effects, commercial power failures, access road problems, or any other conditions deemed to have an impact on facility or air traffic operations.
- Unsolicited statements from knowledgeable personnel about facility operations.

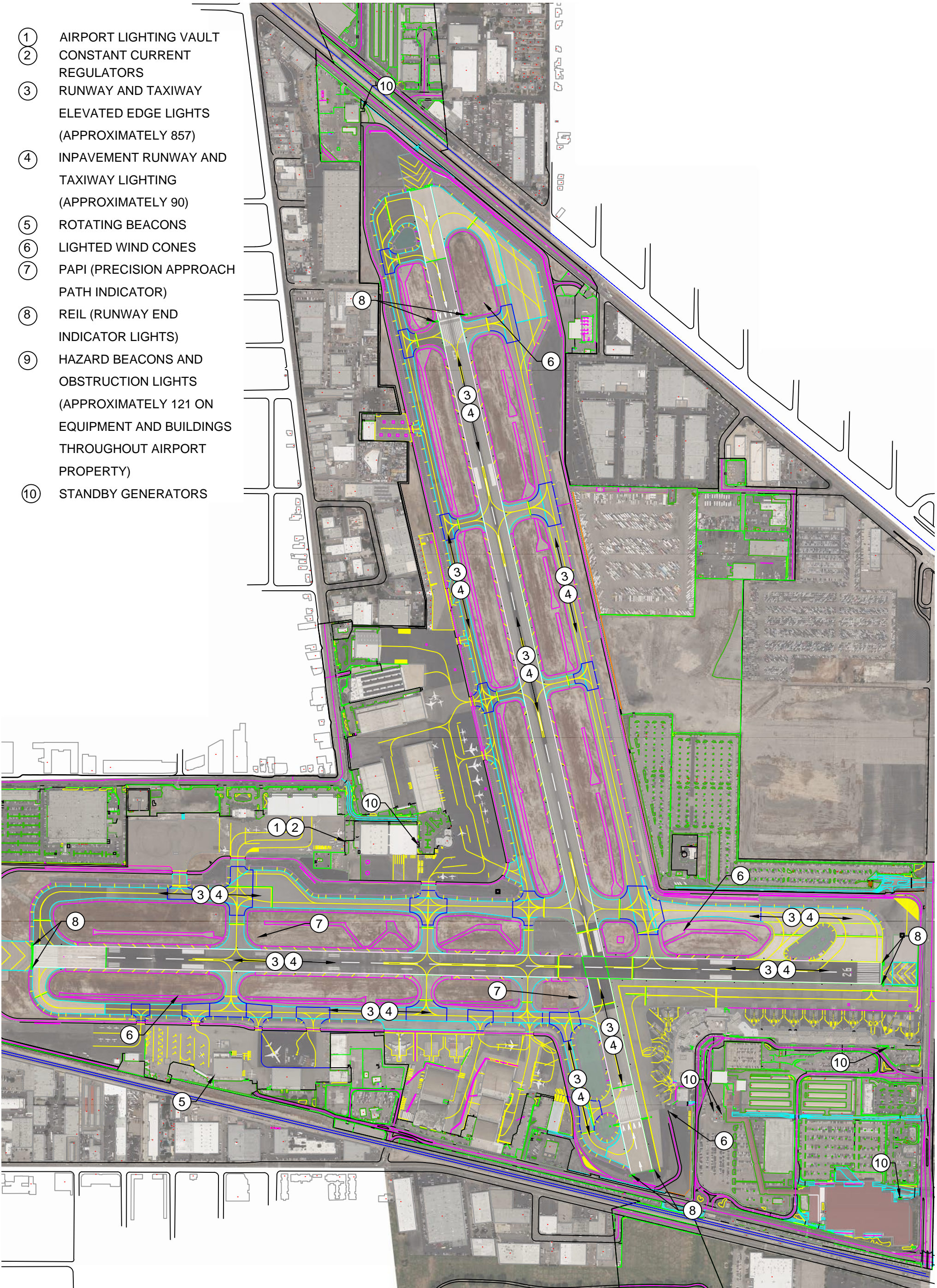
Example Maintenance Log. *This log and the content below is intended as an example only*

|                          |      |      |   |                |
|--------------------------|------|------|---|----------------|
| FACILITY MAINTENANCE LOG |      |      | AIRPORT   |                |
|                          |      |      | ANYSTATE, US  |                |
|                          |      |      | SUBJECT OF LOG  | MONTH AND YEAR |
|                          |      |      | PAPI  | JANUARY 2014   |
| DATE                     | TIME | CODE | REMARKS   | INITIALS       |
|                          |      |      | January 2014  |                |
| 02                       | 1800 |      | Arrived site. (for scheduled maintenance, unscheduled outage)                                 | SM             |
|                          | 1801 |      | Found PAPI lights out on second in board box.   | SM             |
|                          | 1805 |      | Notified OCC (XY, initials of person contacted). EUG NOTAM # 14/01 issued. Began maintenance. | SM             |
|                          | 2240 |      | Completed repair of PAPI system.  | SM             |
|                          | 2350 |      | Completed Quarterly Maintenance IAW AC 150/5340-26 and manufacturers handbook                 | SM             |
| 03                       | 0005 |      | Notified OCC (AC, initials of person contacted). EUG PAPI ready to RTS.                       | SM             |
|                          | 0015 |      | Departed Site   | SM             |
|                          |      |      |   |                |
|                          |      |      |   |                |
|                          |      |      |   |                |
|                          |      |      |   |                |
|                          |      |      |   |                |

**EXHIBIT D**  
**Airfield Testing Site Map**

(attached)

- ① AIRPORT LIGHTING VAULT
- ② CONSTANT CURRENT REGULATORS
- ③ RUNWAY AND TAXIWAY ELEVATED EDGE LIGHTS (APPROXIMATELY 857)
- ④ INPAVEMENT RUNWAY AND TAXIWAY LIGHTING (APPROXIMATELY 90)
- ⑤ ROTATING BEACONS
- ⑥ LIGHTED WIND CONES
- ⑦ PAPI (PRECISION APPROACH PATH INDICATOR)
- ⑧ REIL (RUNWAY END INDICATOR LIGHTS)
- ⑨ HAZARD BEACONS AND OBSTRUCTION LIGHTS (APPROXIMATELY 121 ON EQUIPMENT AND BUILDINGS THROUGHOUT AIRPORT PROPERTY)
- ⑩ STANDBY GENERATORS



# AIRFIELD TESTING AND INSPECTION MAP

**EXHIBIT E**  
**Testing and Inspection Forms**

(attached)

HOLLYWOOD BURBANK AIRPORT - (BUR)  
QUARTERLY AIRPORT TEST RECORD

Date \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_

| Initials | Comments |
|----------|----------|
|          |          |

**Constant Current Regulators (AC 150/5340-26 5.2.3.a)**

|                                       |                |            |            |            |            |
|---------------------------------------|----------------|------------|------------|------------|------------|
| Check Vault Input Voltage and Current | Voltage: _____ |            |            |            |            |
| Check Output Current                  | Step 1         | Step 2     | Step 3     | Step 4     | Step 5     |
| <b>HIRL</b>                           | 2.70-2.90A     | 3.30-3.50A | 4.00-4.20A | 5.10-5.30A | 6.50-6.70A |
| Runway 8-26                           |                |            |            |            |            |

|                      |               |              |              |
|----------------------|---------------|--------------|--------------|
| Check Output Current | Step 1        | Step 2       | Step 3       |
| <b>MIRL/MITL</b>     | 4.66 - 4.94 A | 5.3 - 5.67 A | 6.40 - 6.7 A |
| Runway 15-33         |               |              |              |
| Runway 15-33 RGL     |               |              |              |
| PAPI 33              |               |              |              |
| Runway 8-26 RGL      |               |              |              |
| PAPI 8               |               |              |              |
| Taxiway A            |               |              |              |
| Taxiway B            |               |              |              |
| Taxiway C/G          |               |              |              |
| Taxiway D            |               |              |              |
| Taxiway D Centerline |               |              |              |
| Taxilane             |               |              |              |

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**Elevated Runway and Taxiway Lights (AC 150/5340-26 5.2.1.2)**

|   |          |
|---|----------|
| Check orientation of all lenses - realign as needed |          |
| Photometric test of HIRLs                           | Candelas |
| White   | 10,000   |
| Yellow  | 5,000    |
| Red   | 2,000    |
| Green   | 32,000   |

|  |
|--|
|  |
|  |
|  |
|  |
|  |

Clean / replace at 70%

Fix alignment, clean sockets (150/5340-26 5.3.2.1.2.F)

**In-pavement Runway and Taxiway Lights (AC 150/5340-26 5.4.1.3.a)**

|   |                           |
|---|---------------------------|
| Clean when less than 70% of required output |                           |
| Photometric test of HIRLs                   | > 70% of design intensity |
| White                                       | 10,000                    |
| Yellow                                      | 5,000                     |
| Green                                       | 3,200                     |

|  |
|--|
|  |
|  |
|  |

Clean / replace at 70%

HOLLYWOOD BURBANK AIRPORT - (BUR)  
QUARTERLY AIRPORT TEST RECORD

Date \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_

| Initials | Comments |
|----------|----------|
|----------|----------|

**Precision Approach Path Indicator (PAPI) (AC 150/5340-26 5.7.1.2)**

Check operation of controls  
Check for damage  
Clean lamps and filters

|  |  |
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Visually check mechanical parts for cleanliness,  
burned wires or connection, cracked insulators,  
lamps or filters, etc.  
Check if the surge suppressors are scorched

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Check lamp boxes and adapter units for debris from  
water, mice, birds, spider webs etc. Clean as needed.  
Check for rodent borrows or other potential cable  
damaging activity  
Check lateral and horizontal alignment of the light  
boxes, check the aiming angle with the PAPI aiming

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Unit 1 nearest runway

|        |   |                |
|--------|---|----------------|
|        | 1 | + 3.50 degrees |
| PAPI 8 | 2 | + 3.16 degrees |
|        | 3 | - 2.84 degrees |
|        | 4 | - 2.50 degrees |

|        |   |                     |
|--------|---|---------------------|
|        |   | Per AC 15/5340-30A  |
| PAPI 8 | 1 | + .5 degrees (30')  |
|        | 2 | + .16 degrees (10') |
|        | 3 | - .16 degrees (10') |
|        | 4 | - .5 degrees (30')  |

|         |   |                |
|---------|---|----------------|
|         | 1 | + 3.70 degrees |
| PAPI 33 | 2 | + 3.36 degrees |
|         | 3 | - 3.04 degrees |
|         | 4 | - 2.70 degrees |

|         |   |                          |
|---------|---|--------------------------|
|         |   | The normal approach      |
| PAPI 33 | 1 | angle is 3 degrees       |
|         | 2 |                          |
|         | 3 | Runway 33 is 3.2 degrees |
|         | 4 |                          |

Check leveling and operating of tilt switch  
Check vegetation is not obscuring VGSI equipment

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HOLLYWOOD BURBANK AIRPORT - (BUR)  
QUARTERLY AIRPORT TEST RECORD

Date \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_

|  | Initials | Comments |
|--|----------|----------|
|  |          |          |
|  |          |          |
|  |          |          |

**Precision Approach Path Indicator (PAPI) (AC 150/5340-26 5.7.1.3)**

Check the Obstacle-free approach plane for clearance from tree growth, new towers, pole lines, or other obstacles. The obstacle free plane is 4 miles long and extends 10-degrees on either side of the runway centerline

PAPI 8

PAPI 33

VASI 15

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HOLLYWOOD BURBANK AIRPORT - (BUR)  
SEMI-ANNUAL AIRPORT TEST RECORD

Date \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_ Initials \_\_\_\_\_ Comments \_\_\_\_\_

**AIRFIELD LIGHTING VAULT**

**Insulation Resistance Test**

**(AC 150/5340-26 5.1.3.1)**

|   |          |  |  |  |
|---|----------|--|--|--|
| Check input voltage                                       | Voltage: |  |  |  |
| Ground resistance   |          |  |  |  |
| Inspect and clean buses                                   |          |  |  |  |
| Check relay operation                                     |          |  |  |  |
| Check cut-outs  |          |  |  |  |
| Check switches  |          |  |  |  |
| Check control panel or computer control equipment         |          |  |  |  |
| Check / Test photoelectric switches                       |          |  |  |  |
| Check astronomic time switch                              |          |  |  |  |
| Check lightning arrestors                                 |          |  |  |  |
| Inspect all misc vault equipment (breakers, lights, etc.) |          |  |  |  |

**Constant Current Regulators**

**(AC 150/5340-26 5.2.4)**

Check load if necessary

|                                     | Load | Wiring     |  |  |
|-------------------------------------|------|------------|--|--|
|                                     |      | Insulation |  |  |
| Check relays, wiring and insulation |      |            |  |  |
| Runway 15-33                        |      |            |  |  |
| Runway 15-33 RGL                    |      |            |  |  |
| PAPI 33                             |      |            |  |  |
| Runway 8-26                         |      |            |  |  |
| Runway 8-26 RGL                     |      |            |  |  |
| PAPI 8                              |      |            |  |  |
| Taxiway A                           |      |            |  |  |
| Taxiway B                           |      |            |  |  |
| Taxiway C/G                         |      |            |  |  |
| Taxiway D                           |      |            |  |  |
| Taxiway D Centerline                |      |            |  |  |
| Taxilane                            |      |            |  |  |

HOLLYWOOD BURBANK AIRPORT - (BUR)  
SEMI-ANNUAL AIRPORT TEST RECORD

Date \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_ Initials \_\_\_\_\_ Comments \_\_\_\_\_

**Illuminated Runway and Taxiway guidance signs (AC 150/5340-26 5.4)**

|  |  |  |
|--|--|--|
| Clean interior and exterior of signs                           |  |  |
| Check current through the lamp circuit and adjust if necessary |  |  |

**Rotating Beacon (Table 5-7) (AC 150/5340-26 5.5)**

|  |  |       |  |  |
|--|--|-------|--|--|
| Check and record input voltage                                 |  | volts |  |  |
| Verify that beam is narrow, elevation setting has not slipped  |  |       |  |  |
| Lubricate vertical main shaft                                  |  |       |  |  |
| Check condition and tension of drive belt replace if necessary |  |       |  |  |
| Lighting protection system must be less than 25 ohms           |  | ohms  |  |  |

**Lighted Wind Cone (Table 5-8) (AC 150/5340-26 5.6)**

|                            |  |  |
|----------------------------|--|--|
| Clean and grease bearings  |  |  |
| Read insulation resistance |  |  |

**Precision Approach Path Indicator (PAPI) (AC 150/5340-26 5.7)**

Check insulation resistance of underground cables and record the results:

|                |  |      |  |  |
|----------------|--|------|--|--|
| Runway 8 PAPI  |  | Ohms |  |  |
| Runway 33 PAPI |  | Ohms |  |  |

Check resistance of grounding system and record the results:

|                |  |      |  |  |
|----------------|--|------|--|--|
| Runway 8 PAPI  |  | Ohms |  |  |
| Runway 33 PAPI |  | Ohms |  |  |

**Runway End Identifier Lights (REILs) (AC 150/5340-26 5.9)**

|  |  |  |
|--|--|--|
| Check cabinets for cleanliness and moisture (Table 5-11) |  |  |
| Check electrical connections                             |  |  |
| Check alignment and elevation of unidirectional REIL     |  |  |
| Realign unidirectional REILs as required                 |  |  |
| Check baffles on REIL (if used)                          |  |  |

Date \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

HOLLYWOOD BURBANK AIRPORT - (BUR)  
SEMI-ANNUAL AIRPORT TEST RECORD

Inspection Performed by: \_\_\_\_\_ Initials \_\_\_\_\_ Comments \_\_\_\_\_

**Hazard Beacons and Obstruction Lights**

**(AC 150/530-26 5.11.1.3)**

Check insulation and ground resistance

|  |  |
|--|--|
|  |  |
|--|--|

|         | Location | Insulation<br>Resistance | Ground<br>Resistance |      |
|---------|----------|--------------------------|----------------------|------|
| Loc. 1  |          |                          |                      | Ohms |
| Loc. 2  |          |                          |                      | Ohms |
| Loc. 3  |          |                          |                      | Ohms |
| Loc. 4  |          |                          |                      | Ohms |
| Loc. 5  |          |                          |                      | Ohms |
| Loc. 6  |          |                          |                      | Ohms |
| Loc. 7  |          |                          |                      | Ohms |
| Loc. 8  |          |                          |                      | Ohms |
| Loc. 9  |          |                          |                      | Ohms |
| Loc. 10 |          |                          |                      | Ohms |
| Loc. 11 |          |                          |                      | Ohms |
| Loc. 12 |          |                          |                      | Ohms |
| Loc. 13 |          |                          |                      | Ohms |
| Loc. 14 |          |                          |                      | Ohms |

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**In-pavement Runway and Taxiway Lights**

**(AC 150/5340-26 5.3.4.1.4)**

Check torque on mounting bolts

Runway 15-33

Runway 8-26

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HOLLYWOOD BURBANK AIRPORT - (BUR)  
ANNUAL AIRPORT TEST RECORD

Date \_\_\_\_\_

Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_

Initials

Comments

**AIRFIELD LIGHTING VAULT**

Paint equipment as necessary

**Constant Current Regulators**

(AC 150-5340-26 5.2.3)

Perform Short Circuit Test

Short  
Circuit  
Test

Open Circuit  
Test

Perform Open Circuit Test

Runway 15-33

Runway 15-33 RGL

PAPI 33

Runway 8-26

Runway 8-26 RGL

PAPI 8

Taxiway A

Taxiway B

Taxiway C/G

Taxiway D

Taxiway D Centerline

Taxilane

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HOLLYWOOD BURBANK AIRPORT - (BUR)  
ANNUAL AIRPORT TEST RECORD

Date \_\_\_\_\_

Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_

Initials

Comments

**Rotating Beacon (Table 5-7)**

(AC 150/5340-26 5.5.2.4)

Check the base level in four directions  
adjust as necessary

Clean old grease from gears and regrease

Inspect all wiring, connects and relays

Check terminal lugs and conduit supports

Check condition of weather-proofing and  
gaskets, replace and clean as necessary

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**Lighted Wind Cone (Table 5-8)**

(AC 150/5340-26 5.6.1.6)

Check mounting bolts

Check wiring at hinge

Check grounding system resistance

Check paint on wind cone structure

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**Runway End Identifier Lights (REILs)**

(AC 150/5340-26 5.9)

Check power distribution equipment

Check insulation resistance of cables

Runway 15

Runway 33

Runway 26

Check resistance of grounding systems

Runway 15

Runway 33

Runway 26

Service timer motor and contacts

Check need for painting

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HOLLYWOOD BURBANK AIRPORT - (BUR)  
ANNUAL AIRPORT TEST RECORD

Date \_\_\_\_\_

Weather Conditions: \_\_\_\_\_

Inspection Performed by: \_\_\_\_\_

Initials

Comments

**Hazard Beacons and Obstruction Lights**

(AC 150/530-26 5.11)

|         | Location | Check Wire<br>and<br>Connects | Check<br>Voltage at<br>Lamp<br>Socket | Check<br>weather-<br>proofing | Check<br>Lightning<br>Protection |  |  |
|---------|----------|-------------------------------|---------------------------------------|-------------------------------|----------------------------------|--|--|
| Loc. 1  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 2  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 3  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 4  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 5  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 6  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 7  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 8  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 9  |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 10 |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 11 |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 12 |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 13 |          |                               | VAC                                   |                               |                                  |  |  |
| Loc. 14 |          |                               | VAC                                   |                               |                                  |  |  |

|         | Location | Check Power<br>Meter | Service<br>Lowering<br>and Other | Check<br>Change-<br>over<br>Relay | Clean and<br>Recondition |  |  |
|---------|----------|----------------------|----------------------------------|-----------------------------------|--------------------------|--|--|
| Loc. 1  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 2  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 3  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 4  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 5  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 6  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 7  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 8  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 9  |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 10 |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 11 |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 12 |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 13 |          |                      | VAC                              |                                   |                          |  |  |
| Loc. 14 |          |                      | VAC                              |                                   |                          |  |  |

They should flash at a rate of 20-40 flashes per minute

Check operation of photo-cell or other controls

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**EXHIBIT F**  
**Fee Schedule – Rate Sheet**

(attached)

|  |                                 |                                       |  |
|--|---------------------------------|---------------------------------------|--|
| <b>Burbank-Hollywood Airport Oncall Maintenance</b>                          |                                 |                                       |  |
| <b>Projected Contract Term: Feb 2021 thru January 2023</b>                   |                                 |                                       |  |
| <b><u>SEE ATTACHED<br/>CHECKLISTS FOR<br/>SPECIFIC SCOPE OF<br/>WORK</u></b> | <b><u>PROPOSED SCHEDULE</u></b> |                                       |  |
|  |                                 |                                       |  |
| <b><u>WORK PERIOD</u></b>  | <b><u>SCHEDULED DAYS</u></b>    | <b><u>ASSESMENTS TAKING PLACE</u></b> | <b><u>PROJECTED BILLING BASED ON ATTACHMENT F -<br/>FEE SCHEDULE</u></b> |
| Mar-21   |                                 | Quarterly                             | \$ 4,700.00  |
| Jun-21   |                                 | Quarterly/Semi-Annual                 | \$ 15,200.00   |
| Sep-21   |                                 | Quarterly                             | \$ 4,700.00  |
| Dec-21   |                                 | Quarterly/Semi-Annual/Annual          | \$ 18,700.00   |
| Mar-22   |                                 | Quarterly                             | \$ 4,700.00  |
| Jun-22   |                                 | Quarterly/Semi-Annual                 | \$ 15,200.00   |
| Sep-22   |                                 | Quarterly                             | \$ 4,700.00  |
| Dec-22   |                                 | Quarterly/Semi-Annual/Annual          | \$ 18,700.00   |
|  |                                 |                                       |  |
|  |                                 | <b>TOTAL BASE</b>                     | <b>\$ 86,600.00</b>  |

|   |  |   |
|---|--|---|
| <b><u>DAILY RATE FOR<br/>NORMAL TASK<br/>ORDERS</u></b> | <b>INCLUDED</b>  |   |
| <b>\$ 3,500.00</b>                                      | 2 Electricians, 1 truck<br>with Standard Tools<br>including travel | <b>**Based negotiated labor<br/>agreements anything over 4 hours is<br/>considered an 8 hr day.</b> |

**REVISION 1**

Bid Date: 11/25/2020

Time: 2:00PM

**Proposal for:****Burbank Oncall Elec Testing & Inspection Services-2 Year Ext**

from

**ROYAL ELECTRIC COMPANY**

8481 Carbide Court, Sacramento, CA 95828

(916) 226-2100

License: 357377 Type: A, B, C-10 DIR #1000000111

**Burbank Airport Authority**

Project No. A1256

| Item      | Description                        | Quantity | Unit | Unit Price    | Total Price      |
|-----------|------------------------------------|----------|------|---------------|------------------|
| <b>BB</b> | <b>Oncall Services</b>             |          |      |               |                  |
| 01        | Quarterly Testing And Inspection   | 8.00     | EA   | 4,700.0000    | 37,600.00        |
| 02        | Semi-Annual Testing And Inspection | 4.00     | EA   | 10,500.0000   | 42,000.00        |
| 03        | Annual Testing And Inspection      | 2.00     | EA   | 3,500.0000    | 7,000.00         |
|           |                                    |          |      | Total:        | 86,600.00        |
|           |                                    |          |      | <b>Total:</b> | <b>86,600.00</b> |

√ = Locked Bid-Item

! = Zero Total Price

12/03/2020 11:36 am

Estimator: Randy Sondreal



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**EXHIBIT G**  
**Non-AIP Project Federal Requirements**

1. General Civil Rights Provisions

Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance. This provision binds Contractor and subtier contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

2. Civil Rights – Title VI Assurance

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

A. Compliance with Regulations: Contractor 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.

B. Non-discrimination: Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. 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.

C. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by 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 Contractor of Contractor’s obligations under this contract and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.

D. Information and Reports: 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 Authority 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, Contractor will so certify to the Authority or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

E. Sanctions for Noncompliance: In the event of Contractor’s noncompliance with the Non-discrimination provisions of this contract, the Authority will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

1. Withholding payments to Contractor under the contract until Contractor complies;
- and/or
2. Cancelling, terminating, or suspending a contract, in whole or in part.

F. Incorporation of Provisions: 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. Contractor will take action with respect to any subcontract or procurement as the Authority or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, Contractor may request the Authority to enter into any litigation to protect the interests of the Authority. In addition, Contractor may request the United States to enter into the litigation to protect the interests of the United States.

G. 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:

1. 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);

2. 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);

3. 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);

4. 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;

5. The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);

6. Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

7. The Civil Rights Restoration Act of 1987, (PL 100-209), (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);

8. Titles II and III of the Americans with Disabilities Act of 1990, which 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 (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;

9. The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);

10. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;

11. Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

12. 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).

3. Federal Fair Labor Standards Act

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, 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. Contractor has full responsibility to monitor compliance to the referenced statute or regulation. Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

4. Occupational Safety and Health Act

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. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. Contractor retains full responsibility to monitor its compliance and its subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor 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.

## **EXHIBIT H**

### **General Provisions and Special Provisions**

(attached)

**GENERAL PROVISIONS**  
**AND**  
**SPECIAL PROVISIONS**  
**FOR**  
**AS18-01**  
**AIRFIELD LIGHTING INSPECTION, TESTING, AND ON-CALL REPAIR SERVICES**  
**HOLLYWOOD BURBANK AIRPORT**

## **GENERAL PROVISIONS**

### **SECTION 0. GENERAL PROVISIONS DEFINED**

#### **0-1 STANDARD SPECIFICATIONS**

The Work described herein shall be done in accordance with the provisions of the 2015 edition of "Standard Specifications for Public Works Construction" ("Standard Specifications"), except for those provisions that are expressly not incorporated by a provision in the Contract Documents.

#### **0-2 NUMBERING OF SECTIONS**

The numbering of sections and subsections in these General Provisions is compatible with the numbering in the Standard Specifications. Subsections of architectural and/or other work may be numbered according to the Construction Specifications Institute (CSI) format.

#### **0-3 SUPPLEMENTATION OF STANDARD SPECIFICATIONS**

The Sections that follow supplement, but do not replace, the Standard Specifications, except as otherwise indicated herein. In the event of any conflict between the Standard Specifications and these General Provisions, these General Provisions shall control.

### **SECTION 1. TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS**

Provisions below shall supplement, but not replace, those provisions in Section 1 of the Standard Specifications.

#### **1-2 TERMS AND DEFINITIONS**

Whenever in the Standard Specifications or in the Contract Documents the following terms are used, they shall be understood to mean the following:

Airport Designated Representative (ADR) – Person designated by the Director, Engineering and Planning to have design and/or construction management oversight responsibilities for the project.

Agency – The Burbank-Glendale-Pasadena Airport Authority.

Board – The Commission of the Burbank-Glendale-Pasadena Airport Authority.

Contract Documents – As defined in Standard Specifications Section 1-2, but also including the General Provisions and Special Provisions.

County – County of Los Angeles, California

Director, Engineering and Maintenance – Anthony DeFrenza, unless and until written notice of a change

in the Director, Engineering and Maintenance is given by the Authority to Contractor.

Engineer – Shall be the Engineer of Record.

Inspector – An authorized representative of the Authority, assigned by the Authority to make inspections of Work performed by or materials supplied by the Contractor.

Laboratory – A laboratory authorized by the Authority to test materials and Work involved in the Contract.

Project – See Work.

Submittal – Any drawing, calculation, specification, product data, samples, manuals, requests for substitutes, spare parts, photographs, survey data, traffic control plans, record drawings, Bonds or similar items required to be submitted to the Authority under the terms of the Contract.

### 1-3 ABBREVIATIONS

The institutions listed in Section 1-3.3 of the Standard Specifications shall be supplemented by the list below:

| <b>Abbreviation</b> | <b>Word or Words</b>   |
|---------------------|--|
| AAN .....           | American Association of Nurserymen   |
| ACI .....           | American Concrete Institute  |
| AGCA .....          | Associated General Contractors of America  |
| APWA .....          | American Public Works Association  |
| ASME .....          | American Society of Mechanical Engineers   |
| CRSI .....          | Concrete Reinforcing Steel Institute   |
| CSI .....           | Construction Specifications Institute  |
| IEEE .....          | Institute of Electric and Electronic Engineers   |
| NEC .....           | National Electric Code   |
| NEMA .....          | National Electrical Manufacturers Association  |
| NFPA .....          | National Fire Protection Association   |
| SSS .....           | State of California Standard Specifications,<br>Latest edition, Department of Transportation |
| SSP .....           | State of California Standard Plans,<br>Latest edition, Department of Transportation          |

## SECTION 2. SCOPE AND CONTROL OF THE WORK

The provisions below shall supplement, but not replace, those provisions in Section 2 of the Standard Specifications.

### 2-2 ASSIGNMENT

Any purported assignment without written consent of the Authority shall be null, void, and of no effect, and the Contractor shall hold harmless, defend and indemnify the Authority and its officers, officials, employees, agents and representatives with respect to any claim, demand or action arising from or relating to any unauthorized assignment.

If the Authority opts to consent to assignment, the Authority's consent shall be contingent upon: (1) a letter from the Surety agreeing to the assignment and assigning the Payment Bond to the assignee without any reduction, or the assignee supplying a new Payment Bond in the amount originally required under the Contract Documents; and (2) the assignee supplying all of the required insurance in the amounts required in the Contract Documents. Until the Surety assigns the Payment Bond or the assignee supplies a new Payment Bond, and until the assignee supplies all of the required insurance, an assignment otherwise consented to in writing by the Authority shall not be effective. Even if the Authority consents to assignment, no assignment shall relieve the Contractor of liability under the Contract.

## 2-4 CONTRACT BONDS

The Payment Bond shall remain in force until expiration of the time within which the California Labor Commissioner may serve a civil wage and penalty assessment against the principal, any of its subcontractors, or both the principal and its subcontractors pursuant to Labor Code Section 1741, and until the expiration of the time within which a joint labor management committee may commence an action against the principal, any of its subcontractors, or both the principal and its subcontractors pursuant to Labor Code Section 1771.2. The Payment Bond must be submitted using a form approved by Authority counsel.

## 2-5 PLANS AND SPECIFICATIONS

### 2-5.2 Precedence of the Contract Documents

With regard to Section 2-5.2 in the Standard Specifications, in the event of an actual conflict, the Special Provisions shall control over the Special Provisions, and the Request for Proposals shall control over the Proposal, such that the order of precedence shall be as follows:

1. Permits issued by regulatory agencies with jurisdiction.
2. Change Orders and Supplemental Agreements, whichever occurs last.
3. Airfield Lighting System Professional Services Agreement.
4. Addenda.
5. Request for Proposals.
6. General Provisions.
7. Special Provisions.
8. Standard Specifications.
9. Reference Specifications
10. Proposal.

## 2-7 SUBSURFACE DATA

If the Authority or its consultants have made investigations of subsurface conditions in areas where the Work is to be performed, such investigations shall be deemed made only for the purpose of study and design. If a geotechnical or other report has been prepared for the Project, the Contractor may inspect the records pertaining to such investigations subject to and upon the conditions hereinafter set forth. The inspection of the records shall be made in the Airport Engineering Office. It is the Contractor's sole responsibility to determine whether such investigations exist, and the Authority makes no affirmative or negative representation concerning the existence of such investigations.

The records of any such investigations are made available solely for the convenience of the Contractor. It is expressly understood and agreed that the Authority, the ADR, the Engineer, their agents, consultants or employees assume no responsibility whatsoever with respect to the sufficiency or accuracy of any investigations, the records thereof, and the interpretations set forth therein. No warranty or guarantee is expressed or implied that the conditions indicated by any such investigations or records are representative of those existing in the project area. The Contractor agrees to make such independent investigations and examination as necessary to be satisfied of the conditions to be encountered in the performance of the Work.

The Contractor represents that it has studied the Specifications and other Contract Documents, and all surveys and investigation reports of subsurface and latent physical conditions, has made such additional surveys and investigations as necessary for the performance of the Work at the Contract Price in accordance with the requirements of the Contract Documents, and that it has correlated the results of all such data with the requirements of the Contract Documents. No claim of any kind shall be made or allowed for any error, omission or claimed error or omission, in whole or in part, of any geotechnical exploration or any other report or data furnished or not furnished by the Authority.

## **2-10 INSPECTION**

The Contractor shall arrange and pay for all off-site inspection of the Work required by any ordinance or governing authorities. The Contractor shall also arrange and pay for other inspections, including tests in connection therewith, as may be assigned or required.

## **SECTION 3. CHANGES IN WORK**

The provisions below shall supplement, but not replace, those provisions in Section 3 of the Standard Specifications.

### **3-2 CHANGES INITIATED BY THE AGENCY**

The Authority reserves the right, without notice to the Surety, to increase or decrease the quantity of any item or portion of the Work described in the Contract Documents or to alter or omit portions of the Work so described, as may be deemed necessary or expedient by the ADR, without in any way making the Contract void. Such increases, alterations or decreases of Work shall be considered and treated as though originally contracted for, and shall be subject to all the terms, conditions and provisions of the original Contract. The Contractor shall not claim or bring suit for damages, whether for loss of profits or otherwise, on account of any decrease, alteration or omission of any kind of Work to be done.

### **EXTRA WORK**

New and unforeseen work will be classified as Extra Work only when the Work is not covered and cannot be paid for under any of the various items or combination of items for which a bid price appears on the Proposal. The Contractor shall not do any Extra Work except upon written order from the ADR.

## **SECTION 4. CONTROL OF MATERIALS**

### **MATERIALS AND WORKMANSHIP**

The provisions below shall supplement, but not replace, those provisions in Section 4-1 of the Standard Specifications.

The Contractor and all Subcontractors, suppliers, and vendors shall guarantee that the Work will meet all requirements of this Contract as to the quality of materials, equipment, and workmanship.

#### Test of Materials

Except as elsewhere specified, the Authority shall bear the cost of testing materials and workmanship that meet or exceed the requirements indicated in the Standard Specifications and the Special Provisions. The cost of all other tests, including the retesting of material or workmanship that fails to pass the first test, shall be borne by the Contractor.

If the Contractor requests to substitute an equivalent item for a brand or trade name item, the burden of proof as to the comparative quality and suitability of alternative equipment or articles or materials shall be upon the Contractor, and the Contractor shall furnish, at its own expense, all information necessary or related thereto as required by the ADR. All requests for substitution shall be submitted, together with all documentation necessary for the ADR to determine equivalence, no later than ten (10) Days after the contract award, unless a different deadline is listed in the Special Provisions.

## **SECTION 5 UTILITIES**

The provisions below shall supplement, but not replace, those provisions in Section 5 of the Standard Specifications.

### **5-1 LOCATION**

The location and existence of any underground Utility or substructure has not been obtained. The methods used and costs involved to locate existing elements, points of connection and all construction methods are the Contractor's sole responsibility. Accuracy of information furnished, as to existing conditions, is not guaranteed by the Authority. The Contractor, at its sole expense, must make all investigations necessary to determine locations of existing elements, which may include contacting Underground Service Alert and other private underground locating firm(s), utilizing specialized locating equipment, hand trenching, or both. For every Dig Alert Identification Number issued by Underground Service Alert during the course of the Project, the Contractor must submit to the Authority a copy of the Underground Service Alert form.

#### **5-1.3 Entry by Utility Owners**

The right is reserved to the owners of public utilities or franchises to enter the project site for the purpose of making repairs or changes in their property that may be necessary as a result of the Work as well as any other reason authorized by the Authority. When the Contract Documents provide for the utility owners to alter, relocate or reconstruct a Utility, or when the Contract Documents are silent in this regard and it is determined by the ADR that the utility owners must alter, relocate or reconstruct a Utility, the Contractor shall schedule and allow adequate time for those alterations, relocations or reconstructions by the respective utility owners. Authority employees and agents shall likewise have the right to enter upon the project site at any time and for any reason or no reason at all.

## 5-2 PROTECTION

If the Contractor damages or breaks the Utilities, it will be the Contractor's responsibility to repair the Utility at no cost to the utility owner or the Authority.

## 5-3 REMOVAL

Facilities encountered during the prosecution of the Work that are determined to be abandoned shall be removed by the Contractor as required for the Work, unless directed otherwise by the ADR. The remaining portion of the existing Utility which is left in place shall be accurately recorded, in elevation and plan, on the control set of Contract Drawings.

## 5-4 RELOCATION

The Contractor shall cooperate fully with all forces of the Authority or other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities that interfere with the progress of the Work. The Contractor shall schedule the Work so as to minimize interference with the relocation, altering, or other rearranging of facilities.

## 5-6 COOPERATION

The Contractor's attention is directed to the fact that Work may be conducted at or adjacent to the site by other contractors during the performance of the Work under this Contract. The Contractor shall conduct its operations so as to cause a minimum of interference with the work of such other contractors, and shall cooperate fully with such contractors to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts. Compensation for compliance shall be included in the various items of the Work, and no additional compensation shall be allowed therefor.

## 5-7 NOTIFICATION

The Contractor shall notify the ADR and the owners of all Utilities and substructures not less than forty-eight (48) hours before starting construction.

## **SECTION 6. PROSECUTION, PROGRESS AND ACCEPTANCE OF THE WORK**

The provisions below shall supplement, but not replace, those provisions in Section 6 of the Standard Specifications.

### TERMINATION OF THE CONTRACT FOR CONVENIENCE

In addition to the reasons for termination listed in Section 6-5 of the Standard Specifications, which allow termination upon any written notice, the Authority may cancel the Contract for any other reason or for no reason upon thirty (30) Days' written notice. The rest of the procedure outlined in Section 6-5 shall apply to such situation, including the Contractor's required immediate notification of Subcontractors and suppliers and the payment. In no event (including termination for impossibility or impracticability, due to conditions or events beyond the control of the Authority, for any other reason or for no reason) shall the

total amount of money to Contractor exceed the amount which would have been paid to Contractor for the full performance of the services described in the Contract.

Furthermore, some of the Authority's projects are funded in whole or in part by funds other than the Authority's general fund. If this Project is funded by such external funds in whole or in part, or if those external funds are terminated or reduced at any time and for any reason or for no reason at all, and the Authority determines at its discretion that no other funding is available for continuation of this Project, the Authority will not be obligated to continue funding for the services contained in these Contract Documents and may terminate the Project immediately. The Authority shall reimburse the Contractor for its work satisfactorily completed until the termination date. In no event shall the total amount of money to the Contractor exceed the amount which the Authority has received in funding from its external source. The Special Provisions may include further details in this regard.

#### DELAYS AND EXTENSIONS OF TIME

Unless otherwise agreed in writing, an adjustment to the Contract Time by reason of a Change Order shall be agreed to at the time the Change Order is issued and accepted by Contractor. If the Change Order does not reserve the right of the parties, or either of them, to seek an adjustment to the Contract Time, then the parties forever relinquish and waive such right and there shall be no further adjustments to the Contract Time.

##### Extensions of Time

In the event it is deemed appropriate by the Authority to extend the time for completion of the Work, any such extension shall not release any guarantee for the Work required by the Contract Documents, nor shall any such extension of time relieve or release the Sureties on the Bonds executed. In executing such Bonds, the Sureties shall be deemed to have expressly agreed to any such extensions of time. The amount of time allowed by an extension of time shall be limited to the period of the delay giving rise to the same as determined by the Authority. Notwithstanding any dispute which may arise in connection with a claim for adjustment of the Contract Time, the Contractor shall promptly proceed with the Work.

##### Payment for Delays

Notwithstanding any other terms and conditions of the Contract Documents, the Authority shall have no obligation whatsoever to increase the Contract Price or extend the time for delays.

Unless compensation and/or mark-up is agreed upon by the Authority, the Contractor agrees that no payment of compensation of any kind shall be made to the Contractor for damages or increased overhead costs caused by any delays in the progress of the Contract, whether such delays are avoidable or unavoidable or caused by any act or omission of the Authority or its agents. Any accepted delay claim shall be fully compensated for by an extension of time to complete the performance of the Work.

This Section shall not apply to compensable delays caused solely by the Authority. If a compensable delay is caused solely by the Authority, the Contractor shall be entitled to a Change Order that: (1) extends the time for completion of the Contract by the amount of delay caused by the Authority; and (2) provides equitable adjustment, as determined by the Authority, to the Contractor.

#### COMPLETION, ACCEPTANCE AND WARRANTY

## Acceptance

The Project will not be considered complete and ready for issuance of a Notice of Completion until all required Work is completed, the project site is cleaned up in accordance with Section 7-8 of the Standard Specifications, the General Provisions, and the Special Provisions, and all of the following items have been received by the ADR:

All written guarantees and warranties;

Duplicate copies of all operating instructions and manufacturer's operating catalogs and data, together with such field instructions as necessary to fully instruct Authority personnel in correct operation and maintenance procedures for all equipment installed listed under the electrical, air conditioning, heating, ventilating and other trades. This data and instructions shall be furnished for all equipment requiring periodic adjustments, maintenance or other operation procedures.

The Contractor shall allow at least seven (7) Working Days' notice for final inspection. Such notice shall be submitted to the ADR in writing.

## Warranty

For the purposes of the calculation of the start of the warranty period, the Work shall be deemed to be completed upon the date of recordation of the Notice of Completion. If that direction is contingent on the completion of any items remaining on a punchlist, the Work shall be deemed to be completed upon the date of the ADR's acceptance of the final item(s) on that punchlist.

The Contractor shall repair or replace defective materials and workmanship as required in Section 6-8.3 of the Standard Specification at its own expense. Additionally, the Contractor agrees to defend, indemnify and hold the Authority harmless from claims of any kind arising from damage, injury or death due to such defects.

The parties agree that no certificate given shall be conclusive evidence of the faithful performance of the Contract, either in whole or in part, and that no payment shall be construed to be in acceptance of any defective Work or improper materials. Further, the certificate or final payment shall not terminate the Contractor's obligations under the warranty herein. The Contractor agrees that payment of the amount due under the Contract and the adjustments and payments due for any Work done in accordance with any alterations of the same, shall release the Authority and its officers and employees from any and all claims or liability on account of Work performed under the Contract or any alteration thereof.

## **SECTION 7. RESPONSIBILITIES OF THE CONTRACTOR**

The first paragraph of Section 7-3.1 of the Standard Specifications shall not be incorporated and shall instead be replaced with the following:

The Contractor shall provide and maintain insurance naming the Authority and its officials, officers, employees, attorneys, agents, designated volunteers, and independent contractors in the role of Authority officials as insureds or additional insureds regardless of any inconsistent statement in the policy or any subsequent endorsement whether liability is attributable to the Contractor or the Authority. The insurance provisions shall not be construed to limit the Contractor's indemnity obligations contained in

the Contract. The Authority will not be liable for any accident, loss, or damage to the Work before completion, except as otherwise specified in Section 6-10.

The first sentence of Section 7-8.4.2 shall not be incorporated, and shall instead be replaced with the following:

Construction materials and equipment shall not be stored in Streets, roads, or highways unless otherwise specified in the Special Provisions or approved by the ADR.

The first sentence of the second paragraph of Section 7-9 of the Standard Specifications shall not be incorporated, and shall instead be replaced with the following:

The Contractor shall relocate, repair, replace, or reestablish all existing improvements within the project limits which are not designated for removal (e.g., curbs, sidewalks, driveways, signal loops, fences, walls, sprinkler systems, signs, Utility installations, pavements, structures, etc.) which are damaged or removed as a result of the Contractor's or the Subcontractors' operations or as required by the Plans and Specifications.

The last paragraph of Subsection 7-9 of the Standard Specifications shall not be incorporated, and shall instead be replaced with the following:

All costs to the Contractor for protecting, removing, restoring, relocating, repairing, replacing, or reestablishing existing improvements shall be included in the Proposal.

Section 7-12 of the Standard Specifications shall not be incorporated, and shall instead be replaced with the following:

The names, addresses and specialties of the Contractor, Subcontractors, architects or engineers may not be displayed on any signage within the public right-of-way. This signage prohibition includes advertising banners hung from truck beds or other equipment.

