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# Airport Visual Aids

Illuminating Engineering Society

October 17<sup>th</sup> – 21<sup>st</sup> , 2011

Hilton Wilmington Riverside

Wilmington, North Carolina



2011-IESALC  
Wilmington, NC

Presented by Alvin Logan

FAA AAS-100



# AGENDA

- AC Updates
  - 5340-30F, 5345-28F, 5345-39D, 5345-47C, 5345-56B
- EB-67D LEDs, EB-84 ALCMS, EB-85 SPR, FAROS EB
- RWSL THL/ALSF-II Assessment



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# AC 5340-30F



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# 150/5340-30F, Design and Installation Details for Airport Visual Aids

- Paragraph added to prevent mixing elevated and in-pavement light fixtures for runway threshold lights.
- Added clarification to the application of retroreflective markers.
- Table 2-2, Note 2 is clarified for the use of L-861SE light fixtures.
- Reinstated longitudinal tolerance for runway centerline lights.



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# 150/5340-30F, Design and Installation Details for Airport Visual Aids

- Taxiway Centerline Lights - additional information is added to clarify the use of yellow and green fixtures.
- NFPA 780 is included to provide additional information for the installation of lightning protection systems on airfields.
- Paragraph 12.6 adds additional information found in the National Electric Code (NEC) Handbook and NFPA 780 about grounding stakes.



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# 150/5340-30F, Design and Installation Details for Airport Visual Aids

- Paragraph 12.7 is added to add a bonding wire to connect the light fixture to the light base internal grounding lug.
- Paragraph 13.3(a) adds a note for airport managers to notify air traffic control about variances in airfield lighting preset standards for the Airfield Lighting Control and Monitoring System (ALCMS).



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# AC 5345-28F



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# AC 150/5345-28F

## Precision Approach Path Indicator

- (a) Incorporated Engineering Brief #67, Light Sources Other Than Incandescent and Xenon For Airport and Obstruction Lighting Fixtures, when using alternative lighting devices.



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# AC 150/5345-28F

## Precision Approach Path Indicator

- Style A Surge and Transient Protection
  - The PAPI equipment susceptibility to power line surges must be per the defined waveforms detailed in Table 4, Location Category C2, in ANSI/IEEE C62.41-1991, *Recommended Practices on Surge Voltages in Low Voltage AC Power Circuits*. Surge protection must be provided against a minimum of 3 applications at 15 second intervals of a 5 kilo amp 8/20 microsecond ( $\mu$ S) short circuit current pulse and 10 kilo volt 1.2/50  $\mu$ S open circuit pulse.



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# AC 5345-56B



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# AC 150/5345-56B ALCMS

- Paragraph 5.4c is updated to delete reference to Appendix 2 and add reference to paragraph 10.3.2 for test system preset settings.
- Paragraph 10.3.2, Table 8 adds a note for airport managers to notify air traffic of variances in airfield lighting preset standards of the Airfield Lighting Control & Monitoring System.
- Appendix 2, Airport Lighting Preset Controls, is deleted to eliminate the possibility of any confusion between System Test preset settings.



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# AC 5345-39D



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# AC 5345-39 Updates

- Paragraph 3.4.2.2b is added to clarify the Type II retroreflective marker maximum cylinder diameter.
- Paragraph 3.4.2.2c is added to clarify the standard height requirement of a Type II retroreflective marker.
- Paragraph 3.4.3.1 is reworded to clarify Type II marker mounting system requirements.



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# AC 5345-47C



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# Specification for Series to Series Isolation Transformers

- Paragraph 2.3, ASTM Specification D4247 is withdrawn by ASTM with no replacement.
  - This specification covers cross-linked polychloroprene compounds suitable for use as outer coverings or jackets on electrical cables for general-purpose, black heavy-duty and black extra-heavy-duty service.



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# Specification for Series to Series Isolation Transformers

- Deleted references to ASTM D4247 and 2240. Paragraph is rewritten to allow the use of thermoplastic elastomers (TPE) and thermoplastic vulcanizates (TPV).
- Existing Paragraph 3.4.1h and subparagraphs are deleted. Durometer hardness is increased from  $65 \pm 10$  to  $75 \pm 10$  for the use of TPE and TPV materials and moved to 3.4.1h.



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# Engineering Brief Updates



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# Draft Engineering Briefs

- EB-84 for ALCMS Security Draft
  - Design and use of virtual private network (VPN) systems to enable secure off-site remote maintenance and monitoring of airport lighting control monitoring systems (ALCMS)
- EB-85 for Snow Plow Rings Draft
  - Design and installation criteria for a snowplow ring (SPR) that protects Style 2 and 3 in-pavement lights per AC 150/5345-46 from the destructive effects of airport plowing operations without altering photometric performance.



