



INTERTEK AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM

IESALC Government Contacts Subcommittee Meeting

IESALC Annual Spring Meeting

Washington, DC April 18, 2019

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INTRODUCTION



- **Purpose / Outline**

- Overview of ALECP
- Update of Current Program Status
- Update on Current Initiatives



TESTING VS. CERTIFICATION



TESTING	CERTIFICATION
ONE-TIME EVENT	TESTING ALONG WITH CONTINUED SURVEILLANCE
MAY NOT BE COMPREHENSIVE	MUST INCLUDE ALL APPLICABLE SPECIFIED TESTING AND REQUIREMENTS
ONLY APPLIES TO SAMPLES TESTED	MUST INCLUDE STRICT CONFIGURATION MANAGEMENT SO CONSISTENCY OF PRODUCED PRODUCTS CAN BE MONITORED
NO MONITORING OF PRODUCTION	PRODUCTION MONITORING REQUIRED
RESULTS IN TEST REPORT	RESULTS IN CERTIFICATE, LISTING, AND AUTHORIZATION TO USE A MARK

AIRPORT LIGHTING EQUIPMENT CERTIFICATION

Certification Program covers all equipment specified in the FAA AC 150/5345 series:

- Rotating Beacons
- Obstruction Lights
- Wind Cones
- Isolation Transformers
- Taxiway/ Runway Inpavement Lights
- Retroreflective Markers
- Cable Connectors
- Underground Cable
- Runway & Taxiway Signs
- Portable Runway Lights
- Light Bases Constant Current Regulators
- Precision Approach Path Indicators (PAPI)
- Runway End Identification Lights (REIL)





ALECP PURPOSE AND APPLICABILITY

- **Purpose is to assist in enhancing aviation safety by:**
 - Insuring good quality, reliable, airfield lighting products
 - Verifying equipment performance so that all pilots receive reliable, standardized visual queues.
- **Applicability of ALECP Certification**
 - **Airfield Lighting Products:**
 - Only FAA acceptable means to satisfy Title 14 CFR Part 139 Section 139.311 Certification of Airports
 - Mandatory for all projects funded by Federal AIP for PFC monies
 - Widely used around the world to insure a standard level of performance

ALECP PURPOSE AND APPLICABILITY



- **Applicability of ALECP Certification**

- **Obstruction Lighting Products:**

- **FAA Regulations - 14 CFR Part 77**

- 77.7 – Specifies the requirements for notifying the FAA of construction or alteration of an obstruction.
 - FAA Form 7460-1, Notice of Proposed Construction or Alteration
- 77.9 - Specifies what types of construction requires notification to the FAA.
- 77.17 – Provides the definitions of obstructions.
- 77.29 – Describes the aeronautical study that the FAA does to evaluate the impact of the proposed obstruction.
- 77.31 – Describes the determination that FAA makes for each obstruction.
 - Determination of No Hazard to Air Navigation is issued with conditions including the lighting and marking.
- 77.33 – Determination of No Hazard to Air Navigation is good for 18 months.



ALECP PURPOSE AND APPLICABILITY

- **Applicability of ALECP Certification**

- **Obstruction Lighting Products:**

- FCC Regulations – 47 CFR Part 17

- 17.4 – Antenna structure registration requirements
- 17.7 – Requirements to notify FAA
- 17.23 – Conditions set forth in FAA determination are mandatory
- 17.47 – Inspection requirements for antenna structure obstruction lighting equipment.
- 17.48 – Reporting of improper functioning lights
- 17.49 – Documentation of inspections



ALECP PURPOSE AND APPLICABILITY

- **Applicability of ALECP Certification**

- **Obstruction Lighting Products:**

Taken from recent determination from FAA Obstruction Evaluation Group website:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, paint/red lights - Chapters 3(Marked),4,5(Red),&12.