Otherwise, the provisions below shall supplement, but not replace, those provisions in Section 7 of the Standard Specifications.

#### THE CONTRACTOR'S EQUIPMENT AND FACILITIES

A noise level limit of 90 dbA at a distance of fifty (50) feet shall apply to all construction equipment on or related to the job whether owned by the Contractor or not. The use of excessively loud warning signals shall be avoided, except in those cases required for the protection of personnel.

#### LABOR

##### Public Work

The Contractor acknowledges that the Project is a "public work" as defined in Labor Code Section 1720 et seq. ("Chapter 1"), and that this Project is subject to (a) Chapter 1, including without limitation Labor Code Section 1771 and (b) the rules and regulations established by the California Department of Industrial Relations ("DIR") implementing such statutes. The Contractor shall perform all Work on the Project as a

public work. The Contractor shall comply with and be bound by all the terms, rules and regulations described in (a) and (b) as though set forth in full herein.

#### Copies of Wage Rates

Pursuant to Labor Code Section 1773.2, copies of the prevailing rate of per diem wages for each craft, classification, or type of worker needed to perform the Project are on file at the Airport Engineering Office and will be made available to any interested party on request. By initiating any Work on this Project, the Contractor acknowledges receipt of a copy of the DIR determination of such prevailing rate of per diem wages, and the Contractor shall post such rates at each job site covered by these Contract Documents.

#### Job Site Notices

The Contractor is required to post job site notices, as prescribed by regulation.

#### Failure to Pay Prevailing Rates

The Contractor shall comply with and be bound by the provisions of Labor Code Sections 1774 and 1775 concerning the payment of prevailing rates of wages to workers and the penalties for failure to pay prevailing wages. The Contractor shall, as a penalty paid to the Authority, forfeit two hundred dollars (\$200) for each calendar day, or portion thereof, for each worker paid less than the prevailing rates as determined by the DIR for the work or craft in which the worker is employed for any public work done pursuant to these Contract Documents by the Contractor or by any Subcontractor.

#### Apprentices

The Contractor shall comply with and be bound by the provisions of Labor Code Sections 1777.5, 1777.6 and 1777.7 and California Code of Regulations Title 8, Section 200 et seq. concerning the employment of apprentices on public works projects. The Contractor shall be responsible for compliance with these Sections for all apprenticeable occupations. Before commencing Work on this Project, the Contractor shall provide the Authority with a copy of the information submitted to any applicable apprenticeship program. Within sixty (60) Days after concluding Work, Contractor and each of its Subcontractors shall submit to the Authority a verified statement of the journeyman and apprentice hours performed under this Contract.

#### Debarment or Suspension

The Contractor shall not perform Work with any Subcontractor that has been debarred or suspended pursuant to California Labor Code Section 1777.1 or any other federal or state law providing for the debarment of contractors from public works. The Contractor and Subcontractors shall not be debarred or suspended throughout the duration of this Contract pursuant to Labor Code Section 1777.1 or any other federal or state law providing for the debarment of contractors from public works. If the Contractor or any Subcontractor becomes debarred or suspended during the duration of the Project, the Contractor shall immediately notify the Authority.

#### Payroll Records

The Contractor shall comply with and be bound by the provisions of Labor Code Section 1776, which requires the Contractor and each Subcontractor to (1) keep accurate payroll records and verify such records in writing under penalty of perjury, as specified in Section 1776, (2) certify and make such payroll records available for inspection as provided by Section 1776, and (3) inform the Authority of the location of the records. The Contractor has ten (10) Days in which to comply subsequent to receipt of a written notice requesting these records, or as a penalty to the Authority, the Contractor shall forfeit one hundred dollars (\$100) for each Day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

#### Hours of Labor

The Contractor acknowledges that eight (8) hours labor constitutes a legal day's work. The Contractor shall comply with and be bound by Labor Code Section 1810. The Contractor shall comply with and be bound by the provisions of Labor Code Section 1813 concerning penalties for workers who work excess hours. The Contractor shall, as a penalty paid to the Authority, forfeit twenty-five dollars (\$25) for each worker employed in the performance of this Project by the Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one calendar week in violation of the provisions of Division 2, Part 7, Chapter 1, Article 3 of the Labor Code. Pursuant to Labor Code Section 1815, work performed by employees of the Contractor in excess of eight (8) hours per day, and forty (40) hours during any one week shall be permitted upon public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1-1/2) times the basic rate of pay.

#### Registration with the DIR

In accordance with Labor Code Sections 1725.5 and 1771.1, no contractor or subcontractor shall be qualified to bid on, be listed in a bid proposal, subject to the requirements of Public Contract Code Section 4104, or engage in the performance of any contract for public work, unless currently registered and qualified to perform public work pursuant to Section 1725.5.

#### Compliance Monitoring and Posting Job Sites

This Project is subject to compliance monitoring and enforcement by the DIR. The Contractor shall post job site notices, as prescribed by regulation.

#### Subcontractors

For every Subcontractor who will perform Work on the Project, the Contractor shall be responsible for such Subcontractor's compliance with Chapter 1 and Labor Code Sections 1860 and 3700, and the Contractor shall include in the written contract between it and each Subcontractor a copy of the provisions in this Section 7-2 of the General Provisions and a requirement that each Subcontractor shall comply with those provisions. The Contractor shall be required to take all actions necessary to enforce such contractual provisions and ensure Subcontractor's compliance, including without limitation, conducting a periodic review of the certified payroll records of the Subcontractor. Upon becoming aware of the failure of the Subcontractor to pay its workers the specified prevailing rate of wages, the Contractor shall diligently take corrective action to halt or rectify any failure.

## Subcontractors/Vendors or Suppliers

Contractor shall be required to provide a photocopy of the full executed subcontract agreements for all DBE and Non-DBE Subcontractors, Vendors, or Suppliers. All subcontract agreements must be provided prior to submission of any Pay Application.

### 7-2.9 Prevailing Wage Indemnity

To the maximum extent permitted by law, the Contractor shall indemnify, hold harmless and defend (at the Contractor's expense with counsel reasonably acceptable to the Authority) the Authority, its officials, officers, employees, agents and independent contractors serving in the role of Authority officials, and volunteers from and against any demand or claim for damages, compensation, fines, penalties or other amounts arising out of or incidental to any acts or omissions listed in Section 7-2 of the General Provisions by any Person (including the Contractor, its Subcontractors, and each of their officials, officers, employees and agents) in connection with any Work undertaken or in connection with the Contract Documents, including without limitation the payment of all consequential damages, attorneys' fees, and other related costs and expenses. All duties of the Contractor under this Section 7-2.9 shall survive expiration or termination of the Contract.

## LIABILITY INSURANCE

The Contractor shall at all times during the term of the Contract carry, maintain, and keep in full force and effect the insurance referenced in Section 7-3 of the Standard Specifications, as modified below.

### Additional Insureds

The Authority and its officials, officers, employees, attorneys, agents, designated volunteers, and independent contractors in the role of Authority officials, shall be the insured or named as additional insureds covering the Work, regardless of any inconsistent statement in the policy or any subsequent endorsement, whether liability is attributable to the Contractor or the Authority.

### No Limitation on Indemnity

The insurance provisions shall not be construed to limit the Contractor's indemnity obligations contained in these Contract Documents.

### Replacement Insurance

The Contractor agrees that it will not cancel, reduce or otherwise modify the insurance coverage. The Contractor agrees that if it does not keep the required insurance in full force and effect, and such insurance is available at a reasonable cost, the Authority may take out the necessary insurance and pay the premium thereon, and the repayment thereof shall be deemed an obligation of the Contractor and the cost of such insurance may be deducted, at the option of the Authority, from payments due the Contractor. This shall be in addition to all other legal options available to the Authority to enforce the insurance requirements.

### Certificates of Insurance with Original Endorsements

The Contractor shall submit to the Authority certificates of insurance with the original endorsements, both of which reference the same policy number, for each of the insurance policies that meet the insurance requirements, not less than one (1) day before beginning of performance under the Contract. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. Endorsements may be executed on the Authority's standard forms titled "Additional Insured Endorsement," or on any other form that contains substantially the same terms and is approved by the Authority's Risk Manager. In any case, the endorsements must specifically name the Burbank-Glendale-Pasadena Airport Authority and its officials, officers, employees, attorneys, agents, designated volunteers, and independent contractors in the role of Authority officials as insureds or additional insureds. Current insurance certificates and endorsements shall be kept on file with the Authority at all times during the term of this Contract. The Authority reserves the right to require complete, certified copies of all required insurance policies at any time.

#### Subcontractors

The Contractor shall ensure all Subcontractors and their employees are listed as additional insureds on all of the Contractor's insurance.

#### General Liability Insurance

Instead of the minimum limits listed in Section 7-3.2 of the Standard Specifications, the coverage shall provide the following minimum limits:

| Insurance Coverage Requirements                      | Limits of Liability |
|--|---------------------|
| Comprehensive General Liability Aggregate Limit      | \$10,000,000        |
| Products/Completed Operations Hazard Aggregate Limit | \$10,000,000        |
| Bodily Injury Limit                                  | \$10,000,000        |
| Property Damage Limit                                | \$10,000,000        |
| Each Occurrence                                      | \$10,000,000        |

#### Workers' Compensation Insurance

The Workers' Compensation insurance shall have a minimum limit of One Million dollars (\$1,000,000) or the amount required by law, whichever is greater.

#### Automobile Insurance

Instead of the minimum limits listed in Section 7-3.4 of the Standard Specifications, the automobile insurance shall have a minimum limit of Ten Million dollars (\$10,000,000) per claim and occurrence and Ten Million dollars (\$10,000,000) in the aggregate for bodily injuries or death of one person and Ten Million dollars (\$10,000,000) for property damage arising from one incident.

#### INDEMNIFICATION

The following indemnity provisions shall supersede the indemnity in Section 7-3.1 of the Standard Specifications.

#### Contractor's Duty

To the maximum extent permitted by law, the Contractor hereby agrees, at its sole cost and expense, to defend with competent defense counsel approved by the Authority, protect, indemnify, and hold harmless the Authority and its officials, officers, employees, volunteers, attorneys, agents (including those Authority agents serving as independent contractors in the role of Authority representatives), successors, and assigns (collectively "Indemnitees") from and against any and all claims (including, without limitation, claims for bodily injury, death or damage to property), demands, charges, obligations, damages, causes of action, proceedings, suits, losses, stop payment notices, judgments, fines, liens, penalties, liabilities, costs and expenses of every kind and nature whatsoever, in any manner arising out of, incident to, related to, in connection with or resulting from any act, failure to act, error or omission of the Contractor or any of its officers, agents, attorneys, servants, employees, Subcontractors, material suppliers or any of their officers, agents, servants or employees, and/or arising out of, incident to, related to, in connection with or resulting from any term, provision, image, plan, covenant, or condition in the Contract Documents; including, without limitation, the payment of all consequential damages, attorneys' fees, experts' fees, and other related costs and expenses (individually, a "Claim," or collectively, "Claims"). The Contractor shall promptly pay and satisfy any judgment, award or decree that may be rendered against any of the Indemnitees as to any such Claim. The Contractor shall reimburse Indemnitees for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided. The Contractor's obligation to indemnify shall not be restricted to insurance proceeds, if any, received by the Contractor or Indemnitees. This indemnity shall apply to all Claims regardless of whether any insurance policies are applicable or whether the Claim was caused in part or contributed to by an Indemnitee.

#### Civil Code Exception

Nothing in this Section 7-4 shall be construed to encompass Indemnitees' sole negligence or willful misconduct to the limited extent that the underlying Contract is subject to Civil Code Section 2782(a) or the Authority's active negligence to the limited extent that the underlying Contract Documents are subject to Civil Code Section 2782(b), provided such sole negligence, willful misconduct or active negligence is determined by agreement between the parties or by the findings of a court of competent jurisdiction.

#### Nonwaiver of Rights

Indemnitees do not and shall not waive any rights that they may possess against the Contractor because the acceptance by the Authority, or the deposit with the Authority, of any insurance policy or certificate required pursuant to these Contract Documents. This indemnity provision is effective regardless of any prior, concurrent, or subsequent active or passive negligence by Indemnitees and shall operate to fully indemnify Indemnitees against any such negligence.

#### Waiver of Right of Subrogation.

The Contractor, on behalf of itself and all parties claiming under or through it, hereby waives all rights of subrogation and contribution against the Indemnitees, while acting within the scope of their duties, from

all Claims arising out of or incident to the activities or operations performed by or on behalf of the Contractor regardless of any prior, concurrent or subsequent active or passive negligence by Indemnitees.

#### Survival

The provisions of this Section 7-4 shall survive the expiration or termination of the Contract, are intended to be as broad and inclusive as is permitted by state law, and are in addition to any other rights or remedies that Indemnitees may have under the law. Payment is not required as a condition precedent to an Indemnitee's right to recover under this indemnity provision, and an entry of judgment against the Contractor shall be conclusive in favor of the Indemnitee's right to recover under this indemnity provision.

#### PERMITS

Before starting any construction work, the Contractor will be required to obtain all necessary permits from the Authority, as well as all other permits required from all other agencies. Should this Project require construction of trenches or excavations which are five (5) feet or deeper and into which a person is required to descend, the Contractor shall obtain a Cal/OSHA permit and furnish the Authority with a copy before Work can commence on this Project. Contractor shall bear all cost for fees for all agencies except for the Authority's permit fees.

#### COOPERATION AND COLLATERAL WORK

The Contractor shall be responsible for coordinating all Work with the Authority's street sweeping, trash pick-up, and street maintenance contractors, emergency services departments, utility companies' crews, and others when necessary. Payment for conforming to these requirements shall be included in other items of Work, and no additional payment shall be made thereof.

#### WORKSITE MAINTENANCE

Clean-up shall be done as Work progresses at the end of each day and thoroughly before weekends. The Contractor shall not allow the project site to become littered with trash and waste material, but shall maintain the same in a neat and orderly condition throughout the construction operation. Materials which need to be disposed shall not be stored at the project site, but shall be removed by the end of each Working Day. If the job site is not cleaned to the satisfaction of the ADR, the cleaning will be done or contracted by the Authority and shall be back-charged to the Contractor and deducted from the Contract Price.

The Contractor shall make arrangements for storing its equipment and materials. The Contractor shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the Work. Approved areas within project site may be used for temporary storage; however, the Contractor shall be responsible for obtaining any necessary permits from the Authority. In any case, the Contractor's equipment and personal vehicles of the Contractor's employees shall not be parked on the traveled way or on any section where traffic is restricted at any time.

The Contractor shall deliver, handle, and store products in accordance with the manufacturer's written recommendations and by methods and means that will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the project site and overcrowding of construction spaces. In particular, the Contractor shall provide delivery and

installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss.

Storage shall be arranged to provide access for inspection. The Contractor shall periodically inspect to assure products are undamaged and are maintained under required conditions.

The Contractor shall promptly remove from the vicinity of the completed Work, all rubbish, debris, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the Work by the Authority will be withheld until the Contractor has satisfactorily complied with the foregoing requirements for final clean-up of the project site.

All costs associated with the clean-up and storage required to complete the Project shall be the sole responsibility of the Contractor.

#### SAFETY

The provisions below shall supplement but not replace those provisions in Subsection 7-10 of the Standard Specifications.

##### Haul routes

Subsection 7-10.3 of the Standard Specifications shall be deleted and replaced as follows:

The Contractor must obtain the ADR's approval before using any haul routes. Further detail requirements for haul traffic are delineated in the Special Provisions.

##### Steel Plate Covers

The Contractor shall cover all openings, trenches and excavations at the end of each Work Day with steel plate covers.

#### RECYCLING OF MATERIALS

Subsection 7-15 is hereby added to the Standard Specifications as follows:

Recycling of Asphalt Concrete, Portland Cement Concrete, Aggregate Base, and Green Waste are Required

The records of disposal, including scale tonnages, shall be furnished to the Authority on a monthly basis. Failure to comply with the requirements of this Section will result in delay of progress payment.

##### Contractor's Obligation

The Authority is committed to a recycling program. If available, it is the obligation of the Contractor, under this Contract, to recycle the waste material through an approved recycling plant. Records and reports of waste recycle will be submitted to the Authority on a regular monthly basis.

## **SECTION 8. FACILITIES FOR AGENCY PERSONNEL**

The provisions of Section 8 of the Standard Specifications shall apply except as modified herein. No field offices for Authority personnel shall be required; however, Authority personnel shall have the right to enter upon the Project at all times and shall be admitted to the offices of the Contractor to use the telephone, desk and sanitary facilities provided by the Contractor for its own personnel.

## **SECTION 9. MEASUREMENT AND PAYMENT**

The provisions below shall supplement, but not replace, those provisions in Section 9 of the Standard Specifications.

### **AUDIT**

The Authority or its representative shall have the option of inspecting and/or auditing all records and other written materials used by the Contractor in preparing its billings to the Authority as a condition precedent to any payment to the Contractor or in response to a construction claim or a Public Records Act (Government Code Section 6250 et seq.) request. The Contractor will promptly furnish documents requested by the Authority at no cost. Additionally, the Contractor shall be subject to State Auditor examination and audit at the request of the Authority or as part of any audit of the Authority, for a period of three (3) years after final payment under the Contract. The Contractor shall include a copy of this Section 9-4 in all contracts with its Subcontractors, and the Contractor shall be responsible for immediately obtaining those records or other written material from its Subcontractors upon a request by the State Auditor or the Authority. If the Project includes other auditing requirements, those additional requirements will be listed in the Special Provisions.

## **SECTION 10. ADDITIONAL TERMS**

### **10-1 NONDISCRIMINATORY EMPLOYMENT**

The Contractor shall not unlawfully discriminate against any individual based on race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation or military and veteran status. The Contractor understands and agrees that it is bound by and will comply with the nondiscrimination mandates of all statutes and local ordinances and regulations.

### **10-2 NOTICE TO PROCEED**

Upon award of this Contract and signing the Contract Documents, the Authority shall issue the Contractor a Notice to Proceed. The Authority will not authorize any Work to be done under these Contract Documents before the Contract has been fully executed. Any Work that is done by the Contractor in advance of such time shall be considered as being done at the Contractor's own risk and responsibility, and as a consequence will be subject to rejection.

### **10-3 CONTRACTOR'S RESPONSIBILITY FOR WORK**

Until the final acceptance of the Work by the Authority as defined in Section 6-8.2 of the General Provisions, by written action of the ADR, the Contractor shall have the charge and care thereof and shall

bear the risk of injury or damage to any part of the Work by the action of the elements, criminal acts, or any other cause. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the Work occasioned by any cause before its completion and acceptance and shall bear the expense thereof, except for such injuries or damages arising from the sole negligence or willful misconduct of the Authority, its officers, agents or employees. In the case of suspension of Work from any cause whatever, the Contractor shall be responsible for all materials and the protection of Work already completed, shall properly store and protect them if necessary, and shall provide suitable drainage and erect temporary structures where necessary.

#### 10-4 PROCEDURE IN CASE OF DAMAGE TO PUBLIC PROPERTY

Any portions of curb, gutter, sidewalk or any other Authority improvement damaged by the Contractor during the course of construction shall be replaced by the Contractor at its own cost. The cost of additional replacement of curb, gutter or sidewalk in excess of the estimated quantities shown in the Bid form and Specifications, and found necessary during the process of construction (but not due to damage resulting from carelessness on the part of the Contractor during its operation), shall be paid to the Contractor at the unit prices submitted in the Bid.

#### 10-5 REMOVAL OF INTERFERING OBSTRUCTIONS

The Contractor shall remove and dispose of all debris, abandoned structures, tree roots and obstructions of any character encountered during the process of excavation. It is understood that the cost of any such removals are made a part of the unit price bid by the Contractor under the item for excavation or removal of existing Work.

#### 10-6 ACCESS TO PRIVATE PROPERTY

Unless otherwise stated in the Special Provisions, the Contractor shall be responsible for all fees and costs associated with securing permission to access private property for any portion of the Project.

#### 10-7 WORKING DAYS AND HOURS

The Contractor shall do all Work between the hours as specified in the Drawings and Specifications. There are no limitations on the days of the week or Holidays. No Work will be allowed on Authority holidays, which are as follows: New Years Day, Martin Luther King, Jr. Day, Presidents Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving, Christmas Eve, Christmas Day, unless otherwise authorized in writing 72 hours in advance of proposed Work Day.

In addition, no Work will be allowed on any special Election Day that may be declared. Should a special Election Day be declared, a time extension of one (1) Working Day will be granted for each such Day.

A permit may have other hours or Days for the Contractor to do the Work, and those hours and Days shall supersede any hours and Days written in this Section.

Whenever the Contractor is permitted or directed to perform night Work or to vary the period during which Work is performed during the Working Day, the Contractor shall give twelve (12) hours' notice to the ADR so that inspection may be provided. Also, a charge may be made to the Contractor for approved overtime or weekend inspections requested by the Contractor.

#### 10-8 CLAIM DISPUTE RESOLUTION

In the event of any dispute or controversy with the City over any matter whatsoever, the Contractor shall not cause any delay or cessation in or of Work, but shall proceed with the performance of the Work in dispute. The Contractor shall retain any and all rights that pertain to the resolution of disputes and protests between the parties. The Disputed Work will be categorized as an “unresolved dispute” and payment, if any, shall be as later determined by mutual agreement or a court of law. The Contractor shall keep accurate, detailed records of all Disputed Work, claims and other disputed matters.

All claims arising out of or related to the Contract Documents or this Project, and the consideration and payment of such claims, are subject to the Government Claims Act (Government Code Section 810 et seq.) with regard to filing claims. All such claims are also subject to Public Contract Code Section 9204 and Public Contract Code Section 20104 et seq. (Article 1.5), where applicable. This Contract hereby incorporates those provisions as though fully set forth herein. Thus, the Contractor or any Subcontractor must file a claim in accordance with the Government Claims Act as a prerequisite to filing a construction claim in compliance with Section 9204 and Article 1.5 (if applicable), and must then adhere to Article 1.5 and Section 9204, as applicable, pursuant to the definition of “claim” as individually defined therein.