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# Draft Engineering Briefs

- EB-89 - Guidance for Taxiway Naming Convention
  - This Engineering Brief provides clarification for taxiway naming convention standards contained in FAA Advisory Circular (AC) 150/5340-18F, Standards for Airport Sign Systems.



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# Draft Engineering Briefs

- EB for RCL in Displaced Threshold > 700 feet
  - Technology to control interlocked switching of runway centerline lights and MALSR in displaced threshold.
- EB for FAROS/eFAROS
  - Design guidance for implementation of a direct warning system (based on LOOPs sensor) to airborne flight crews of runway occupancy status.



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# Engineering Brief 67

Light Sources Other than Incandescent and Xenon  
for Airport and Obstruction Lighting Fixtures



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# Moratorium for LED RCLs/TDZ



## Federal Aviation Administration

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### Memorandum

Date: SEP 17 2010  
To: All Regional Airports Division Managers  
From:   
Rick Marinelli, Manager, Airport Engineering Division, AAS-100  
Prepared by: Alvin Logan, Airport Engineering Division, AAS-100  
Subject: Acquisition & Installation of Light Emitting Diode (LED) Runway Centerline  
and Touchdown Zone Lighting Systems

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The purpose of this memorandum is to announce a moratorium on the acquisition and installation of FAA LED Runway Centerline (L-850A) and LED Touchdown Zone (L-850B) Lighting Fixtures built in accordance with Engineering Brief 67, "Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures" and listed in Appendix 1 of FAA AC 150/5345-53C Addendum, "Airport Lighting Equipment Certification Program".

Flight testing of the subject lighting systems has recently been conducted at Raleigh-Durham International Airport during nighttime VFR. The consensus reached was the lighting intensity of the LED fixtures exhibited bright signals even at the lowest step setting (step 1 of 5) of the constant current regulator.

The Airport Engineering Division is currently coordinating with industry to address this issue. We anticipate subsequent modifications to the Engineering Brief in the near future. Once the issue is resolved, we will notify the Regions of the product updates.

Please contact Alvin Logan at (202) 267-8743 with any questions.



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# Raleigh Durham Approach



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# Engineering Briefs Updates

- EB 67C, Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures (1/7/2011)
  - Defined new dimming curve for white light
  - Redefined aviation white chromaticity boundaries
  - Alternative lighting fixture accelerated life test
  - Alternative light fixture power factor and method of determination
  - Include new Category C2 surge protection requirements
  - Incorporated dominant wavelengths



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# Engineering Brief 67C



U.S. Department  
of Transportation  
**Federal Aviation  
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## Memorandum

Subject: **INFORMATION:** Engineering Brief 67C  
Light Sources Other Than Incandescent and Xenon For  
Airport and Obstruction Lighting Fixtures

From: Manager, Airport Engineering Division, AAS-100

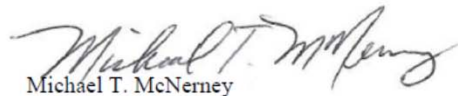
To: All Regions  
Attn: Manager, Airports Division

Date: Dec 29, 2010

Reply to  
Attn. of:

Engineering Brief 67C provides additional requirements for light sources other than incandescent and xenon technologies subject to certification under Advisory Circular 150/5345-53, "Airport Lighting Equipment Certification Program," and other applicable documents as required. It includes the required specific test and design requirements for alternative light sources that will be used in certified airfield lighting fixtures. This Engineering Brief ensures these new lighting technologies are seamlessly integrated with existing lighting technologies on the airfield.

Airfield Lighting Equipment Manufacturers employing alternative light sources in equipment certified under FAA Advisory Circular 150/5345-53 must meet the requirements contained in each applicable AC. The third party certification activity must verify the airfield lighting manufacturers' equipment meets the design and operational provisions as dictated by changing illuminating technology.

  
Michael T. McNerney

Attachment



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# Reinstatement Memo for L-850 LEDs




## Federal Aviation Administration

### Memorandum

Date: Jan 3, 2011

To: All Regional Airports Division Managers

From:   
Michael T. McNerney, Assistant Manager, Airport Engineering Division, AAS-100

Prepared by: Alvin Logan, Airport Engineering Division, AAS-100

Subject: Reinstatement of Light Emitting Diode (LED) L-850A, Runway Centerline and L-850B, Touchdown Zone Lighting Systems

This memorandum rescinds FAA memorandum "Acquisition & Installation of Light Emitting Diode (LED) Runway Centerline and Touchdown Zone Lighting Systems" dated Sept 17, 2010.