- **FAA AC 70/7460-1L**

- Describes how obstructions must be marked and lighted
- Section 12.4 states that lighting equipment should conform to the latest version of FAA AC 150/5345-43. FAA AC 150/5345-53 lists the manufacturers that have demonstrated compliance
Other manufacturers' equipment may be used if it meets the requirements of -43

FAA AC 150/5345-53D



- **Third Party Certifier Acceptance Criteria**
 - Section 5

- **Third Party Certifier Application (every 4 years)**
 - Section 6
 - Background as a certification body
 - Competency verification (accreditations)
 - Resumes of related staff
 - Copy of procedural guide and license agreement

FAA AC 150/5345-53D



- **GENERAL OUTLINE**

- Manufacturer submits certification request via AL-2 application form
- Qualification testing
- Documentation submittal and engineering review
- Initial manufacturing facility audit (semi-annual inspections continue)
- License Agreement
- Certificate issued and product listed in 53D Addendum
- Certification process covered under ANSI accreditation to ISO 17065



SEMI-ANNUAL INSPECTIONS

- **First Visit:**
 - AL-7 Audit (follows basic ISO quality assurance requirements)
 - AL-1; AL-1A Contact Sheet

- **Second Visit:**
 - Product Checklist(s)
 - Construction review using the applicable ACs
 - Production Testing Requirements
 - As required in the applicable ACs
 - AL-1; AL-1A Contact Sheet (as needed)

RESCINDING OF CERTIFICATES



FAA AC 150/5345-53D, Appendix 2, section 5.h

Lack of required documentation

Failure of manufacturer to honor required warranty

Unsatisfactory failure rate of equipment in the field

Unreliable performance of equipment as determined by the FAA

Failure of manufacturer to maintain quality system

Changes made to the equipment without the approval of the third party certifier

Failure to re-certify

Non-compliance found during manufacturer challenge process

CURRENT PROGRAM STATISTICS



- 60 program participants
- 69 licensed manufacturing facilities
 - (5 pending)
- Certifications since the Fall Government Contacts Meeting in October 2018
 - 34 new or re-qual. certificates
 - 169 revised certificates
 - 30 de-listings

DRAFT SPECIFICATIONS



FAA AC 150/5345-42J (Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories)

Deadline for comments – 1/8/2018

FAA AC 150/5345-26E (Specification for L-823 Plug and Receptacle, Cable Connectors)

Deadline for comments – 3/23/2018

FAA AC 150/5345-28H (Precision Approach Path Indicator (PAPI) Systems)

Deadline for comments – 2/12/2018

DRAFT SPECIFICATIONS



FAA AC 150/5345 – 54C (Specification for L-884, Power and Control Unit for Land and Hold Short Lighting Systems)

Deadline for comments – 3/28/18

FAA AC 150/5345 – 39E (Specification for L-853, Runway and Taxiway Retroreflective Markers)

Deadline for comments – 8/24/2018

DRAFT SPECIFICATIONS



FAA AC 150/5345 – 3H (Specification for L-821, Panels for the Control of Airport Lighting)

Deadline for comments – 9/26/2018

FAA AC 150/5345 – 5C (Specifications for Airport Lighting Circuit Selector Switch)

Deadline for comments – 9/26/2018

NEW SPECIFICATIONS



FAA AC 150/5345 – 43J

Dated – 3/11/2019

Principal Changes:

Clarification to 3.3.8 and 4.2.11 to exempt DC systems from the Transient Protection requirement

ANSI/IEEE C62.41-1991, IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

Clarification to 3.3.11 limiting the interlock switch requirement to high voltage discharge xenon systems



NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Principal Changes:

Change to L-810 photometric requirements

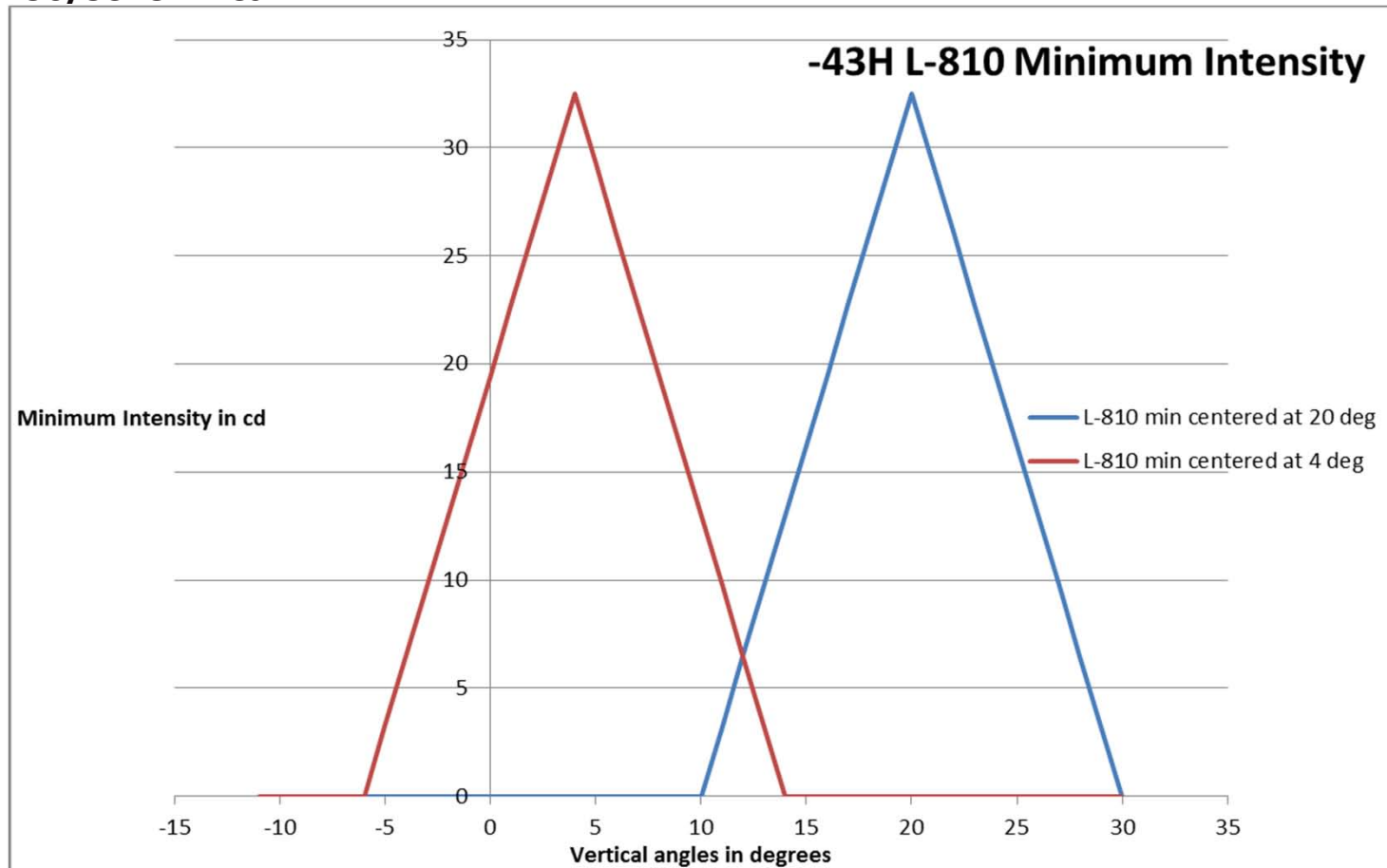
3.4.1.2 Note added to require 32.5cd minimum “over the minimum vertical beam spread of 10 degrees”.

3.4.1.2.1 (L-810(F) section) States “With respect to the center of the beam and over a vertical range of +/-5 degrees, there must be a minimum intensity of 32.5cd...”