#### 10-9 THIRD PARTY CLAIMS

The Authority shall have full authority to compromise or otherwise settle any claim relating to the Project at any time. The Authority shall timely notify the Contractor of the receipt of any third-party claim relating to the Project. The Authority shall be entitled to recover its reasonable costs incurred in providing this notice.

#### 10-10 COMPLIANCE WITH LAWS

The Contractor shall comply with all applicable federal, state and local laws, ordinances, codes and regulations in force at the time the Contractor performs pursuant to the Contract Documents.

#### 10-11 CONTRACTOR’S REPRESENTATIONS

By signing the Contract, the Contractor represents, covenants, agrees, and declares under penalty of perjury under the laws of the State of California that: (a) the Contractor is licensed, qualified, and capable of furnishing the labor, materials, and expertise necessary to perform the services in accordance with the terms and conditions set forth in the Contract Documents; (b) there are no obligations, commitments, or impediments of any kind that will limit or prevent its full performance under the Contract Documents; (c) there is no litigation pending against the Contractor that could adversely affect its performance of the Contract, and the Contractor is not the subject of any criminal investigation or proceeding; and (d) to the Contractor’s actual knowledge, neither the Contractor nor its personnel have been convicted of a felony.

#### 10-12 CONFLICTS OF INTEREST

The Contractor agrees not to accept any employment or representation during the term of the Contract or within twelve (12) months after acceptance as defined in Section 6-8.2 of the General Provisions that is or may likely make the Contractor “financially interested,” as provided in Government Code Sections 1090 and 87100, in any decisions made by the Authority on any matter in connection with which the Contractor has been retained pursuant to the Contract Documents.

#### 10-13 APPLICABLE LAW

The validity, interpretation, and performance of these Contract Documents shall be controlled by and construed under the laws of the State of California, excluding California's choice of law rules. Venue for any such action relating to the Contract shall be in the Los Angeles County Superior Court.

#### 10-14 TIME

Time is of the essence in these Contract Documents.

#### 10-15 INDEPENDENT CONTRACTOR

The Contractor and Subcontractors shall at all times remain, as to the Authority, wholly independent contractors. Neither the Authority nor any of its officials, officers, employees or agents shall have control over the conduct of the Contractor, Subcontractors, or any of their officers, employees, or agents, except as herein set forth, and the Contractor and Subcontractors are free to dispose of all portions of their time and activities that they are not obligated to devote to the Authority in such a manner and to such Persons that the Contractor or Subcontractors wish except as expressly provided in these Contract Documents. The Contractor and Subcontractors shall have no power to incur any debt, obligation, or liability on behalf of the Authority, bind the Authority in any manner, or otherwise act on behalf of the Authority as agents. The Contractor and Subcontractors shall not, at any time or in any manner, represent that they or any of their agents, servants or employees, are in any manner agents, servants or employees of the Authority. The Contractor and Subcontractors agree to pay all required taxes on amounts paid to them under the Contract, and to indemnify and hold the Authority harmless from any and all taxes, assessments, penalties, and interest asserted against the Authority by reason of the independent contractor relationship created by the Contract Documents. The Contractor shall include this provision in all contracts with all Subcontractors.

#### 10-16 CONSTRUCTION

In the event of any asserted ambiguity in, or dispute regarding the interpretation of any matter herein, the interpretation of these Contract Documents shall not be resolved by any rules of interpretation providing for interpretation against the party who causes the uncertainty to exist or against the party who drafted the Contract Documents or who drafted that portion of the Contract Documents.

#### 10-17 NON-WAIVER OF TERMS, RIGHTS AND REMEDIES

Waiver by either party of any one (1) or more of the conditions of performance under these Contract Documents shall not be a waiver of any other condition of performance under these Contract Documents. In no event shall the making by the Authority of any payment to the Contractor constitute or be construed as a waiver by the Authority of any breach of covenant, or any default that may then exist on the part of the Contractor, and the making of any such payment by the Authority shall in no way impair or prejudice any right or remedy available to the Authority with regard to such breach or default.

#### 10-18 TERM

The Contract is effective as of the Effective Date listed, and shall remain in full force and effect until the Contractor has fully rendered the services required by the Contract Documents or the Contract has been

otherwise terminated by the Authority. However, some provisions may survive the term listed within this Section, as stated in those provisions.

#### 10-19 NOTICE

Except as otherwise required by law, any notice or other communication authorized or required by these Contract Documents shall be in writing and shall be deemed received on (a) the day of delivery if delivered by hand or overnight courier service during the Authority's regular business hours or (b) on the third (3rd) business day following deposit in the United States mail, postage prepaid, to the address listed on the Contractor's Bid and to the Airport Engineering Office, or at such other address as one party may notify the other.

#### 10-20 SEVERABILITY

If any term or portion of these Contract Documents is held to be invalid, illegal, or otherwise unenforceable by a court of competent jurisdiction, the remaining provisions of these Contract Documents shall continue in full force and effect.

### **END OF GENERAL PROVISIONS**

## **SPECIAL PROVISIONS**

### **SECTION 1. LIQUIDATED DAMAGES**

#### **1-02 Runway/Night Work Area Operations**

The Contractor shall pay the Authority as liquidated damages (but not as a penalty): (i) the sum of Five Thousand Dollars (\$5,000) for the first fifteen (15) minute period of each morning that a runway or identified night work area is not opened for operations at the listed time; (ii) an additional Five Thousand Dollars (\$5,000) for the second fifteen (15) minute period of each morning that a runway or identified night work area is not opened at the listed time; and (iii) an additional Fifty Thousand Dollars (\$50,000) per hour (or portion of an hour) thereafter of each morning that a runway or identified night work area is not opened for operations at the listed time.

#### **1-03 Incursions**

The Contractor shall confine its apparatus, the storage of materials and the operations of its workmen to limits indicated by law and directions of the ADR. The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Access on or near runways, taxiways, or the Security Identification Display Area ("SIDA") is absolutely prohibited, except with continuous escort by an authorized agent of the Authority. The Contractor shall pay the Authority as liquidated damages (but not as a penalty) the sum of Five Thousand Dollars (\$5,000) per instance of unapproved vehicular incursion or access on a runway, taxiway, or SIDA. This provision is limited to damages for disruption in airport operations and/or security. This provision shall not apply to any damages to property or personal injury arising out of any incursion, and the Contractor shall be fully liable for the full amount of all of such damages.

#### **1-04 Traffic Safety**

The Contractor shall keep the work site, and adjacent areas, in a neat, clean and orderly manner. If there exists a situation which is deemed unsafe for vehicle or pedestrian traffic, the ADR may stop the Work and order the appropriate corrective action at no additional expense to the Authority. If the Contractor fails to remedy the deficiency in a reasonable time frame, the Authority may clean or make whatever changes are necessary to the site using its own forces, and may charge the Contractor for associated expenses. In addition, the Contractor shall pay the Authority as liquidated damages (but not as a penalty) the sum of One Hundred Dollars (\$100.00) per hour until the remediation work is complete.

#### **1-05 Acknowledgements**

Liquidated damages are cumulative for each item. The Authority shall not be liable to the Contractor or any Subcontractor for any losses or damages incurred by the Contractor or any such Subcontractor arising from the Contractor's, or any such Subcontractor's inability to complete the Work prior to the expiration of the construction period.

The parties agree that the Authority would suffer substantial damages as the result of any delays by the Contractor in completing the items described above within the applicable time periods specified above, and that it would be impracticable or extremely difficult to fix the actual amount of damages caused by

such delays. Therefore, the parties agree that the above amounts are reasonable approximations of the actual damages to be suffered by the Authority by reason of any such delays.

## **SECTION 2. FIELD ACCESS IDENTIFICATION PROGRAM**

### **2-01 Applications**

The following information must be provided to the Authority before any type of field access badge may be issued:

1. List of company officials with samples of its signatures who may authorize production of new badges and the reissue of expired badges.
2. Company phone numbers for verification purposes.
3. List of all employees and dates of hire who will need field/ramp access I.D. cards.
4. A brief description of the area where access is required.
5. All employees requiring unescorted access and vehicle driving privileges to the worksite must submit to a criminal history records check a minimum of two weeks prior to the project start date. Applicants who successfully complete the criminal history check will need to schedule a two hour airport security and driver's training class with Airport Operations. Applicants will be badged upon successful completion of this class and will be eligible to escort other employees on the work site.

The Contractor shall bear all expense associated with processing employees through the Criminal History Records Check and Badging (currently \$60/Applicant, fingerprinting \$30/Applicant). Contact the Administrative Specialist at (818) 840-8833 for more information.

6. An applicant information form approved by the manager listed in item (1) one for each employee.

Employees that are approved to have an I.D. card must show a current Driver's License before processing can begin.

Photos for I.D. cards are taken Monday through Friday 8:00 a.m. to 4:00 p.m., and will be issued at that time.

At the completion of the project all badges issued to contractor or subcontractor shall be returned to Airport Operations. Failure to return the Identification Badge will result in forfeiture of retention payment in the amount of \$150.00 per badge not returned.

### **2-02**

The Contractor will have a specified number of access points to the AOA dependent upon its work area. The Contractor is responsible for the security of specified AOA access points. If the Contractor wishes to use a gate guard to secure a gate, the guard must be badged under the responsibility of the Contractor. If at any time, airport security of the gate is compromised because of Contractor or a Subcontractor personnel's dereliction of duty, the Project will be shut-down until investigation is complete and the

Operations Department Representative instructs personnel to resume construction activity. The Contractor and Subcontractor personnel must abide by Airport, FAA, TSA, local laws, rules and regulations. Failures to do so will subject the individual to Violation Enforcement Program established by the Authority and possible criminal prosecution.

## 2-03 Vehicles

Gate access and driving privileges on the AOA must be approved by the ADR or his/her designated representative. The field driving privilege is contingent upon compliance with all rules and regulations as stipulated by the Authority. Infractions of the Motor Vehicle Rules and Regulations of the Authority will result in an immediate escort off of airport property and may result in the assessment of runway/taxiway incursion liquidated damages, as specified above.

### **SECTION 3. REQUIRED SECURITY TRAINING**

Any project involving access to the Security Identification Display Area ("SIDA") requires the following:

1. Security training pursuant to Federal Aviation Regulation 107.25 must be received by sufficient personnel to ensure that at least one individual who has received the training is present at the job site at all times.
2. Security training is offered by Airport Operations and can be coordinated by contacting the Manager, Airport Operations or an Operations Duty Supervisor.

### **SECTION 4. AIRPORT REGULATIONS**

The Contractor shall abide by the rules, regulations and requirements of the Authority relating to access to and protection of property. The Contractor shall also abide by the directions of the ADR, as well as by applicable regulations of the FAA.

### **SECTION 5. QUALITY CONTROL/QUALITY ASSURANCE**

#### 5-01 Quality Control

Quality Control is the inspection, analysis, and control over what is being done, manufactured, or fabricated, so that the specified level of quality is achieved and maintained. The Contractor has the sole responsibility for all Quality Control of the work. The Contractor shall hire and pay for an independent firm that will perform inspections, tests, and other quality control services required by the ADR. Employment of testing laboratory shall in no way relieve Contractor of its obligation to perform Work in accordance with requirements of Contract Documents.

#### 5-02 Quality Assurance

Quality Assurance is the inspection, testing, and other relevant actions taken by an owner or its representative to ensure that the desired level of quality is in accordance with the applicable standards or specifications for the product or work. The Authority will test or observe at its discretion to see that the specified standards of the specifications and Governing Agencies are met by the Contractor.

## **SECTION 6. SAFETY**

### **6-01 General**

The provisions of this safety and security plan and associated procedures are applicable within the boundaries of the Airport. A complete understanding of all procedures and requirements contained herein is required to ensure safety during construction. This safety plan is a part of this Agreement and deviations from the requirements established herein will be sufficient cause for contract termination.

Required reference material associated with this safety plan includes:

FAA AC 150/5200 18C, Airport Safety Self-Inspection

FAA AC 150/5210-5B, Painting, Marking and Lighting of Vehicles Used on an Airport

FAA AC 150/5370 2E, Operational Safety on Airports During Construction

FAA AC 150/5370-13A, Offpeak Construction of Airports Using Hot-Mix Asphalt

Copies of these documents are available on the FAA website:

[http://www.faa.gov/airports\\_airtraffic/airports/resources/advisory\\_circulars/](http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/).

### **6-02 Contractor Safety Officer Appointment**

The Contractor shall appoint its on-site Construction Superintendent or other qualified individual(s) as its duly authorized representative to serve as Contractor Safety officer (CSO) for the duration of the contract. The CSO shall thoroughly understand the safety and security requirements of this Agreement, the necessity for them and shall have sufficient authority to implement its provisions without significant deviation. The Contractor shall notify the ADR in writing of the name of the individual(s) selected for the assignment.

The CSO shall represent the Contractor on safety and security requirements compliance. The CSO shall be especially knowledgeable regarding the requirements of FAA AC's 150/5200 18, Airport Self Inspection Guide and 150/5370 2 Operational Safety on Airports During Construction, latest edition.

### **6-03 Contractor Safety Officer Responsibilities**

Prior to the desired date for commencement of the Work, the CSO shall accomplish the following:

1. Develop and submit in writing a detailed work sequence schedule with dates and times specified for all milestone events. This sequence schedule shall conform, as a minimum, to the events specified in Section 7-04 below, and shall be subject to the approval of the ADR. To assure adequate time for coordination, this document shall be submitted at least one week prior to the date of the preconstruction conference.
2. Develop and submit in writing a detailed outline of the procedures to be followed to maintain safety and security of both Contractor operations and the integrity of airport landside and airside operations during the prosecution of contract work. This plan shall detail, in addition, the procedures to

be followed in the event of an accident or fire involving Contractor personnel and the Contractor's efforts to maintain fire protection and security. These procedures shall be subject to the approval of the ADR and reflect any change as may be deemed necessary.

3. Conduct at least one meeting of all Contractor supervisory personnel prior to the start of the Work. The purpose of this meeting is to review the approved work sequence schedule and safety and security procedures. Attendance at this meeting by the CSO, all Contractor supervisory personnel and the ADR is mandatory. This meeting shall also be open to other employees of the Contractor and others as the ADR may deem appropriate. Minutes of this meeting shall be taken by the CSO, copies provided to each supervisor and kept on file in the Contractor's construction office for periodic review and updating.

4. Develop a safety and security orientation program and provide a briefing for all employees of the Contractor and Subcontractors that will be used on the project. A similar briefing will be given to new employees prior to their use on the Work. In addition, the CSO shall be responsible for briefing, from time to time, all Contractor personnel on any changes to safety and security measures deemed necessary.

#### 6-04 Construction Sequencing

The Contractor shall prepare a construction schedule and submit to the ADR at least one week prior to the pre-construction conference.

The Contractor shall acquaint its supervisors and employees with the sequence of construction and the relationship to airport activity and aircraft operations that are inherent to this airport. No runway, taxiway, apron or airport roadway shall be closed without the written approval of the ADR, to enable necessary NOTAMS and/or advisories to airport fixed based operators, tenants and users.

The Contractor shall contact the ADR a minimum of ten (10) days prior to any requested closing.

Any construction activity within 200 feet of the centerline of an active runway or within 85 feet of the centerline of an active taxiway or apron requires the closure of the affected area. These safety areas are shown on the phasing plan.

The ADR will arrange for an inspection prior to return to service of any facility, that has been closed for work, on or adjacent thereto, or that has been used for a crossing point or haul route by the Contractor.

#### 6-05 Marking and Lighting

Proper marking and lighting of areas on the airfield associated with the construction shall be the responsibility of the Contractor. This will include properly marking and lighting closed runways, taxiways, taxilanes, and aprons, the limits of construction, material storage areas, equipment storage areas, haul routes, parking areas and other areas defined as required for the Contractor's exclusive use. The Contractor shall erect and maintain around the perimeter of these areas suitable marking and warning devices visible for day and night use. Temporary barricades, flagging, and flashing warning lights shall be required at critical access points. The type and location of marking and warning devices will be approved by the ADR.

Special emphasis shall be given to open trenches, excavations, heavy equipment marshalling areas, and stockpiled material located in the airport operations area, which shall be predominantly marked by the

Contractor with flags and lighted by approved light units during hours of restricted visibility and darkness. All marking shall be in accordance with FAA Advisory Circular (AC) 150/5340 1J or latest edition.

#### 6-06 Traffic Control

The Contractor shall establish and maintain a list of Contractor and subcontractor vehicles authorized to operate on the site. Contractor employee vehicles shall be restricted to the Contractor's staging area and are not allowed in the AOA at any time. To be authorized to operate on the airport, each Contractor or subcontractor's vehicle shall:

1. Be marked/flagged for high daytime visibility and lighted for nighttime operations. Vehicles that are not marked and/or lighted shall be escorted by a vehicle appropriately marked and/or lighted. Vehicles requiring escort shall be identified on the list.
2. Be identified with the name and/or logo of the Contractor and be of sufficient size to be identified at a distance. Vehicles needing intermittent identification could be marked with tape or with commercially available magnetically attached markers. Vehicles that are not appropriately identified shall be escorted by a vehicle that conforms to this requirement. Vehicles requiring escort shall be identified on the list.
3. Be operated in a manner that does not compromise the safety of either landside or airside airport operations. If, in the opinion of the ADR, any vehicle is operated in a manner not fully consistent with this requirement, the ADR has the right to restrict operation of the vehicle or prohibit its use on the airport.

#### 6-07 Construction Site Access.

The Contractor's access to the site shall be as shown on the Contract Layout Plan. No other access points shall be allowed unless approved by the ADR. All Contractor traffic authorized to enter the site shall be experienced in the route or guided by Contractor personnel. The Contractor shall be responsible for traffic control to and from the various construction areas on the site, and for the operation and security of the access gate to the site. A Contractor's flagman or traffic control person shall monitor and coordinate all Contractor traffic at the access gate with Airport Security. The Contractor shall not permit any unauthorized construction personnel or traffic on the site. Access gates to the site shall be locked and secured at all times when not attended by the Contractor. If the Contractor chooses to leave any access gate open, it shall be attended by Contractor personnel who are familiar with the requirements of the Airport Security Program. The Contractor is responsible for the immediate cleanup of any debris deposited along the access route as a result of his construction traffic. Directional signing from the access gate along the delivery route to the storage area, plant site or work site shall be as directed by the ADR. In addition, the following requirements are applicable:

1. All Contractor traffic authorized to travel on the airport shall have been briefed as part of the Contractor's construction safety and security orientation program, be thoroughly familiar with the access procedures and route for travel or be escorted by personnel authorized by the CSO.
2. The Contractor shall install work site identification signs at the authorized access point(s). If, in the opinion of the ADR, directional signs are needed for clarity, they shall be installed along the route authorized for access to each construction site.

3. Under no circumstance will Contractor personnel be permitted to drive their individually owned vehicles to any construction site on the airport. All vehicles must be parked in the area designated for employee parking and out of secured airport property.

4. In addition to the inspection and cleanup required at the end of each shift, the Contractor is responsible for the immediate cleanup of any debris generated along the construction site access route(s) as a result of construction related traffic or operations whether or not created by Contractor personnel.

#### 6-08 Material Suppliers

All material suppliers, subcontractors and visitors to the work site are obligated to follow the same safety and security operating procedures as the Contractor. All material suppliers shall make their deliveries using the same access points and routes as the Contractor and shall be advised of the appropriate delivery procedures at the time the materials order is placed. The Contractor shall not use the Airport address for any delivery but shall use the street address appropriate to the location of the entrance of the work site. If it is not practical to conform to the vehicle identification requirements and the safety and security operations program requirements, the Contractor shall be prepared to escort all suppliers, subcontractors and visitors while they are on the airport.

#### 6-09 Personnel Identification.

All employees, agents, vendors, invitees, etc. of the Contractor or subcontractors requiring access to the construction site shall, conform to the Security Program. The Contractor is required to remove all materials and equipment not approved to stay within the work area at the end of each shift. At the end of the project all badges issued to personnel necessary to facilitate the Work shall be returned to the Authority prior to final payment.

#### 6-10 General Safety Requirement

All Contractor vehicles that are authorized to operate on the airport outside of the designated construction area limits or haul routes as defined herein shall display in full view above the vehicle a flashing amber (yellow) dome-type light or a three foot by three foot, or larger, orange and white checkerboard flag, each checkerboard color being one foot square. Vehicles must be under control of a Contractor mobile (two-way) radio operator (flagmen) monitoring the Airport frequency. Vehicle operators must be vigilant for conflict with any aircraft and give way to any operating aircraft.

All Contractor vehicles that are required to operate outside of the construction area limits as defined herein and cross active runways, taxiways, aprons, or runway approach clear zones shall do so under the direct control of a flagman who is monitoring the Airport frequency. Flagmen and two way radios shall be furnished by the Contractor. Flagmen shall be instructed in the use of two way radios prior to use. All aircraft traffic on runways, taxiways and aprons shall have priority over Contractor's traffic.

Construction vehicles not in use for extended periods during the work day, or during nights and weekends (nonwork periods) shall be parked away from active runways, taxiways, and aprons in designated vehicle marshalling areas.

In order to protect all aircraft traffic, aviation related businesses, terminal apron areas, etc. from potential damage caused by foreign object debris ("FOD") generated by construction activities, the Contractor shall

provide a vacuum truck as required at the startup of construction to daily vacuum all pavements affected by construction. The vacuum truck shall remain on-site for the duration of the project and shall be available at the discretion of the Authority to vacuum pavement areas adjacent to the construction areas to ensure no FOD is present on pavements within 500 feet of any construction area. Protecting the aircraft, airport tenants, users, public, etc. against FOD is a critical safety issue therefore the cost of the vacuum truck will be included in the cost established for this specification item.

#### 6-10 Construction Control

A primary and alternate responsible Contractor's representative shall be designated by the Contractor. The Contractor's representatives shall be available locally on a 24 hour basis. Names of the primary and alternate, including phone number, shall be made available to the ADR by the Contractor. The Contractor shall insure that the names and phone numbers are kept current and made available to the ADR.