All testing and validation of LED L-850A and L-850B airport lighting technologies have been completed at Raleigh-Durham International airport by the FAA William J. Hughes Technical Center. Light intensity standards for Constant Current Regulator Steps 1 and 2 have been defined and standardized. The results of testing and validation are implemented in Engineering Brief 67C, "Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures", dated Dec 29, 2010.

All present and future acquisitions of the subject fixtures must comply with Engineering Brief 67C, dated Dec 29, 2010. Any existing installations of LED L-850A and/or L-850B lighting technologies will require "field modifications" by the manufacturer to comply with the new Engineering Brief 67C guidance.

Thank you for your patience in this matter.

Please contact Alvin Logan at (202) 267-8743 with any questions.



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# Engineering Brief 67D

- Early draft versions attempted to narrow the bandwidth of color available to control LED color variations.
- Dominant wavelengths for LED colors are introduced in an attempt to reduce LED light fixture color variations.
- RPI/Tech Center white LED 1931 CIE chromaticity requirements are introduced. Not as wide as ICAO.



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# Engineering Brief 67D

- Revision circulated with RPI and Tech Center proposed 1931 CIE coordinates (line equations and boundary limits) for white and color LEDs. Unique requirements for obstruction lights and signs are noted via notes in Section 2.
- Potential problems with “blinking” LEDs leads to new requirements for pulse width modulation minimum frequencies.
  - perceived flicker frequency is about 100 Hz so the PWM for an LED light fixture should be higher



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# Engineering Brief 67D

- Warranty requirements are added to differentiate LED based light fixtures for Life Cycle Cost Analyses.
- Light fixture replacement criterion is added to warranty requirements per AC 150/5340-26.
- ETL proposes consolidation of LED intensity curves to one curve for color and white LEDs.



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# RWSL THLs and ALSF-II Evaluation



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- Synopsis:

The incident occurred on 6/24/2011 at 1217UTC. DAL561 advised he was seeing red lights while in position on runway 4R. The crew refused to takeoff, did not roll and an arrival to 4R had to go around.



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# Runway Safety Assessment Response to Takeoff Hold Lights

## Completed Testing in MITRE CAASD Simulator:

- Test for Pilot Confusion between THLs and ALSF-2:
  - **It exists!**
- MITRE Outcome Briefing to FAA



THLs



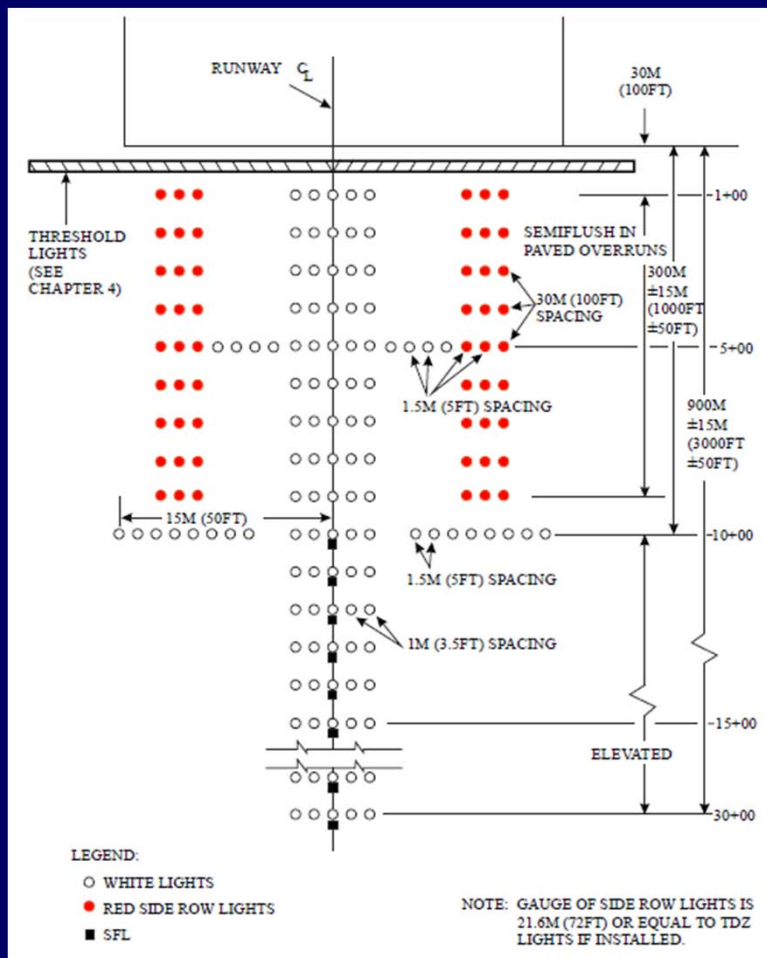
ALSF-2



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# Runway Safety Assessment Response to Takeoff Hold Lights