#### 6-11 Construction Techniques

Construction shall be planned and conducted throughout this project in such a manner as to allow the maintenance of completely safe airport operations. Every effort shall be made to reduce the impact of construction activity on overall airport operations. To this end the Contractor's activities shall be conducted in such a manner so as to preclude, except where absolutely required, open excavations, trenches, ditches and above ground obstacles such as booms on cranes or obstacle markers such as wooden saw horses. The primary responsibility for assuring that the safest possible construction techniques are followed rests with the Contractor.

### **END OF SPECIAL PROVISIONS**

**EXHIBIT I**  
**Wildlife Hazard Management Plan**

(attached)



**BOB HOPE AIRPORT  
WILDLIFE HAZARD  
MANAGEMENT PLAN**

**Submitted to:  
Bob Hope Airport  
2627 Hollywood Way  
Burbank, CA 91505**

**Submitted by:  
AMEC Environment & Infrastructure, Inc.  
10670 White Rock Road, Suite 100  
Rancho Cordova, California 95670-6032**

**May 2014**

**AMEC Project No. 1355100006  
Revision Number 4**

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**Federal Aviation Administration**

**JUN 1 2015**

**GEA  
INSPECTOR**

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## ACRONYMS AND ABBREVIATIONS

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|        |  |
|--------|--|
| AC     | Advisory Circular  |
| ACM    | Airport Certification Manual                               |
| AMEC   | AMEC Environment & Infrastructure, Inc.                    |
| AOA    | Air Operations Area  |
| ATCT   | Air Traffic Control Tower (FAA)                            |
| BUR    | Bob Hope Airport   |
| CDFG/W | California Department of Fish and Game/Wildlife            |
| CFR    | Code of Federal Regulations                                |
| ESA    | Endangered Species Act                                     |
| FAA    | Federal Aviation Administration                            |
| FBO    | Fixed Base Operator  |
| FIFRA  | Federal Insecticide, Fungicide, and Rodenticide Act        |
| FOD    | Foreign Object Debris                                      |
| ILS    | Instrument Landing System                                  |
| MBTA   | Migratory Bird Treaty Act                                  |
| NEPA   | National Environmental Policy Act                          |
| Ops    | Airport Operations Department and/or personnel             |
| PIREP  | Pilot Report   |
| USDA   | U.S. Dept. of Agriculture                                  |
| USFWS  | U.S. Dept. of the Interior, U.S. Fish and Wildlife Service |
| WHA    | Wildlife Hazard Assessment                                 |
| WHMP   | Wildlife Hazard Management Plan                            |

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## 1.0 INTRODUCTION

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A Wildlife Hazard Assessment (WHA) was completed for Bob Hope Airport (BUR) in October 2012 (AMEC 2012) and submitted to the Federal Aviation Administration (FAA). On 13 December 2012 the FAA completed their review of the WHA (FAA Western-Pacific Region 2012), and required that a Wildlife Hazard Management Plan (WHMP) be prepared for BUR and added to the Airport Certification Manual (ACM). In reaching this decision, the FAA considered the WHA, the aeronautical activity at the airport, the views of the certificate holder and airport users, and other pertinent information (FAA 2012).

The WHA identified a number of wildlife hazards and attractants at BUR. These included birds, primarily rock pigeons, landscaping that included wildlife food and shelter attractants, and buildings that allowed access to wildlife for shelter. Immediately outside of the airport, landscaping exists that provides shelter to wildlife, and one drainage source is present which conveys water onto the airport. Two and one-half miles to the east, Burbank Landfill #3 attracts large numbers of birds, which could be mitigated by changing practices there. Bodies of water to the north and south, Hansen Dam and the Los Angeles River respectively, also attract large numbers of birds, including waterfowl. Little can be done to mitigate wildlife populations at those locations, but their threat is minimized by distance (three miles plus).

The goal of the WHMP, as identified in FAA (2012) is to minimize the risk to aviation safety, airport structures or equipment, and human health posed by populations of hazardous wildlife on and around the airport. This WHMP will accomplish this through the identification of hazardous wildlife and their attractants, suitable proactive and reactive management techniques, necessary resources and supplies to successfully implement a wildlife hazard management program, and personnel responsibilities and training requirements. Appropriate wildlife control permits will be identified, as will a schedule and methodology for evaluating and updating the WHMP.

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## 2.0 WHMP REGULATORY REQUIREMENTS

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### 2.1 FAA Requirements

#### 2.1.1 Requirements for Wildlife Hazard Assessments

Title 14 of the Code of Federal Regulations (CFR) 139.337(b)(1–4) requires that, in a manner authorized by the Administrator, each Part 139 certificate holder must ensure that a WHA is conducted when any of the following events occurs on or near the airport:

- a) An air carrier aircraft experiences multiple wildlife strikes
- b) An air carrier aircraft experiences substantial damage from striking wildlife
- c) An air carrier aircraft experiences an engine ingestion of wildlife
- d) Wildlife of a size, or in numbers, capable of causing an event described in paragraph (b)(1), (2), or (3) of this section is observed to have access to any airport flight pattern or aircraft movement area

Title 14 CFR 139.337 (c)(1–5) provides specific guidance as to what facts must be addressed in a WHA. When complete, the WHA is submitted by the airport to the FAA for review and approval. The FAA uses it to determine if the airport must prepare a WHMP. In reaching this decision, the FAA considers the WHA, the aeronautical activity at the airport, the views of the certificate holder and airport users, and any other pertinent information (14 CFR 139.337 (d)(1–6)).

#### 2.1.2 Wildlife Hazard Management Plan Regulatory Requirements and Methodology

14 CFR 139.337 (f)(1–7) provides specific guidance as to what facts must be addressed in a WHMP:

- 14 CFR 139.337 (f)(1). “A list of the individuals having authority and responsibility for implementing each aspect of the plan.
- 14 CFR 139.337 (f)(2). “A list prioritizing the following actions identified in the ASSESSMENT and target dates for their initiation and completion.”
  - 14 CFR 139.337 (f)(2)(i). Wildlife population management.
  - 14 CFR 139.337 (f)(2)(ii). Habitat modification.
  - 14 CFR 139.337 (f)(2)(iii). Land use changes.
- 14 CFR 139.337 (f)(3). “Requirements for and, where applicable, copies of local, State, and Federal wildlife control permits.”
- 14 CFR 139.337 (f)(4). “Identification of resources that the certificate holder will provide to implement the plan.”
- 14 CFR 139.337 (f)(5) “Procedures to be followed during air carrier operations that at a minimum includes—“

- 14 CFR 139.337 (f)(5)(i) "Designation of personnel responsible for implementing the procedures."
- 14 CFR 139.337 (f)(5)(ii) "Provisions to conduct physical inspections of the aircraft movement areas and other areas critical to successfully manage known wildlife hazards before air carrier operations begin."
- 14 CFR 139.337 (f)(5)(iii) "Wildlife hazard control measures."
- 14 CFR 139.337 (f)(5)(iv) "Ways to communicate effectively between personnel conducting wildlife control or observing wildlife hazards and the air traffic control tower."
- 14 CFR 139.337 (f)(6) "Procedures to review and evaluate the wildlife hazard management plan every 12 consecutive months or following an event described in paragraphs (b)(1), (b)(2), and (b)(3) of this section," including:
  - 14 CFR 139.337 (f)(6)(i) "The plans effectiveness in dealing with known wildlife hazards on and in the airport's vicinity and:"
  - 14 CFR 139.337 (f)(6)(ii) "Aspects of the wildlife hazards described in the wildlife hazard assessment that should be reevaluated."
- 14 CFR 139.337 Comments (f)(7) "A training program conducted by a Qualified Airport Wildlife Biologist to provide airport personnel with the knowledge and skills needed to successfully carry out the wildlife hazard management plan required by paragraph (d) of this section."

## **2.2 National Environmental Policy Act Review**

Before the FAA approves a WHMP, the FAA must determine whether or not the plan involves extraordinary circumstances (FAA Order 1050.1E CHG1, paragraphs 303c and 304) (FAA 2006). If a WHMP does not involve extraordinary circumstances, the FAA may categorically exclude the Plan from National Environmental Policy Act (NEPA) review under FAA Order 1050.1E, paragraph 308e. Once a WHMP is approved, it is included in the airport's Airport Certification Manual and is enforceable.

## **2.3 Local, State, and Federal Wildlife Control Permits**

### **2.3.1 Federal**

Congress has passed several acts for the protection of wildlife including the Migratory Bird Treaty Act (MBTA), the Lacey Act (LA), the Endangered Species Act (ESA), Bald and Golden Eagle Protection Act (BGEPA), NEPA, and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). These laws are the foundation of most wildlife regulations that have been published in the CFR. Several agencies are responsible for implementing these regulations and many of these regulations affect wildlife control operations at airports. Federal wildlife laws are administered by the U.S. Fish and Wildlife Service (USFWS). The USFWS is primarily responsible for enforcement of the MBTA, BGEPA, and the ESA. MBTA and ESA permits from the USFWS must be updated annually unless otherwise stated on the permit. BUR holds a MBTA depredation permit from the USFWS (Appendix A) that expired 1/31/2012. BUR has applied for a renewed permit and approval has been pending for an extended duration due to USFWS backlog. The depredation permit does not cover eagles or threatened/endangered

species, nor does it cover application of pesticides. The wildlife coordinator will keep this permit current by applying for renewal no later than 30 days prior to expiration. If activities not covered by the permit become necessary, the wildlife coordinator will either hire contractors holding such permits, or will contact the local office of U.S. Dept. of Agriculture (USDA) Wildlife Services for assistance in obtaining any other needed federal depredation permits.

### **2.3.2 State**

The State of California recognizes and accepts the Federal MBTA depredation permit for the take of migratory bird species, and accepts limited and authorized wildlife hazing, harassment, and depredation to protect the health, safety, and welfare of the traveling public (Official California Legislative Information 2012). Wildlife control firms must be state licensed for trapping nuisance animals (CDFG 2008). For assistance in obtaining any other needed state depredation permits, BUR will contact the local office of USDA Wildlife Services.

### **2.3.3 Local**

Los Angeles County, the City of Los Angeles, and the City of Burbank may have local regulations on firearms, domestic animals, and/or wildlife which may affect BUR wildlife control operations. Most notably, Burbank Municipal Code 5-1-908 states: "No person shall kill, destroy or rob the nest of any songbird" and Los Angeles Municipal Code 53.48 states: "No person shall kill any song bird or destroy or rob the nest of any such bird." "Songbird / song bird" are imprecise terms which are open to interpretation, but the most scientific definition is: "any passerine bird of the suborder Oscines." That would include hazardous birds such as ravens, crows, starlings, and blackbirds.

## **2.4 Federal and State-Listed Threatened and Endangered Species, and Species of Special Concern**

The ESA directs all Federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the ESA. Section 7 of the ESA, called "Interagency Cooperation," is the mechanism by which Federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. This section also describes procedures for responding to requests by state wildlife agencies to facilitate and encourage habitats for state-listed threatened and endangered species or species of special concern that occur on airports and may pose a threat to aviation safety.

The FAA's action in requiring an airport operator to develop, submit for approval, and implement a Plan is considered a Federal action, as defined in the ESA, and therefore, subject to potential section 7 consultation with the USFWS. In these instances, the local USFWS Ecological Services Field Office must be contacted for information regarding the presence of Federally-listed or proposed species or designated or proposed critical habitat occurring on or near the airport.

BUR falls under the jurisdiction of the Carlsbad Fish and Wildlife Office of the USFWS. The USFWS was contacted for a list of any threatened or endangered species that potentially occur in the BUR area. They sent an official species list, a document which identifies threatened,

endangered, and proposed species, designated critical habitat, and candidate species that may occur within the BUR boundary and/or may be affected by the WHMP. No critical or proposed critical habitat and no species which are candidates to be listed were identified. The following four threatened/endangered species of the region were on the list:

- Coastal California gnatcatcher (*Polioptila californica californica*), Listing Status: Threatened
- Least Bell's vireo (*Vireo bellii pusillus*), Listing Status: Endangered
- Nevin's barberry (*Berberis nevinii*), Listing Status: Endangered
- Thread-Leaved brodiaea (*Brodiaea filifolia*), Listing Status: Threatened

No habitat for any of these species occurs on or adjacent to BUR, and none of these species have been observed at BUR.

BUR and its environs does not provide permanent habitat for any state-listed threatened or endangered species or species of special concern. No species of this kind are to be expected, with the possible rare exception of a passing migrant bird. One state-listed as threatened species, the Swainson's hawk, was seen during the WHA. This was at Valhalla Cemetery in April 2011, at a time of peak migration for the species. This species does not nest in the BUR area, but could be a strike risk in migration, when they sometimes form large flocks. That type of occurrence is very unlikely at BUR, but if any Swainson's hawk(s) do appear, standard harassment techniques, not including lethal control, will be employed to move the bird out of harm's way. This methodology will be used for any other state-listed threatened or endangered species as well. Also, there have been no requests by state wildlife agencies to facilitate and encourage habitat for state-listed threatened and endangered species and species of special concern, and it is improbable that any such request would ever be made, so that will not be an issue dealt with by this WHMP.

No animals that are state or federally listed as threatened or endangered are expected at BUR, with the possible rare exception of a passing migrant bird. BUR and its environs does not provide permanent habitat for any such animals. If any such passing listed species was to occur and present a hazard to aircraft, standard harassment techniques, not including lethal control, will be used to move the bird out of harm's way. Therefore, none of the proposed WHMP activities require Section 7 Consultation with the USFWS.

## **2.5 Pesticides and Herbicides**

BUR maintenance staff use Aquaneat herbicide within the Air Operations Area (AOA). This does not require any licensing. No other pesticides are used by BUR staff, though contractors may use pesticides on a case-by-case basis and will be expected to hold all necessary licenses for their application.

## 3.0 IMPLEMENTATION OF THE WHMP

---

### 3.1 Individuals Having Authority and Responsibility for WHMP Implementation

Regardless of the responsibilities delegated below, all personnel working in the AOA have a responsibility to report wildlife immediately to the Wildlife Coordinator or the coordinator's agent. Following is a list of BUR staff with WHMP decision authority for the following roles and/or departments, and a description of their role in implementing the WHMP. Also included are non-BUR entities that could be involved in implementing the WHMP.

#### 1. Wildlife Coordinator – Airside Manager or Designee

The Wildlife Coordinator will be competent and knowledgeable in wildlife identification, biology, and ecology; trained in proper dispersal, capture, and take methods, and familiar with safe operations in airport environments in regard to wildlife. The coordinator will have strong public and interpersonal communication skills. The coordinator will be dedicated to responding to and monitoring all wildlife related activities. When the Wildlife Coordinator is not on duty, his responsibilities will be delegated to another Operations Supervisor, who shall be trained in wildlife hazard identification and abatement in accordance with Part 139 requirements. The coordinator will see that requirements of this WHMP are fulfilled. No other duties will be assigned that would prevent the coordinator from effectively performing their wildlife related duties, which include:

- Obtaining the appropriate wildlife control permits and supplies.
- Maintaining the database of wildlife hazard management activities, as well as wildlife strike information collected from pilot reports, Air Traffic Control Tower (ATCT) reports, mechanical inspections, and runway sweeps.
- Making arrangements for the proper instruction of airport personnel who are involved in the implementation of wildlife hazard management.
- Ensuring that BUR personnel, FBOs and pilots remain familiar with the proper procedures for reporting all types of wildlife strikes and to make FAA Form 5200-7 (bird strike report form) or access to the online version readily available.
- Implementing wildlife control measures.
- Reviewing and monitoring all proposed land-use projects or changes on airport property and adjacent lands that could increase wildlife hazards at BUR. The wildlife coordinator will proactively ensure that potential wildlife hazards are addressed in the planning stages of such projects before they become a problem that requires a reactive solution.
- Establishing a wildlife committee for disseminating wildlife hazard information and coordinating control activities. The committee will be comprised of representatives from all airport departments including administration, operations, maintenance, security, fire department, the ATCT, and Fixed Base Operators (FBOs). At a minimum, the wildlife committee will meet on a quarterly basis to discuss progress with wildlife activities. More frequent meetings may be called if a situation arises that requires the committees' immediate attention. The recommendations of the committee will be shared as necessary with adjacent landowners to ensure wildlife control is properly coordinated. The committee will also act as or appoint a Wildlife Hazard Working Group during reviews of the WHMP.

- Coordination with ATCT, FBOs, pilots etc to alter operations as necessary until the threats clear or they respond to hazards with mitigation techniques.

## **2. Operations Personnel**

Operations personnel (Ops) regularly patrol the AOA and airport during all hours, and are contacted by Communications Center. During patrols, they will always act as "Wildlife Control Personnel." They will be responsible for watching for wildlife and sign of wildlife, dispersing wildlife, and checking for potential wildlife attractants or access points. Other duties may be assigned by the Wildlife Coordinator as needed. Wildlife control will be discussed with the wildlife coordinator. When the wildlife coordinator is not on duty, the airside operations supervisor will act as the agent for the coordinator.

## **3. Maintenance Manager**

The maintenance manager will ensure that on-duty Maintenance Department personnel understand that they are responsible for maintaining airport facilities and landscaping and deterrents as directed by this WHMP and the Wildlife Coordinator. They will also be responsible for disposing of abandoned equipment / supplies and removing abandoned structures, and for installing wildlife exclusion devices on such until disposed of. They will report all wildlife sightings to the Wildlife Coordinator or agent.

## **4. Airport Police Department**

The Airport Police Department will ensure that on-duty police officers understand that they must report all wildlife sightings to the wildlife coordinator or agent. They will be asked to assist in lethal wildlife control and firearms/pyrotechnics training as needed. Any breaches found in security fencing will also constitute a breach in wildlife exclusion, and will be reported to the wildlife coordinator.

## **5. Airport Director**

The airport director will ensure that senior airport management devote appropriate resources and attention to maintaining wildlife hazard control and training at a high level at BUR.

## **6. Planning Department**

The engineering manager will ensure that BUR Planning Department staff consider wildlife hazards when developing master plans and project-level plans for BUR. They shall also regularly communicate with the Wildlife Coordinator regarding plans for hangar renovations, lot conversions, etc. to ensure that wildlife hazard abatement is included at the appropriate planning state (e.g., ensuring netting is placed during a hangar rebuild rather than having to retrofit after completion or identifying vacant areas of BUR where birds gather where development would be beneficial to reducing wildlife strike hazards).

## **7. Finance Department**

Finance Department staff will ensure that funding for necessary wildlife hazard abatement equipment, staffing, or maintenance projects (e.g., fence replacement) is given appropriate priority.

## **8. Air Traffic Control Tower**

On-duty ATCT personnel will immediately report wildlife sightings / hazards /strikes to the wildlife coordinator or agent. They will not approve landings or takeoffs while a

hazard is present in the flight path. Specific warnings regarding wildlife hazards will be broadcast to pilots via voice communications and ATIS as per FAA Order 7110.65.

#### **9. Pilots**

Pilots will be asked to immediately report all wildlife sightings or strikes to the ATCT as per standard Pilot Report (PIREP) protocol. The ATCT will direct pilots to not take off or land while a wildlife hazard is present in the flight path. Pilots will report any suspected bird/wildlife strikes through their organization, maintenance operations, airport operations, and/or ATCT.

#### **10. Airlines**

Airlines will be asked to maintain their facilities, such as baggage handling, in such a way as to exclude wildlife. They will be asked to instruct their pilots not to take off or land while a wildlife hazard is present. All wildlife sightings will be immediately reported to the wildlife coordinator or agent. Any evidence of a wildlife strike found on or around aircraft will be collected and turned in to the on-duty Airside Supervisor and/or Wildlife Coordinator.

#### **11. Fixed-Based Operators**

FBOs will maintain their facilities in such a way as to exclude, and not attract, wildlife. All wildlife sightings will be immediately reported to the Communications Center. Nests in their facilities, old or new, will be removed and exclusion devices will be installed at nest sites. Suspected or known bird/wildlife strikes to aircraft will be reported to the Communications Center, airport operations, and/or ATCT as appropriate.

#### **12. Airside/Landside Tenants**

Airside/landside tenants, such as occupants of the T-hangars will maintain their facilities in such a way as to exclude, and not attract, wildlife. All wildlife sightings will be immediately reported to the Communications Center.

### **3.2 Recommended Actions to Reduce Wildlife Strike Hazard**

Section 14 CFR 139.337 (f)(2) calls for a list prioritizing the actions identified in the WHA with target dates for their initiation and completion. This includes problem wildlife populations and wildlife attractants (food, cover, and water), and proposed mitigation actions. This section will discuss these actions.

BUR has taken many past steps towards reducing wildlife hazards. These have included:

- Occasional use of hazing devices such as pyrotechnics and propane cannons
- Occasional use of lethal control of species that could not be dispersed by hazing
- Removal of coyotes in the Instrument Landing System (ILS) field
- Mowing to a height of 6 to 12 inches
- Installation of exclusion netting at some locations
- Appropriate maintenance of landscaping at some locations
- Legal action against a persistent wildlife attractant source
- Bait stations to reduce small mammal populations of the airport

- Reduction of habitat through paving in some areas
- Fence maintenance and improvements in some areas
- Record keeping of patrols, actions, strikes, etc.

The actions above have reduced wildlife hazards at BUR, but not eliminated them. The WHA recommended the following actions:

- Designate a Wildlife Coordinator
- Form a Wildlife Committee
- Develop a Comprehensive WHMP Based on the Assessment (this document)
- Maintain Permits and Contractors to Control Wildlife
- Train Personnel in Wildlife Hazing Procedures and Species Identification
- Maintain and Improve Wildlife-Aircraft Strike Reporting
- Have Control Supplies (Pyrotechnics, Effigies, etc.) On Hand
- Adopt a Zero-Tolerance Policy toward Hazardous Wildlife
- Continue and Expand the Active Wildlife Hazard Control Program
- Continue Monitoring Wildlife Populations and Use Patterns on the Airfield
- Work with Adjacent Landowners to Manage Wildlife Hazards
- Maintain Records for Wildlife Strikes and Control/Hazing Actions
- Adopt a Vegetation Management Policy on the Airfield
- Maintain Shrubs and Trees Appropriately
- Eliminate Areas of Temporary Standing Water
- Evaluate Potential Wildlife Hazards When Planning Land Use Changes
- Close Gaps under or within the Perimeter Fence and Access Gates
- Implement a Mammal Control Program
- Remove Nests in Facilities
- Haze Consistently
- Reduce Perching Opportunities for Birds near the Movement Area
- Adopt a Policy of Lethal Control (Shooting) for Persistent Wildlife
- Maintain a High Level of Garbage Control
- Improve Communications regarding Wildlife Hazards
- Improve Involvement of Operations & Scheduling in Wildlife Reporting/Avoidance
- Improve Air Traffic Control Wildlife Advisories
- Implement Specific Recommendations for Fixed Based Operators (FBOs)

Planned WHMP actions and target implementation timelines in response to the recommended actions in the WHA are summarized in Table 1 below and discussed in detail in the following sections.

**Table 1**  
**WHMP Actions by Location, including Target Implementation**

| <b>Airport Property Actions</b>  |  |  | <b>Non-Airport Property Actions</b>  |                                 |
|--|--|--|--|---------------------------------|
| <b>AOA</b>   | <b>Within Two Miles of AOA</b>   | <b>Airport Structures Action / Target Date</b>   | <b>Within Two Miles of AOA</b>   | <b>Within Five Miles of AOA</b> |
| Equip vehicles with control & deterrent supplies<br><b>Target Date:</b><br>Within two weeks of WHMP approval, with monthly restocking and reordering | Equip vehicles with control & deterrent supplies<br><b>Target Date:</b><br>Within two weeks of WHMP approval, with monthly restocking and reordering |  |  |                                 |
| Haze hazardous bird guilds<br><b>Target Date:</b><br>Immediately   | Haze hazardous bird guilds<br><b>Target Date:</b><br>Ongoing, as encountered   | Haze hazardous bird guilds<br><b>Target Date:</b><br>Ongoing, as encountered   |  |                                 |
| Physical inspections for wildlife hazards<br><b>Target Date:</b><br>Ongoing, daily or more of runways, taxiways, AOA; monthly ILS                    | Physical inspections for wildlife hazards<br><b>Target Date:</b><br>Ongoing, monthly   | Physical inspections for wildlife hazards<br><b>Target Date:</b><br>Ongoing, monthly (airport controlled properties); yearly (AOA Tenants) | Monitor for wildlife attractants & take action against wildlife attractors, as feasible<br><b>Target Date:</b><br>Ongoing, monthly |                                 |
| Lethal action against persistent bird hazards<br><b>Target Date:</b><br>Ongoing, within one week of observation                                      | Lethal action against persistent bird hazards<br><b>Target Date:</b><br>Ongoing, within one week of observation                                      | Lethal action against persistent bird hazards<br><b>Target Date:</b><br>Ongoing, within one week of observation                            |  |                                 |
| Mammal trapping or extermination<br><b>Target Date:</b><br>Full implementation within 1 year of WHMP approval  | Mammal trapping or extermination<br><b>Target Date:</b><br>Full implementation within 1 year of WHMP approval  | Mammal trapping or extermination<br><b>Target Date:</b><br>Full implementation within 1 year of WHMP approval                              |  |                                 |
| Eliminate insect infestations that attract wildlife<br><b>Target Date:</b><br>Ongoing, within one week of any outbreak                               | Eliminate insect infestations that attract wildlife<br><b>Target Date:</b><br>Ongoing, within one week of any outbreak                               | Eliminate insect infestations that attract wildlife<br><b>Target Date:</b><br>Ongoing, within one week of any outbreak                     |  |                                 |

**Table 1**  
**WHMP Actions by Location, including Target Implementation**

| <b>Airport Property Actions</b>   |   |  | <b>Non-Airport Property Actions</b>  |   |
|---|---|--|--|---|
| <b>AOA</b>  | <b>Within Two Miles of AOA</b>  | <b>Airport Structures Action / Target Date</b>   | <b>Within Two Miles of AOA</b>   | <b>Within Five Miles of AOA</b>   |
| Garbage containers covered at all times<br><b>Target Date:</b><br>Ongoing, immediate  | Garbage containers covered at all times<br><b>Target Date:</b><br>Ongoing, immediate  | Garbage containers covered at all times within open buildings<br><b>Target Date:</b><br>Ongoing, immediate   |  |   |
| Eliminate depressions that hold water<br><b>Target Date:</b><br>Ongoing, during routine resurfacing   | Eliminate depressions that hold water<br><b>Target Date:</b><br>Ongoing, during routine resurfacing   |  | Eliminate flow from Plaza Del Sol<br><b>Target Date:</b><br>Discussion with owner within three months of WHMP approval to achieve resolution |   |
| Eliminate broadleaved weeds and maintain grasses short to prevent seeding<br><b>Target Date:</b><br>Contract herbicide application & hydromulching immediately.<br>Maintain vegetation short at all times | Eliminate fruiting trees from landscaping<br><b>Target Date:</b><br>Immediate, monthly inspection and fruit removal until trees can be replaced | FBO tenants will be required to: report all wildlife; not feed wildlife or allow access to food, water, or shelter; remove any nests; & install exclusion at nest sites following removal.<br><b>Target Date:</b><br>Noticing of tenants immediately, ongoing monitoring |  |   |
| Reduce perching opportunities in the movement area<br><b>Target Date:</b><br>Deterrents installed on structures used for perching within two years  | Thin landscaping trees and shrubs such that they are inhospitable to wildlife<br><b>Target Date:</b><br>Whenever possible                       | All exterior doors will be kept closed when not in use<br><b>Target Date:</b><br>Immediate, ongoing  | Discuss needed landscaping changes with Valhalla Cemetery and Plaza Del Sol<br><b>Target Date:</b><br>Within six months of WHMP approval     | Discuss bird management at Burbank Landfill #3<br><b>Target Date:</b><br>Within six months of WHMP approval |

**Table 1**  
**WHMP Actions by Location, including Target Implementation**

| <b>Airport Property Actions</b>  |  |   | <b>Non-Airport Property Actions</b> |                                 |
|--|--|---|-------------------------------------|---------------------------------|
| <b>AOA</b>   | <b>Within Two Miles of AOA</b>   | <b>Airport Structures Action / Target Date</b>  | <b>Within Two Miles of AOA</b>      | <b>Within Five Miles of AOA</b> |
| <p>Reduce perching opportunities in the movement area</p> <p><b>Target Date:</b><br/>Ongoing, non-flexible markers replaced with flexible ones during any maintenance or upgrades</p>  |  | <p>Doors which do not exclude wildlife will be retrofitted or replaced. Doors will be installed on buildings that currently lack them</p> <p><b>Target Date:</b><br/>Ongoing, as tenants change or when leases are renewed</p>  |                                     |                                 |
| <p>Eliminate gaps under perimeter fences</p> <p><b>Target Date:</b><br/>Temporary measures within two months of WHMP approval inspected quarterly. Permanent measures to be installed during routine fence maintenance or upgrades</p> | <p>Eliminate gaps under perimeter fences</p> <p><b>Target Date:</b><br/>Temporary measures within two months of WHMP approval inspected quarterly. Permanent measures to be installed during routine fence maintenance or upgrades</p> | <p>All BUR occupied areas not already equipped will be fitted with exclusionary netting where needed</p> <p><b>Target Date:</b><br/>Between two and five years of WHMP approval. Daily dispersal and exclusion until permanent measures are installed.</p>  |                                     |                                 |
| <p>Eliminate gaps around gates</p> <p><b>Target Date:</b><br/>Temporary measures within two months of WHMP approval, inspected quarterly. Permanent measures to be installed within two years.</p>                                     | <p>Eliminate gaps around gates</p> <p><b>Target Date:</b><br/>Temporary measures within two months of WHMP approval, inspected quarterly. Permanent measures to be installed within two years.</p>                                     | <p>All FBO or tenant buildings not already equipped will be fitted with exclusionary netting where needed</p> <p><b>Target Date:</b><br/>Permanent netting installed when tenants change or when leases are renewed. Daily dispersal and temporary measures installed at nest sites until permanent exclusion installed</p> |                                     |                                 |

**Table 1**  
**WHMP Actions by Location, including Target Implementation**

| Airport Property Actions   |  |  | Non-Airport Property Actions   |  |
|--|--|--|--|--|
| AOA  | Within Two Miles of AOA  | Airport Structures Action / Target Date  | Within Two Miles of AOA  | Within Five Miles of AOA   |
| Any construction plans will be scrutinized to ensure that there is not potential for attracting wildlife<br><b>Target Date:</b><br>As soon as plans available for review | Any construction plans will be scrutinized to ensure that there is not potential for attracting wildlife<br><b>Target Date:</b><br>As soon as plans available for review | Any construction plans will be scrutinized to ensure that there is not potential for attracting wildlife<br><b>Target Date:</b><br>As soon as plans available for review | Monitor major proposed land use changes for their potential to create wildlife attractants<br><b>Target Date:</b><br>As soon as plans available for review | Monitor major proposed land use changes for their potential to create wildlife attractants<br><b>Target Date:</b><br>As soon as plans available for review |
| Abandoned equipment and buildings<br><b>Target Date:</b><br>Secured from wildlife entry within one month of WHMP approval, and removed within two years                  | Abandoned equipment and buildings<br><b>Target Date:</b><br>Secured from wildlife entry within one month of WHMP approval and removed within two years                   | Abandoned equipment and buildings<br><b>Target Date:</b><br>Secured from wildlife entry within one month of WHMP approval and removed within two years                   |  |  |
| Record and archive all wildlife patrol or control actions taken<br><b>Target Date:</b><br>Log immediately & turn in to coordinator daily for archiving                   | Record and archive all wildlife patrol or control actions taken<br><b>Target Date:</b><br>Log immediately & turn in to coordinator daily for archiving                   | Record and archive all wildlife patrol or control actions taken<br><b>Target Date:</b><br>Log immediately & turn in to coordinator daily for archiving                   |  |  |
| Identify and report all wildlife struck<br><b>Target Date:</b><br>Identify within 48 hours or send to Smithsonian.<br>Report to FAA within one week                      | Identify and report all wildlife struck<br><b>Target Date:</b><br>Identify within 48 hours or send to Smithsonian.<br>Report to FAA within one week                      | Identify and report all wildlife struck<br><b>Target Date:</b><br>Identify within 48 hours or send to Smithsonian.<br>Report to FAA within one week                      |  |  |
| Communication of Wildlife Hazards and strikes between ATCT and other BUR personnel<br><b>Target Date:</b><br>Immediate   | Communication of Wildlife Hazards and strikes between ATCT and other BUR personnel<br><b>Target Date:</b><br>Immediate   | Communication of Wildlife Hazards and strikes between ATCT and other BUR personnel<br><b>Target Date:</b><br>Immediate   | Communication of Wildlife Hazards and strikes between ATCT and other BUR personnel<br><b>Target Date:</b><br>Immediate                                     | Communication of Wildlife Hazards and strikes between ATCT and other BUR personnel<br><b>Target Date:</b><br>Immediate                                     |

**Table 1**  
**WHMP Actions by Location, including Target Implementation**

| Airport Property Actions  |   |   | Non-Airport Property Actions  |   |
|---|---|---|---|---|
| AOA   | Within Two Miles of AOA   | Airport Structures Action / Target Date   | Within Two Miles of AOA   | Within Five Miles of AOA  |
| Hazard Control<br><b>Target Date:</b><br>When a hazard is present, takeoffs & landings immediately delayed or diverted to alternate runways & specific ATCT advisories issued | Hazard Control<br><b>Target Date:</b><br>When a hazard is present, takeoffs & landings immediately delayed or diverted to alternate runways & specific ATCT advisories issued | Hazard Control<br><b>Target Date:</b><br>When a hazard is present, takeoffs & landings immediately delayed or diverted to alternate runways & specific ATCT advisories issued | Hazard Control<br><b>Target Date:</b><br>When a hazard is present, takeoffs & landings immediately delayed or diverted to alternate runways & specific ATCT advisories issued | Hazard Control<br><b>Target Date:</b><br>When a hazard is present, takeoffs & landings immediately delayed or diverted to alternate runways & specific ATCT advisories issued |
| Ongoing Data Collection & Analysis<br><b>Target Date:</b><br>Ongoing, with annual data analysis   | Ongoing Data Collection & Analysis<br><b>Target Date:</b><br>Ongoing, with annual data analysis   | Ongoing Data Collection & Analysis<br><b>Target Date:</b><br>Ongoing, with annual data analysis   | Ongoing Data Collection & Analysis<br><b>Target Date:</b><br>Ongoing, with annual data analysis   | Ongoing Data Collection & Analysis<br><b>Target Date:</b><br>Ongoing, with annual data analysis   |
| Evaluate and Review WHMP<br><b>Target Date:</b><br>Annually or following a triggering event   | Evaluate and Review WHMP<br><b>Target Date:</b><br>Annually or following a triggering event   | Evaluate and Review WHMP<br><b>Target Date:</b><br>Annually or following a triggering event   | Evaluate and Review WHMP<br><b>Target Date:</b><br>Annually or following a triggering event   | Evaluate and Review WHMP<br><b>Target Date:</b><br>Annually or following a triggering event   |

### 3.2.1 Problem Wildlife Populations and Wildlife Attractants

Problem wildlife on BUR is primarily avian. Bird species identified as an issue include: members of the columbid guild (doves and pigeons), particularly the non-native rock pigeon; corvids (crows and ravens); starling/blackbird guild, particularly the European starling; gull guild; raptor guild (vultures, hawks, eagles, falcons), particularly the red-tailed hawk, due to its size and regular occurrence; and the shorebird guild.

**Table 2**  
**The Most Hazardous Bird Guilds Found at BUR**

| Guild                | Ranking <sup>1</sup> | Most abundant species in Guild | Guild Strike Ranking <sup>2</sup> |
|----------------------|----------------------|--------------------------------|-----------------------------------|
| Columbids            | 1                    | Rock Pigeon                    | 1 (108 strikes)                   |
| Corvids              | 2                    | Common Raven                   | 6 (3 strikes)                     |
| Starling/Blackbird   | 3                    | European Starling              | 5 (7 strikes)                     |
| Gulls                | 4                    | California Gull                | 3 (16 strikes)                    |
| Small Perching Birds | 5                    | House Finch                    | 2 (17 strikes)                    |
| Raptor               | 6                    | American Kestrel               | 4 (9 strikes)                     |

|           |   |          |                               |
|-----------|---|----------|-------------------------------|
| Shorebird | 7 | Killdeer | No known strikes <sup>3</sup> |
|-----------|---|----------|-------------------------------|

Notes:

<sup>1</sup> Rankings were derived from the number of observations during WHA point count surveys.

<sup>2</sup> Guild Strike Ranking was derived from reported strikes of identified birds at BUR at the time of the WHA.

<sup>3</sup> Shorebirds could be among the many strikes reported as unidentified.

Mammals are uncommon on the airport. The largest mammal wildlife known to have occurred on the airport, coyotes, were appropriately treated with zero tolerance and removed when found to be living on the ILS field. Two past mammal strikes were reported, but the species identity is unknown. The mammals most frequently detected during the WHA included feral domestic cats, Audubon's cottontail rabbit, and the Virginia opossum. Various airport and FBO personnel also reported sightings of raccoons, small domestic dogs, and California ground squirrels, rats, and mice. Sign of Botta's pocket gopher was also frequently seen in unpaved infields and the ILS field. Small mammals such as rats, mice, and gophers do not present a major hazard to aircraft, but they act as attractants for predators such as hawks, owls, and coyotes.

A variety of elements act as attractants on the airport. These include: broad-leaved weeds, especially when allowed to go to seed; hangars that are left open and/or which lack bird exclusion devices (netting, etc.), drainage onto the airport from an adjacent business park (Plaza Del Sol), and dense landscaping (primarily in FBO and private areas outside of the AOA). Standing water is a problem when present, but other than the drainage noted above, this happens only for a short term following rains, where shallow depressions exist on paved areas.

In the long-term, attractants or habitat features that are responsible for the presence of wildlife, will be rectified as outlined in Section 3.2.2 below through exclusion/repellents and habitat modification. However, in the short-term and/or despite deterrent measures, if problem wildlife is present on BUR the following measures will be taken:

Rock Pigeons have been involved in by far the most strikes at BUR. These strikes have caused aircraft damage and flight delays. This species will be hazed off of the airport when seen during the course of normal AOA patrols by the on-duty Ops Supervisor. Larger flocks, however, will be treated with zero tolerance. The on-duty Ops Supervisor will immediately haze them off the airport as seen or reported to be present by the ATCT, pilots, maintenance personnel, etc. This same policy will apply to individuals vs. flocks of other moderately sized birds such as American kestrels, killdeer, gulls (any species), mourning doves, Eurasian collared-doves, American crows, and Eurasian starlings. Two larger species which frequent the airport, common ravens and red-tailed hawks (and any other large raptors) will always be treated with zero tolerance due to their size. With the general exception of raptors, all of the above are flocking species, such that the continued presence of one or a small number may attract additional birds, thus increasing the flock size and the danger that it presents.

The species above are known hazards, but when any other unexpected large bird species or flocks that are a threat are found to be present in/near the AOA, they will be hazed off of the airport by the on-duty Ops Supervisor promptly as well. Hazing will involve the use of pyrotechnics and/or physically approaching the birds on foot or with a vehicle. In all cases, the ATCT will be notified that a bird strike hazard is present, and hazing will be coordinated with the ATCT so as not to haze birds into the flight path of arriving and/or departing aircraft. This policy will be implemented immediately.

If repeated hazing attempts fail to remove the avian wildlife hazard, and if the attractant or habitat feature that is drawing the wildlife cannot quickly be modified, BUR airport police will escalate to shooting the problem animal(s) in coordination with the ATCT, as allowed by applicable laws and permits. This option will only be employed after diligent attempts to disperse wildlife by non-lethal means have failed, but if the hazard cannot be removed, lethal means will be employed within one week at the maximum.

During the WHA, birds, especially raptors, were periodically observed perching on many of the manmade structures adjacent to Runways 8 and 15 and on the ILS field. To reduce perching opportunities for birds near the movement area, BUR will install perching deterrents such as spikes on structures adjacent to these runways within one year. During all routine maintenance or upgrades, markers will be replaced with flexible types (such as thin plastic) which do not support the weight of a perching bird.

If birds, especially pigeons, are found or reported to be utilizing roosts inside hangars or other structures on BUR, a proactive approach will be utilized for their removal. They will be hazed and nests will be removed as they are encountered. If the problem animals cannot be displaced within one week maximum, however, capture or lethal means will be employed. Where safe, they can be eliminated by airport police utilizing the air rifle while on their perches. For best results, a laser pointer will be to "corral" the pigeons into one portion of the roost area before shooting. BUR will also provide guidance to FBOs on allowing airport police or an insured contractor using air rifles to remove pigeons from inside hangars and other on-airport structures. The issue of public sensitivity to lethal control will be considered, and discretion will be used. However, concerns over public sensitivity will not outweigh those of public safety.

For small mammals, BUR will continue to contract pest control stations around the terminal, and will expand this service within six months to FBO, maintenance buildings, and other structures where rats and mice have been reported or may occur. Within six months, an exterminator will be contracted to eliminate pocket gophers on the air and ILS fields, with annual follow-ups to ensure that they do not return (or sooner if sign is seen). An on-call licensed trapper or exterminator will be contracted within six months to remove or eliminate larger mammals such as cats, rabbits, opossums, raccoons, and squirrels immediately as they are seen or reported.

### **3.2.2 Habitat Modification**

As noted at the beginning of this section, BUR has already made some modifications to make habitat less attractive to wildlife, but additional steps will be taken, as detailed below.

#### **3.2.2.1 Vegetative/Prey Food Items for Hazardous Species**

As noted above, potential rodent prey (gophers, rats, mice) will be controlled by ongoing and contracted extermination/control programs. Invertebrate prey, such as earthworms and insects, were not identified as an issue during the WHA, however if an insect outbreak occurs which is attracting wildlife hazards, a licensed exterminator will be contracted within one week to eliminate the problem. If the insects are being attracted by something on the airport, it will be eliminated within one week as well, to the extent possible.

The WHA identified several vegetative food items that were attracting wildlife to the airport. These included grasses, broadleaved weeds, and their flowers and seeds on the infields and ILS field; and fruiting trees including palms and figs used as landscaping.

Ideally, the vegetated areas of the infields and ILS field would be paved or planted with a grass monoculture which would be maintained at an appropriate length (6-12 inches) as recommended by the FAA. However, no known grass species could be maintained in that way at BUR due to the arid climate and paving the infields has been deemed infeasible due to cost and drainage issues. Therefore, BUR will eliminate this problem in three ways:

1. Broad-leaved weeds will be eliminated through application of targeted emergent and pre-emergent herbicides by Maintenance staff (as occurs now) or a licensed contractor. This service will be performed or contracted immediately to catch weeds as the rainy season begins. Until eliminated, weeds will be kept mowed short to minimize flower and seed production.
2. Bermuda grass, a slow growing, perennial, relatively drought-tolerant grass will be hydromulched onto the ILS and infields. This service will be contracted immediately to establish Bermuda grass during the rainy season. Bermuda grass and any other grass extant on the field will always be kept mowed to minimize seed production.
3. As feasible, vegetated areas will be paved to eliminate all growth. Feasibility of paving is limited by the capacity of storm water infrastructure and available funding.

At a minimum, there are several fruit-producing ficus (fig) trees present between Terminals A and B and there are fruiting palm trees near the main entrance of the airport. All of these trees were seen to be attracting wildlife during the WHA. These trees will be scheduled for replacement when budget allows. In the meantime, fruiting trees will be examined monthly and palm fruiting stalks will be removed well prior to fruit ripening. When ficus trees are found to be fruiting, fruit will be cleaned up daily. Palm and ficus trees will be kept appropriately trimmed (see Section 3.2.2.2 below). This applies equally to any other fruiting trees that may be present on BUR property, for example the palms at the Atlantic Aviation office, which were well maintained at the time of the WHA.

Garbage issues were found to be minimal at BUR during the WHA, with only a few exceptions involving uncovered/unclosed containers. Any uncovered garbage containers will be covered immediately, and signs requiring garbage containers to be closed/covered at all times will be prepared immediately and placed at any locations that lack them now.