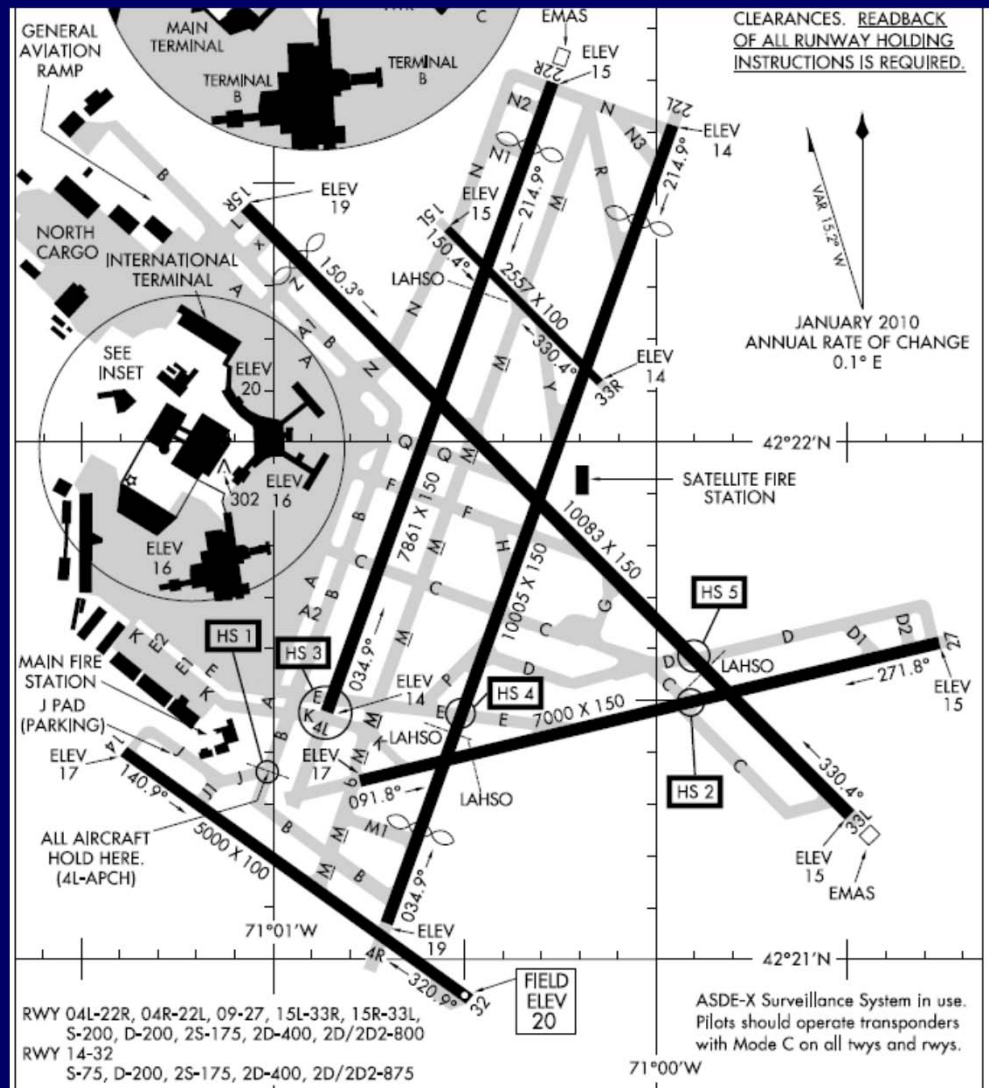
**ALSF-II**

**RWSL THLs**



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# BOS Logan



AIRPORT DIAGRAM

10266

BOSTON, MASSACHUSETTS  
BOSTON / GENERAL EDWARD LAWRENCE LOGAN INTL (BOS)

- Confusion with RWSL  
THLs and ALSF-II



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# FAROS

- FAROS Engineering Brief will be circulated to FAA Regions for comment to make a determination of feasibility, practicality of usage.



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# Questions?



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