BUR has been vigilant regarding wildlife feeding in and around the airport. Legal action was taken against an individual that would not stop feeding birds and an employee was recently stopped from feeding birds in one of the parking lots. To prevent feeding stations from being established or reestablished, the wildlife coordinator will patrol the airport perimeter and vicinity monthly, looking for direct evidence (food, feeders) or indirect evidence (such as flocks of birds) of feeding in the area. If feeding activity is found, appropriate action will be taken immediately, starting with a simple request that feeding cease, and escalating to legal action if necessary.

### 3.2.2.2 Vegetative Management

In the AOA, management of the infield and ILS field is discussed above, as are some trees in the vicinity. At the FBOs, there are some landscaping trees and shrubs within the airfield fence that are being appropriately maintained, and a few that are not. Outside the airfield fence, however, many of the FBO trees and shrubs are inappropriately dense. To discourage use of these plants by wildlife, all trees and shrubs on BUR property will be thinned in such a way as to make them "transparent". That is, interior branches will be removed such that one can see through the plants, allowing light and air to pass through, which makes them unappealing to wildlife. On palms, all but the top, freshest fronds will be removed regularly, to keep these trees inhospitable for roosting and nesting. Thinning will be done prior to spring 2015, to minimize the establishment of nests and will be maintained in that way thereafter.

### 3.2.2.3 Water Management

Surface water is well managed at BUR, with only minor issues. There are currently many shallow depressions on the paved airfield that hold water after storms. These are ephemeral and attract little wildlife. These depressions will be eliminated when routine resurfacing is done, through best management practice leveling by the surfacing contractor. The primary water issue at BUR involves one area where water is deliberately diverted onto the AOA from a commercial complex north of Runway 8 (Plaza Del Sol). This location was seen to be a drinking and bathing attractant for wildlife species during the WHA. The diversion of water onto BUR must stop. The wildlife coordinator will make an attempt to resolve the issue within three months. If this fails, further action, up to and including legal action, will follow. As a last resort, BUR will resolve the drainage issue onsite. The water currently flows into a shallow drainage ditch which then flows east for several hundred feet before emptying underground through a grate. This results in days of standing water in sections of the ditch. If the water cannot be prevented from entering the airfield, the underground drainage system will be extended to the point where the water enters BUR to prevent surface flow and pooling.

### 3.2.2.4 Airport Fencing

The perimeter fence around the BUR AOA was in generally satisfactory condition during the WHA, and additional improvements were made during and after that time. Nevertheless, there are still expanses of the perimeter fence that are located on dirt substrates which can allow larger animals such as dogs and coyotes to dig under the fence and gain access to the AOA. Further, some areas that do have paved substrates, nevertheless have gaps between the bottom of the fence and the pavement that are large enough to allow mammals such as cottontail rabbits through. Ideally, the areas with soft substrates would be paved, and all such areas would have the bottom of the fence flush with or imbedded in the pavement. Such design will be implemented in future updates to the fencing. In the meantime, any gaps identified BUR staff will be filled and blocked with k-rail, millings, gravel, or some other temporary measure within one month of identification.

Additionally, most of the access gates on BUR have gaps large enough to allow access by rabbit-sized mammals or larger. All gates will be inspected by a qualified contractor and retrofitted to eliminate gaps. This can be accomplished by attaching plastic or brush "guard" devices or strips to the bottom of gates or on gaps between gate sections. Alternatively, for

bottom gaps, concrete or asphalt "speed bumps" can be installed under the gates, to close the gaps and prevent mammals from squeezing through. Where possible, gaps between gate sections will be eliminated simply by using a smaller length of chain to cinch the sections more tightly together. All gate gaps will be permanently eliminated within one year, with at least temporary measures in place within one month.

Personnel patrolling the AOA will be aware of the fence and will be watching for potential wildlife intrusion areas. A thorough inspection of the fence and gates will be conducted quarterly by the wildlife coordinator.

### 3.2.2.5 Modification of Airport Buildings

#### ***Terminal Buildings***

In general, the terminal buildings are well managed for wildlife. As noted above, bait stations are present for rodent control, and this will be continued. Also, as noted above, most landscaping around the terminals is appropriate and well maintained, with the exception of the ficus trees, and these appropriate practices will also continue. As identified in the WHA, outside portions of the terminal building, including baggage handling areas, vary from areas with well-netted exclusion of wildlife to areas where exclusion measures are absent or inadequate to prevent roosting and nesting. Such areas will be fitted with permanent exclusionary netting within one year. Until permanently excluded, any birds attempting to roost or nest on the terminal buildings will be dispersed daily. Nests will be removed promptly and temporary exclusion measures will be placed at nest sites. The wildlife coordinator will make quarterly physical inspections at a minimum.

#### ***Building 18 and Associated Yard and Structures (Airport Maintenance)***

This facility showed evidence of mammalian use in the warehouse and of bird nests in the vehicle maintenance building. Personnel there reported that opossums have been found in the building, and have even had young there. They also noted that cats and mice have also been seen. Although no direct evidence of wildlife occupation was seen in the yard, storage piles and old equipment provide areas that could harbor animals. Mammal control will be implemented at this facility as noted in Section 3.2.2.1 above. Permanent bird exclusion netting will be installed to prevent bird usage of overhead beams for roosting and nesting in the vehicle maintenance building. Although the vehicle service area has no doors, the roll up doors in the main building for maintenance will be closed when they are not actively being used to facilitate the movement of equipment or vehicles into the facility. Old equipment and supplies that have no further use will be disposed of. These actions will be completed within two to three years. The wildlife coordinator will make quarterly physical inspections at a minimum.

#### ***Hangar 35 (Fire Station)***

The fire station has accessible rafters, doors that are always open, and generally unkempt conditions in much of the building beyond what is being actively used by the fire department. Despite this, at the time of the WHA inspection, there was only one location that showed evidence of regular bird use and another that had probable mammal droppings. Department personnel reported regular sightings of cats, raccoons, and opossums, including opossums

getting trapped in the trash cans. The main doors at this facility may need to remain open for emergency response purposes; however, potential wildlife access points elsewhere in this building will be closed, netted, or repaired to minimize access opportunities. Permanent bird exclusion netting will be installed to prevent bird usage of overhead beams for roosting and nesting. Garbage cans will be kept tightly covered. These actions will be completed within one year. The wildlife coordinator will make monthly physical inspections at a minimum.

#### ***Building 19 (Police Air Support)***

This building is kept closed when not in active use, and no wildlife problems were noted during the WHA. Officers reported cat, rabbit, and opossum sightings in and around the building, however. Officers will be asked to promptly report wildlife sightings, and Ops will also ask monthly if there has been no communication. If necessary, mammal control will be implemented at this facility as noted in Section 3.2.2.1 above. The wildlife coordinator will make quarterly physical inspections at a minimum.

#### ***Building 50 (Fuel Yard)***

The underside of the canopy over the fueling station is regularly used by birds, particularly European starlings. Netting will be installed to prevent bird usage of this area for roosting / nesting. The wildlife coordinator will make quarterly physical inspections at a minimum.

#### ***Parking Structures and Associated Buildings***

These areas, including valet buildings, payment kiosks, etc. were not found to be major wildlife attractants. At a minimum, they will be inspected quarterly for signs of wildlife activity. The wildlife coordinator will take appropriate action if wildlife usage is detected.

#### ***FBO Buildings, Including T-Hangars***

The WHA identified FBO buildings that were clean and well netted, and made recommendations regarding other FBO buildings/tenants that provide shelter to wildlife. Some recommendations require simple behavioral changes, such as closing doors when not in immediate use, reporting wildlife when seen, not feeding animals or allowing animals access to food/garbage, and immediately removing new or existing nests. Until permanent bird exclusion netting is installed in such locations, temporary exclusion devices (spikes, etc.) will be placed at nest sites following nest removal. The wildlife coordinator will ask building occupants to implement the preceding changes immediately, and will make annual physical inspections at a minimum. Other recommendations require time and funding, such as retrofitting doors and installing netting. These type of modifications, listed below, will be phased in as soon as is possible when conducting routine building maintenance, renewing leases, or preparing buildings for new tenants:

##### ***Hangar 1***

- Netting will be installed to prevent bird usage of overhead beams for roosting / nesting

##### ***Hangar 2***

- The area around the door wheels will be retrofitted to block access by wildlife when the doors are closed

- Netting will be installed to prevent bird access to overhead beams for roosting / nesting

*Hangar 4 and the west half of 5*

- Netting will be installed to prevent bird usage of overhead beams for roosting / nesting
- In shared Hangar 5, horizontal netting will also be installed to prevent bird access from one side of the hangar to the other (also see below)
- Known mammal "nest" areas will be secured, including trapping and removal

*Hangars 6, 7, 7A, and the east half of 5*

- Netting will be installed to prevent bird usage of overhead beams for roosting / nesting
- In shared Hangar 5, horizontal netting will also be installed to prevent bird access from one side of the hangar to the other

*Hangars 70, 71, 72, 1A, and small open building adjacent and west of Building 1A*

- Breaches allowing avian access to Hangars 70 and 72 will be located and sealed, or, if they cannot be sealed a regular inspection schedule will be set-up and adhered to in problem areas in order to monitor for bird activity and immediately remove any birds and/or nests found
- Landscaping irrigation will be kept to a minimum and regularly monitored to insure that it is not producing runoff or puddles attractive to wildlife
- Areas being used by wildlife for airport access will be blocked
- Netting will be installed in Hangar 1A to prevent bird usage of overhead beams for roosting and nesting
- Doors and/or netting will be installed in the shed west of Hangar 1A to prevent bird usage of overhead beams for roosting and nesting
- Bird deterrents will be installed on the pole behind the shed to deter bird usage of it

*Building 8*

- Netting will be installed to prevent bird usage of overhead beams for roosting / nesting
- Overhead vents will be screened to prevent wildlife entry

*T-Hangars*

- The small T-hangars along the west side of Runway 15 were not found to be harboring wildlife during the WHA, but some animals and sign were seen in the vicinity. Tenants will be asked to maintain these facilities in such a way as to exclude, and not attract, wildlife and to immediately report any wildlife sightings.

### ***Airport Construction***

Any construction planned or occurring on BUR property (such as the new parking garage), will be scrutinized by the wildlife coordinator on an ongoing basis. This will ensure that such plans do not contain temporary or permanent elements with potential for attracting wildlife that may cause hazards. These hazards could include, but are not limited to, poor garbage and water control by construction crews, installation of inappropriate landscaping, or design which does not exclude wildlife. Such issues will be dealt with immediately, as encountered or proposed.

### ***Leased Facilities and Abandoned Structures/Equipment***

BUR does not currently lease any properties outside airport property and no abandoned structures are present at this time. If property is leased for BUR use in the future, it will be treated with the same wildlife policies as lands on airport property. If any structures are permanently abandoned, within one month they will be made secure from wildlife usage until

such time as they can be torn down, which will occur within one year. Temporarily abandoned structures will be closed and secured from wildlife usage within one month until reoccupied. Abandoned equipment and supplies will be removed from the airport as soon as is possible, but always within one year. If the abandoned equipment is capable of harboring wildlife, it will be secured with netting or similar exclusionary devices within one month until removed.

### **3.3 Land Use Changes**

The wildlife coordinator will stay alert for any major land use changes planned for the area surrounding BUR and scrutinize them for their potential to create wildlife attractants that may cause wildlife hazards. These can include, but are not limited to agricultural activities, waste handling facilities, surface mining, urban development, wildlife refuges and storm water management systems. BUR will notify the FAA of such projects.

While it is not always possible to affect change in existing off-site attractants, three sites in particular are of concern. The Wildlife Coordinator will begin or continue discussions with these landowners within three months:

- The row of Italian cypress trees just offsite along the north fenceline of Runway 8 (at the Plaza Del Sol commercial complex). These tall, dense trees are attractive to wildlife. They should be removed or at a minimum be kept heavily thinned as noted in Section 3.3.2.2 above. BUR will seek to have this wildlife attractant abated. This is the same complex which drains water onto the airport, and ownership has reportedly not been cooperative in the past.
- The trees at Valhalla Cemetery should be thinned as noted in Section 3.2.2.2 above to reduce their attractiveness to wildlife. BUR will seek to have this wildlife attractant abated. Ownership at Valhalla has been cooperative in regard to past airport requests. Most flights pass over this cemetery immediately after takeoff, so reduction of bird hazards there is important.
- Although it is approximately 2.5 miles to the east, the City of Burbank Landfill #3 is a major attractant of birds into the area, especially gulls and ravens. BUR will speak to the landfill about the need to more effectively exclude birds. At the time of the WHA, the landfill was using propane cannons, but not effectively.

### **3.4 Resources That Will Be Provided to Implement the WHMP**

#### **3.4.1 Have Control Supplies (Pyrotechnics, Cannons, Effigies, etc.) On Hand.**

Operations has two vehicles. Each will always be equipped with the following:

- Pyrotechnics (ample supply of bangers and screamers)
- 15mm pyrotechnic pistol launcher in good working order, with firing caps
- Binoculars in good working order
- Bird field guide (recommend two different guides per vehicle)
- 12-gauge shotgun in good working order, with shell crackers
- Radio

The wildlife coordinator will inventory and test supplies on hand and on vehicles monthly and reorder/restock as needed. Due to safety, security, and regulatory issues, shotguns will be closely regulated by BUR on the airfield. Additional static deterrents such as the Scare Wars system, for example, can be purchased if situations needing other control methods arise. BUR currently sources abatement supplies from Margo Supplies and Sutton Ag Enterprises. Additional suppliers are listed in Appendix C.

### **3.5 Procedures to Be Followed During Air Carrier Operations**

#### **3.5.1 Conduct Physical Inspections to Successfully Manage Known Wildlife Hazards**

Although BUR has a voluntary flight curfew from 10:00 PM – 7:00 AM, in practice BUR operates 24 hours a day, 365 days a year. Therefore, air carrier operations are ongoing at all times and physical inspections must be made at all times as well for the successful mitigation of wildlife hazards in the airport environment. During inspections, personnel will be looking for wildlife, remains, sign of wildlife, potential wildlife attractants, and potential wildlife access points. Inspections will be documented as noted in Section 4.

- (a) Runways and taxiways will be visually inspected several times daily by the on-duty Operations Supervisor and/or by all Operations personnel conducting routine patrols of the AOA. At least once a day the runways and taxiways will be closely inspected either on foot or with a binocular.
- (b) The AOA will be visually inspected several times daily by the on-duty Operations Supervisor and/or by all Operations personnel conducting routine patrols. Infields in particular will be scrutinized for pocket gopher activity, insect infestations, broad-leaved weeds, overly tall vegetation, or grasses that are going to seed.
- (c) Routine daily patrols of the AOA do not always include the ILS field. At a minimum, the ILS field will be inspected by binocular daily from outside the fence for perching birds, other wildlife, sign of wildlife, or improperly maintained vegetation. At a minimum, the ILS field will be entered and closely inspected monthly. These close inspections will include scrutiny for pocket gopher activity, insect infestations, broad-leaved weeds, overly tall vegetation, or grasses that are going to seed. ILS buildings and structures will be inspected for nests or other wildlife usage in, under, or on them.
- (d) The perimeter fence and gates will be visually inspected for gaps and holes regularly during the day by the on-duty Operations Supervisor and/or by all Operations personnel conducting routine patrols. Quarterly, at a minimum, the fence and gates, including the ILS field, will be inspected on foot for gaps and holes.

#### **3.5.2 Wildlife Hazard Control Measures**

Section 3.2.1 above discusses exclusion, harassment, capture, lethal control, and potential relocation measures as means to prevent or remove wildlife on the airport. Monitoring and recordkeeping, as discussed in Section 4, can help predict when wildlife hazards may occur, and how best to deal with them. Depending on the nature of the wildlife hazard present, a variety of operational control measures will be implemented as needed in cooperation between the wildlife coordinator and the ATCT. Some of these have already been discussed above, but include:

- Takeoffs and approaches will be delayed as needed if a wildlife hazard is present in the flight path
- If safe, measures to avoid wildlife may be utilized to avoid delays. These could include the use of alternate runways or traffic direction
- When wildlife is known to be present or in the area, specific air traffic control advisories on wildlife hazards will be issued, including wildlife sightings from pilot reports (PIREPS). These advisories will include bird/wildlife type, location, and direction of flight, as applicable.
- In the event that a predictable wildlife hazard exists (seasonally or at a particular time of day), flight scheduling will be adjusted to avoid times of peak hazard.

### **3.5.3 Effective Communication Between Wildlife Hazard Personnel and ATCT**

Wildlife hazards require immediate attention and will never be handled by voicemail or delayed response. The On-Duty Airside Operations Supervisor will immediately contact the tower by radio when they observe a wildlife hazard. An appropriate response from the measures above will be employed to prevent a hazard to aircraft while the problem wildlife is dealt with. Normal air operations will be delayed until it is safe to resume. Likewise, if the ATCT observes or is informed of a wildlife hazard, they will contact the On-Duty Airside Operations Supervisor or Operations personnel to have the problem abated quickly so that normal air operations can resume.

The ATCT will also immediately report any wildlife strikes to the Communications Center. Phone numbers and schedules for Airside Operations Supervisors (24-hour schedule), and ATCT supervisors (24 hour schedule) will be made readily available to all parties for contact in the event of radio communication difficulties.

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## 4.0 RECORDKEEPING AND DATA COLLECTION

### 4.1 Recordkeeping

BUR has done an excellent job of recordkeeping, which will continue. All Ops patrols of the AOA will include surveillance for wildlife or wildlife remains. A log will be kept of all such patrols, referred to as "Perimeter and Part 139 Inspections", including wildlife that was detected and detailed records of wildlife dispersal and control efforts. The minimum amount of information recorded during a wildlife encounter will include the person(s) conducting the action, date, time, species, number of animals, location on airfield, control methods used, and the animal's response to the control action. BUR will log all abatement activities and wildlife strikes in their ProDIGIQ database, as they currently do. All personnel that frequent the AOA, not just Operations, will be reminded regularly of the importance of reporting all wildlife, wildlife strikes and, wildlife remains encountered, either directly or by contacting the Communications Center.

Accurate records will be kept of all wildlife remains (particularly feathers, beaks, feet, bones and talons) that are discovered during routine runway sweeps for FOD. All individuals who participate in FOD sweeps of runways and taxiways will be briefed on the importance of saving wildlife remains. When possible, the remains will be placed in a sealed plastic bag and frozen until identified. The remains will be retained until the species can be positively identified. Every effort will be made to identify wildlife remains to the species level. The identification process will begin immediately following the discovery of remains and will be completed within 48 hours. Remains that cannot be identified will be submitted to the Smithsonian Institution's Feather Identification Lab at that time. When sending birdstrike remains to the lab for identification, BUR shall include a completed FAA 5200-7 form (Appendix B) and contact information.

There are two options for shipment of birdstrike remains regular US postal service and overnight shipping (Table 3). If a case is damaging or priority, overnight shipping should be used. It is important to securely package the material and use the correct address. Shipments can be labeled "safety investigation material".

**Table 3**  
**Addresses for Shipment of Birdstrike Remains for Identification**

| Regular Shipment  | Overnight / Priority Shipment  |
|---|--|
| Smithsonian Institution<br>Feather Identification Lab<br>E600, MRC 116<br>P.O. Box 37012<br>Washington, DC 20013-7012 | Smithsonian Institution<br>Feather Identification Lab<br>E600, MRC 116<br>10th & Constitution Ave., NW<br>Washington, DC 20560 |

Additional strike information that will be recorded include the exact location where the carcass was found, predominant runway in use at the time of the incident, and nature of strike (e.g., reported by pilot, found during a runway sweep, found during mechanical inspection, etc.).

All strikes will be reported to the FAA National Wildlife Aircraft Strike Database within one week, unless it is necessary to wait for species identification from the Smithsonian. Copies of logs and strike records will be kept by the Airport Manager for reference and discussion at wildlife

committee meetings. All such records will be maintained electronically such that data can be easily extracted or sorted.

Good records are necessary to properly evaluate the effectiveness of a program, including the number of times that wildlife has been seen in the AOA and the number of requests for wildlife dispersal from air traffic control, pilots, and/or others. Documentation of all strikes is particularly important to the effectiveness of a WHMP in reducing wildlife hazards both on and near the airport. Therefore, this WHMP includes a commitment to document all wildlife strikes that occur within a 10,000-foot separation distance to better identify, understand and reduce threats to safe aviation.

#### **4.2 Ongoing Data Collection and Analysis**

The WHA documented occurrence, land-use patterns, and population dynamics of wildlife at and around BUR, especially as they related to attractants. Wildlife abundance and use patterns on airfields are affected by a host of variables that are rarely the same from year to year, however. The WHA conclusions were a benchmark. Survey locations and methods were established in a manner to facilitate continued monitoring. BUR operations staff trained in bird identification will continue to monitor wildlife populations from the WHA survey on-airport point count locations, on a quarterly basis. Analysis of this data will provide general insights into wildlife use patterns over time, enable BUR to gauge the effectiveness of their control efforts, and help prioritize such efforts.

## 5.0 PROCEDURES TO REVIEW AND EVALUATE THE WHMP

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The WHMP will be reviewed and evaluated every 12 consecutive months or following a triggering event. A triggering event is when:

1. An air carrier aircraft experiences multiple wildlife strikes;
2. An air carrier aircraft experiences substantial damage from striking wildlife. As used in this paragraph, substantial damage means damage or structural failure incurred by an aircraft that adversely affects the structural strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component;
3. An air carrier aircraft experiences an engine ingestion of wildlife; or
4. Wildlife of a size, or in numbers, capable of causing an event described in the preceding lines (1), (2), or (3) of this section is observed to have access to any airport flight pattern or aircraft movement area.

The review will include discussion of the WHMP's implementation, effectiveness of the training program, and WHMPs effectiveness in dealing with known wildlife hazards on and in the airport's vicinity. Aspects of the wildlife hazards described in the WHA that need reevaluation will be brought up, and recommendations will be made for further refinements or modifications. The Wildlife Hazard Working Group / wildlife committee will act in the review role.

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## 6.0 WHMP TRAINING PROGRAM

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All airport personnel implementing wildlife control measures and monitoring activities established by the WHMP will be trained following the curriculum outlined in FAA AC 150/5200-36A (FAA 2012a), part 6 and Appendices B and C. After the initial training, recurrent training will be conducted every 12 months thereafter. Recurrent training requirements as described in 14 CFR 139.303 (Federal Register 2004a) will equip personnel actively involved in an airports wildlife hazard management program with sufficient resources needed to comply with the requirements in their Airport Certification Manual and the requirements of 14 CFR 139.337 (Federal Register 2004). Personnel identified in 14 CFR 139.337 (f)(5)(i) will be included in the training program. The person or persons in charge of the training program will have had formal wildlife hazard management training. Participation in this training must be documented, and the training must be certified as meeting the requirements of AC 150/5200-36A.

Recurrent training requirements as described in 14 CFR 139.303 should equip personnel actively involved in an airports wildlife hazard management program with sufficient resources needed to comply with the requirements in their Airport Certification Manual and the requirements of 14 CFR 139.337. Personnel identified in 14 CFR 139.337 (f)(5)(i) should be considered for inclusion within this recurrent training. Training records must be maintained as directed by AC 150/3200-36A. Pesticide user training and certification requires its own regulated training and certification schedule and should be closely followed.

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## 7.0 REFERENCES

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- AMEC. 2012. Wildlife Hazard Assessment for Bob Hope Airport, Burbank, CA. October.
- California Department of Fish and Wildlife, California Natural Diversity Database. 2013. Rarefind Occurrence Report for the Burbank, Sunland, Van Nuys, and San Fernando quadrangles.
- FAA. 2012. Draft Advisory Circular (AC) 150/5200- XX. Protocol for the Conduct and Review of Wildlife Hazard Site Visits, Wildlife Hazard Assessments, and Wildlife Hazard Management Plans. Initiated by Airport Safety and Operations Division (AAS-300). 30 November 2012. Accessed online at:  
[http://www.faa.gov/regulations\\_policies/advisory\\_circulars/index.cfm/go/document.information/documentID/1020497](http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1020497)
- FAA. 2012a. AC 150/5200-36A. Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports. 31 January 2012. Accessed online at:  
[http://www.faa.gov/documentLibrary/media/Advisory\\_Circular/150\\_5200\\_36a.pdf](http://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5200_36a.pdf)
- FAA. 2006. Order 1050.1E CHG1, Environmental Impacts: Policies and Procedures. Accessed online at: [http://www.faa.gov/documentLibrary/media/order/energy\\_orders/1050-1E.pdf](http://www.faa.gov/documentLibrary/media/order/energy_orders/1050-1E.pdf)
- FAA Western-Pacific Region. 2012. Wildlife Hazard Assessment Review. Letter from Airports Division, Safety & Standards Branch, Los Angeles, CA to Bob Hope Airport, Burbank, CA dated December 13, 2012.
- Federal Register. 2004. Code of Federal Regulations (CFR). Title 14, Part 139—Certification of Airports, 139.337, *Wildlife Hazard Management*. Accessed online at:  
[http://www.faa.gov/airports/airport\\_safety/part139\\_cert/media/part139\\_wcorrections.pdf](http://www.faa.gov/airports/airport_safety/part139_cert/media/part139_wcorrections.pdf)
- Federal Register. 2004a. Code of Federal Regulations (CFR). Title 14, Part 139—Certification of Airports, 139.303, Personnel. Accessed online at:  
[http://www.faa.gov/airports/airport\\_safety/part139\\_cert/media/part139\\_wcorrections.pdf](http://www.faa.gov/airports/airport_safety/part139_cert/media/part139_wcorrections.pdf)
- Official California Legislative Information. 2012. California Fish and Game Code, Section 3470-3472.2 Management of Wildlife at Public Use Airports. Accessed online at:  
<http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc&codebody=&hits=20>
- USFWS. 1998. Determination of Endangered or Threatened Status for Four Southwestern California Plants from Vernal Wetlands and Clay Soils. 10/13/1998, 63 FR 54975 54994 ETWP.

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**APPENDIX A**

**MBTA DEPREDAATION PERMIT FROM THE USFWS**

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DEPARTMENT OF THE INTERIOR  
U.S. FISH AND WILDLIFE SERVICE

## FEDERAL FISH AND WILDLIFE PERMIT

2. AUTHORITY-STATUTES  
16 USD 703-712

REGULATIONS  
50 CFR Part 13  
50 CFR 21.41

1. PERMITTEE

BOB HOPE AIRPORT  
BURBANK GLENDALE PASADENA AIRPORT AUTHOR  
2627 HOLLYWOOD WAY  
BURBANK, CA 91505  
U.S.A.

3. NUMBER  
MB198129-0

4. RENEWABLE  
☒ YES  
☐ NO

5. MAY COPY  
☒ YES  
☐ NO

6. EFFECTIVE  
05/20/2014

7. EXPIRES  
04/30/2015

8. NAME AND TITLE OF PRINCIPAL OFFICER (If #1 is a business)  
RICHARD STEELE  
OPERATIONS DEPARTMENT MANAGER

9. TYPE OF PERMIT  
DEPREDAATION AT AIRPORTS

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED  
Bob Hope Airport  
Los Angeles County, California

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL, TRIBAL, OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

D. You are authorized to take, temporarily possess, and transport the migratory birds specified below to relieve or prevent injurious situations impacting public safety. Lethal take is limited to those individuals which cannot be dispersed by nonlethal means. All take must be done as part of an integrated wildlife damage management program that emphasizes nonlethal management techniques.

(1) The following may be lethally taken (Harassment and/or removal of endangered/threatened species and/or bald and golden eagles require additional permits from Migratory Bird Permit Office and/or Ecological Services Office):

50 each: Canada Geese, Western Gull, California Gull, Ring-billed Gull

25 each: Mallard, Mourning Dove, Western Meadowlark

10 each: Horned Lark

2 each: American Kestrel

(2) The following active nests (including eggs) found on airport property may be destroyed:

☒ ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS

ANNUAL REPORT DUE: 01/31

You must submit a report to your Regional Migratory Bird Permit Office even if you had no activity. Report form is at [www.fws.gov/forms/3-202-9.pdf](http://www.fws.gov/forms/3-202-9.pdf).

ISSUED BY

TITLE

WILDLIFE BIOLOGIST, REGION 8

DATE

05/20/2014

**Unlimited:** any bird that is not a threatened or endangered species, bald or golden eagle, Federal Bird of Conservation Concern, or State Bird Species of Special Concern.

\* Nests of threatened and endangered species, bald and golden eagles, and birds of Federal or State conservation concern may be removed after written approval is obtained from the Migratory Bird Permit Office and/or Ecological Services Office, provided contents are given to a federally permitted migratory bird rehabilitator. After the contents have been removed, the nest may be destroyed. Active hazing is required after removal to prevent re-nesting

**E. You are authorized in emergency situations only to take, trap, or relocate any migratory birds, nests and eggs, including species that are not listed in Condition D (except Bald Eagles, Golden Eagles, or endangered or threatened species) when the migratory birds, nests, or eggs are posing a direct threat to human safety. A direct threat to human safety is one which involves a threat of serious bodily injury or a risk to human life.**

**You must report any emergency take activity to your migratory bird permit issuing office at [permitsr8mb@fws.gov](mailto:permitsr8mb@fws.gov) within 72 hours after the emergency take action.** Your report must include the species and number of birds taken, method, and a complete description of the circumstances warranting the emergency action.

F. You are authorized to salvage and temporarily possess migratory birds found dead or taken under this permit for (1) disposal, (2) transfer to the U.S. Department of Agriculture, (3) diagnostic purposes, (4) purposes of training airport personnel, (5) donation to a public scientific or educational institution as defined in 50 CFR 10.12, (6) donation to persons authorized by permit or regulation to possess them, or (7) donation of migratory game birds only to a public charity (those suitable for human consumption). Any dead bald eagles or golden eagles salvaged must be reported within 48 hours to the National Eagle Repository at (303) 287-2110 and to the migratory bird permit issuing office at [permitsr8mb@fws.gov](mailto:permitsr8mb@fws.gov). The Repository will provide directions for shipment of these specimens.

G. You may not salvage and must immediately report to U.S. Fish and Wildlife Service Office of Law Enforcement (OLE) any dead or injured migratory birds that you encounter that appear to have been poisoned, shot, electrocuted, have collided with industrial power generation equipment, or were otherwise killed or injured as the result of potential criminal activity. See USFWS OLE contact information below.

H. You may use the following methods of take: (1) shotgun (non-toxic shot); (2) rifle (non-toxic ammunition); (3) air rifle (non-toxic pellets) (4) nets; (5) registered animal drugs (excluding nicarbazin), pesticides and repellents; (6) and falconry abatement.

Anyone who takes migratory birds under the authority of this permit must follow the American Veterinary Medical Association Guidelines on Euthanasia when euthanization of a bird is necessary ([http://www.avma.org/issues/animal\\_welfare/euthanasia.pdf](http://www.avma.org/issues/animal_welfare/euthanasia.pdf).)

I. You may temporarily possess and stabilize sick and injured migratory birds and immediately transport them to a federally licensed rehabilitator for care. Healthy birds may not be admitted to rehabilitation facilities as per regulation 50 CFR 21.31. However rehabilitation facilities may act as a subpermittee to care for healthy birds provided possession remains under the depredation permit. The permittee is ultimately responsible for healthy birds possessed under this depredation permit, even while under the care of entities which have their own federal permits.

J. Records to be maintained at Address in Block 1 Above. Summary of Additional Annual Report Requirements as described above:

K. The following subpermittees are authorized: any other person who is (1) employed by or under contract to you for the activities specified in this permit, or (2) otherwise designated a subpermittee by you in writing, may exercise the authority of this permit.

**For suspected illegal activity, immediately contact USFWS Law Enforcement at: 916-569-8444**



## Standard Conditions Migratory Bird Depredation Permits 50 CFR 21.41

All of the provisions and conditions of the governing regulations at 50 CFR part 13 and 50 CFR part 21.41 are conditions of your permit. Failure to comply with the conditions of your permit could be cause for suspension of the permit. The standard conditions below are a continuation of your permit conditions and must remain with your permit. If you have questions regarding these conditions, refer to the regulations or, if necessary, contact your migratory bird permit issuing office. For copies of the regulations and forms, or to obtain contact information for your issuing office, visit: <http://www.fws.gov/migratorybirds/mbpermits.html>.

1. To minimize the lethal take of migratory birds, you are required to continually apply non-lethal methods of harassment in conjunction with lethal control.  
*[Note: Explosive Pest Control Devices (EPCDs) are regulated by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). If you plan to use EPCDs, you require a Federal explosives permit, unless you are exempt under 27 CFR 555.141. Information and contacts may be found at <http://www.atf.gov/explosives/how-to/become-an-fel.htm>.]*
2. Shotguns used to take migratory birds can be no larger than 10-gauge and must be fired from the shoulder. You must use nontoxic shot listed in 50 CFR 20.21(j).
3. You may not use blinds, pits, or other means of concealment, decoys, duck calls, or other devices to lure or entice migratory birds into gun range.
4. You are not authorized to take, capture, harass, or disturb bald eagles or golden eagles, or species listed as threatened or endangered under the Endangered Species Act found in 50 CFR 17, without additional authorization.

For a list of threatened and endangered species in your state, visit the U.S. Fish and Wildlife Service's Threatened and Endangered Species System (TESS) at: <http://www.fws.gov/endangered>.

5. If you encounter a migratory bird with a Federal band issued by the U.S. Geological Survey Bird Banding Laboratory, Laurel, MD, report the band number to 1-800-327-BAND or <http://www.reportband.gov>.
6. This permit does not authorize take or release of any migratory birds, nests, or eggs on Federal lands without additional prior written authorization from the applicable Federal agency, or on State lands or other public or private property without prior written permission or permits from the landowner or custodian.
7. Unless otherwise specified on the face of the permit, migratory birds, nests, or eggs taken under this permit must be:
  - (a) turned over to the U.S. Department of Agriculture for official purposes, or
  - (b) donated to a public educational or scientific institution as defined by 50 CFR 10, or
  - (c) completely destroyed by burial or incineration, or
  - (d) with prior approval from the permit issuing office, donated to persons authorized by permit or regulation to possess them.

8. A subpermittee is an individual to whom you have provided written authorization to conduct some or all of the permitted activities in your absence. Subpermittees must be at least 18 years of age. As the permittee, you are legally responsible for ensuring that your subpermittees are adequately trained and adhere to the terms of your permit. You are responsible for maintaining current records of who you have designated as a subpermittee, including copies of designation letters you have provided.
9. You and any subpermittees must carry a legible copy of this permit, *including these Standard Conditions*, and display it upon request whenever you are exercising its authority.
10. You must maintain records as required in 50 CFR 13.46 and 50 CFR 21.41. All records relating to the permitted activities must be kept at the location indicated in writing by you to the migratory bird permit issuing office.
11. Acceptance of this permit authorizes the U.S. Fish and Wildlife Service to inspect any wildlife held, and to audit or copy any permits, books, or records required to be kept by the permit and governing regulations.
12. You may not conduct the activities authorized by this permit if doing so would violate the laws of the applicable State, county, municipal or tribal government or any other applicable law.

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**APPENDIX B**

**APPENDIX B. FAA FORM 5200/7**

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## **APPENDIX C**

### **LIST OF DISTRIBUTORS OF WILDLIFE CONTROL SUPPLIES**

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## **Appendix C**

### **List of Distributors of Wildlife Control Supplies**

#### **Distress Tapes:**

Cornell Lab of Ornithology, User Services Dept. (607) 254-2407

Reed-Joseph International Co., 232 Main St., PO Box 894, Greenville, MS 38701.  
(800) 647-5554

Signal Broadcast Products, Inc., 2314 Broadway, Denver, CO 80205. (303) 296-1838

#### **Pyrotechnics:**

Pyrodyne, 2523 Pacific Highway East, Tacoma, WA 98424. (206) 922-0800

Reed-Joseph International Co., 232 Main St., PO Box 894, Greenville, MS 38701.  
(800) 647-5554

MARGO Supplies Ltd., Site 20, Box 11, R.R. #6, Calgary, Alberta T2M4L5. (403) 285-9731

Sutton Ag, 538 Brunken Ave. #7, Salinas, CA 93901. (408) 422-9693

Stoneco, PO Box 187, Dacono, CO 80514. (303) 833-2376

#### **Trapping Supplies:**

Minnesota Trapline Products, 6699 156<sup>th</sup> Ave. NW, Pennock, MN 56279. (320) 599-4176

Sterling Fur Company, 11268C Frick Road, Sterling, OH 44276. (330) 939-3763

Tomahawk Live Trap Company, PO Box 323, Tomahawk, WI 54487. (800) 272-8727

#### **Metal Wires or Projectors:**

Bird Barrier America, Inc., 20925 Shico Rd., Carson, CA 90746. (800) 503-5444

Nixalite of America, 1025 16th Ave., East Moline, IL 61244. (888) 624-1189

Cat Claw, Inc., PO Box 3778, Johnstown, PA 15994.

Shaw Steeple Jacks, Inc., 2710 Redford St., Johnstown, PA 15904.

*This is not an exhaustive list. Inclusion does not indicate an endorsement nor does omission indicate disapproval.*

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**EXHIBIT J**  
**Labor Code Requirements**

1. Pursuant to Labor Code Section 1773.2, copies of the prevailing rate of per diem wages for each craft, classification, or type of worker needed to perform the Services are on file at the Airport and will be made available to any interested party on request. By initiating any Work, Contractor acknowledges receipt of a copy of the DIR determination of such prevailing rate of per diem wages, and Contractor shall post such rates at each job site covered by these Contract Documents.
2. Contractor shall comply with and be bound by the provisions of Labor Code Sections 1774 and 1775 concerning the payment of prevailing rates of wages to workers and the penalties for failure to pay prevailing wages. Contractor shall, as a penalty paid to the Authority, forfeit \$200 for each calendar day, or portion thereof, for each worker paid less than the prevailing rates as determined by the DIR for the work or craft in which the worker is employed for any public work done pursuant to these Contract Documents by Contractor or by any subcontractor.
3. Contractor shall comply with and be bound by the provisions of Labor Code Section 1776, which requires Contractor and each subcontractor to (1) keep accurate payroll records and verify such records in writing under penalty of perjury, as specified in Section 1776, (2) certify and make such payroll records available for inspection as provided by Section 1776, and (3) inform the Authority of the location of the records. Contractor has 10 days in which to comply subsequent to receipt of a written notice requesting these records, or as a penalty to the Authority, Contractor shall forfeit \$100 for each day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.
4. Contractor and each subcontractor shall comply with and be bound by the provisions of Labor Code Section 1771.4(a)(3), which requires that each contractor and each subcontractor shall furnish the records specified in Section 1776 directly to the Labor Commissioner at least monthly, in a format prescribed by the Labor Commissioner.
5. Contractor acknowledges that eight hours labor constitutes a legal day's work. Contractor shall comply with and be bound by Labor Code Section 1810. Contractor shall comply with and be bound by the provisions of Labor Code Section 1813 concerning penalties for workers who work excess hours. Contractor shall, as a penalty paid to the Authority, forfeit \$25 for each worker employed in the performance of the Services by Contractor or by any subcontractor for each calendar day during which such worker is required or permitted to work more than eight hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of Division 2, Part 7, Chapter 1, Article 3 of the Labor Code. Pursuant to Labor Code Section 1815, work performed by employees of the Contractor in excess of eight hours per day, and 40 hours during any one week shall be permitted upon public work upon compensation for all hours worked in excess of eight hours per day at not less than 1.5 times the basic rate of pay.
6. Contractor shall comply with and be bound by the provisions of Labor Code Sections 1777.5, 1777.6 and 1777.7 and California Code of Regulations Title 8, Section 200 et seq. concerning the employment of apprentices on public works projects. Contractor shall be responsible for compliance with these Sections for all apprenticeable occupations. Before commencing the Services, Contractor shall provide the Authority with a copy of the information submitted to any applicable apprenticeship program. Within 60 days after concluding work, Contractor and each of

its subcontractors shall submit to the Authority a verified statement of the journeyman and apprentice hours performed under this Agreement.

7. Contractor shall not perform work with any subcontractor that has been debarred or suspended pursuant to California Labor Code Section 1777.1 or any other federal or state law providing for the debarment of contractors from public works. Contractor and subcontractors shall not be debarred or suspended throughout the duration of this Agreement pursuant to Labor Code Section 1777.1 or any other federal or state law providing for the debarment of contractors from public works. If Contractor or any subcontractor becomes debarred or suspended during the duration of this Agreement, Contractor shall immediately notify the Authority.
8. In accordance with Labor Code Sections 1725.5 and 1771.1, no contractor or subcontractor shall be qualified to bid on, be listed in a bid, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, unless currently registered and qualified to perform public work pursuant to Section 1725.5.
9. The Services are subject to compliance monitoring and enforcement by the DIR. Contractor shall post job site notices, as prescribed by regulation.
10. Labor Code Sections 1860 and 3700 provide that every contractor will be required to secure the payment of compensation to its employees. In accordance with the provisions of Labor Code Section 1861, by signing this Agreement, Contractor certifies as follows:

“I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers’ compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this contract.”

**EXHIBIT K**  
**Task Order Form**

(attached)



Procurement Department  
2627 N. Hollywood Way  
Burbank, CA 91505  
P: 818-840-8840 E: [purchasing@bur.org](mailto:purchasing@bur.org)  
Burbank-Glendale-Pasadena Airport Authority

### TASK ORDER (TO)

|                          |                        |
|--------------------------|------------------------|
| <b>To Firm:</b>          |                        |
| <b>SA/P.O. No:</b>       | <b>Account No.:</b>    |
| <b>T.O. Order No:</b>    | <b>Effective Date:</b> |
| <b>T.O. Revision No:</b> | <b>Revision Date:</b>  |
| <b>Originator:</b>       | <b>Phone No:</b>       |

This Task Order (TO) is issued pursuant to the applicable Services Agreement (SA) between the Burbank-Glendale-Pasadena Airport Authority (Authority), owner/operator of Hollywood Burbank Airport and your Firm, pursuant to terms and conditions of the SA indicated, for the services described below.

Additional sheet(s) attached? ☐ Yes ☐ No

Please check if applicable: ☐ Statement of Work attached ☐ Specification attached ☐ Other attachment

|  |
|--|
| <b>DESCRIPTION / SERVICE CATEGORY:</b> |
|  |
|  |
|  |

#### Task Order Pricing Basis

|   |   |
|---|---|
| <b>Time &amp; Materials, Fee Schedule/Rates:</b> <input type="checkbox"/> | <b>Lump Sum:</b> <input type="checkbox"/> |
| Estimated not-to-exceed amount: \$ _____                                  | \$ _____ Total Lump Sum                   |
| Estimated revision amount: \$ _____                                       | (As agreed in advance, to successfully    |
| Total of previous revisions: \$ _____                                     | complete the described services.)         |
| Current estimated not-to-exceed amount: \$ _____                          |   |

This Task Order is also a Notice to Proceed immediately with the services described, with final completion on \_\_\_\_\_. **Time shall be of the essence in the performance of this Task Order.**

All services are subject to acceptance by the Authority. All required supporting documentation to be included with Invoice Applications for Payment including a copy of the fully executed Task Order.

Except as may be modified herein, all other contract terms and conditions are unchanged.

This Task Order is accepted and agreed by authorized representatives of the parties as indicated below:

|                               |  |
|-------------------------------|--|
| _____<br>Company Name         | _____<br>Burbank-Glendale-Pasadena Airport Authority<br>Company Name |
| _____<br>Authorized Signature | _____<br>Authorized Signature  |
| _____<br>Name                 | _____<br>Name  |
| _____<br>Title                | _____<br>Title   |
| _____<br>Date                 | _____<br>Date  |

**BURBANK-GLENDALE-PASADENA AIRPORT AUTHORITY  
OPERATIONS AND DEVELOPMENT COMMITTEE  
DECEMBER 14, 2020**

**COMMITTEE PENDING ITEMS**

**Future**

1. Award of Purchase Order – Airfield Sweeper / Ramp Scrubber Acquisition
2. Award of Contract - Acquisition of Body Cameras (APD)