NEW SPECIFICATIONS



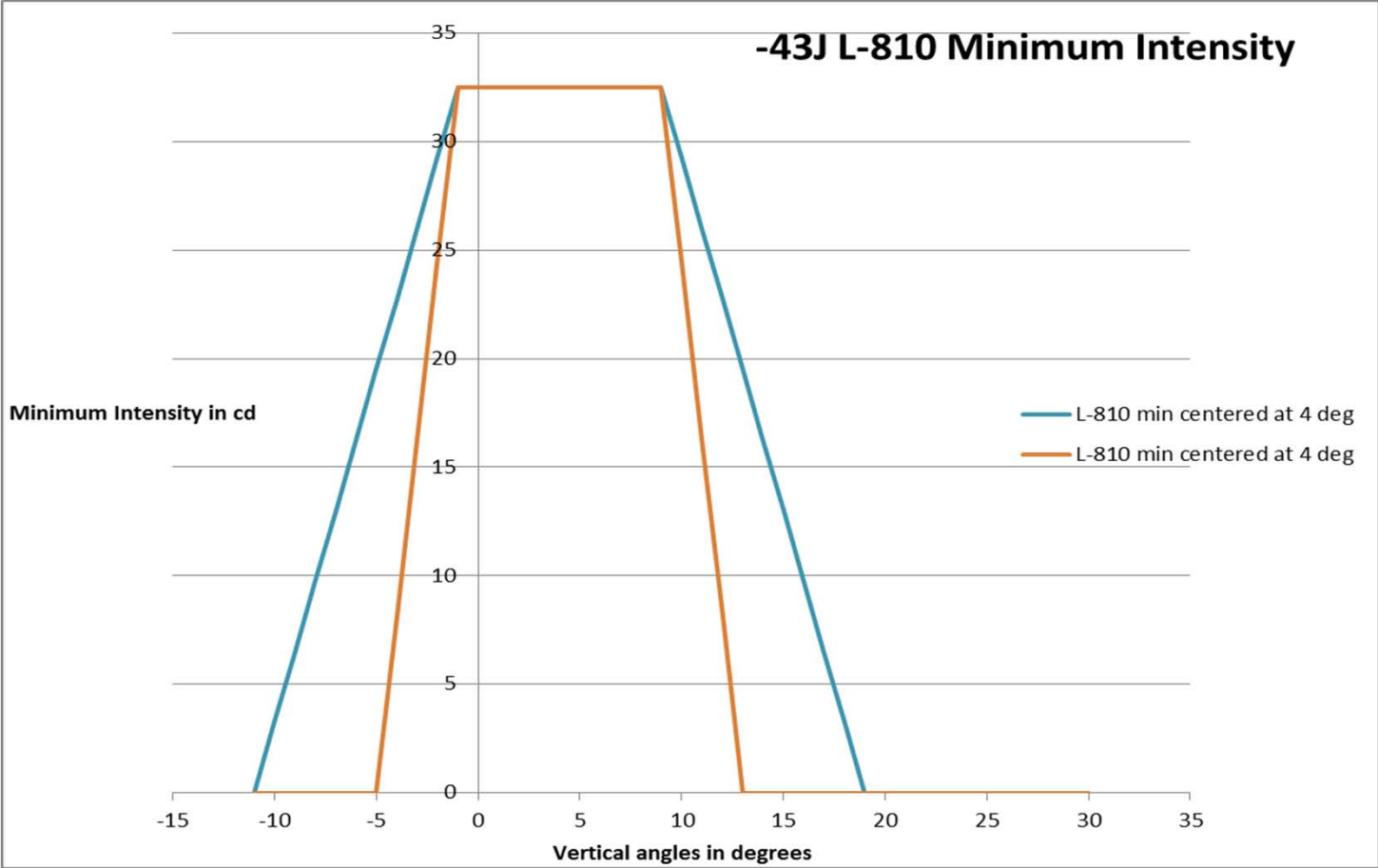
FAA AC 150/5345 – 43J



NEW SPECIFICATIONS



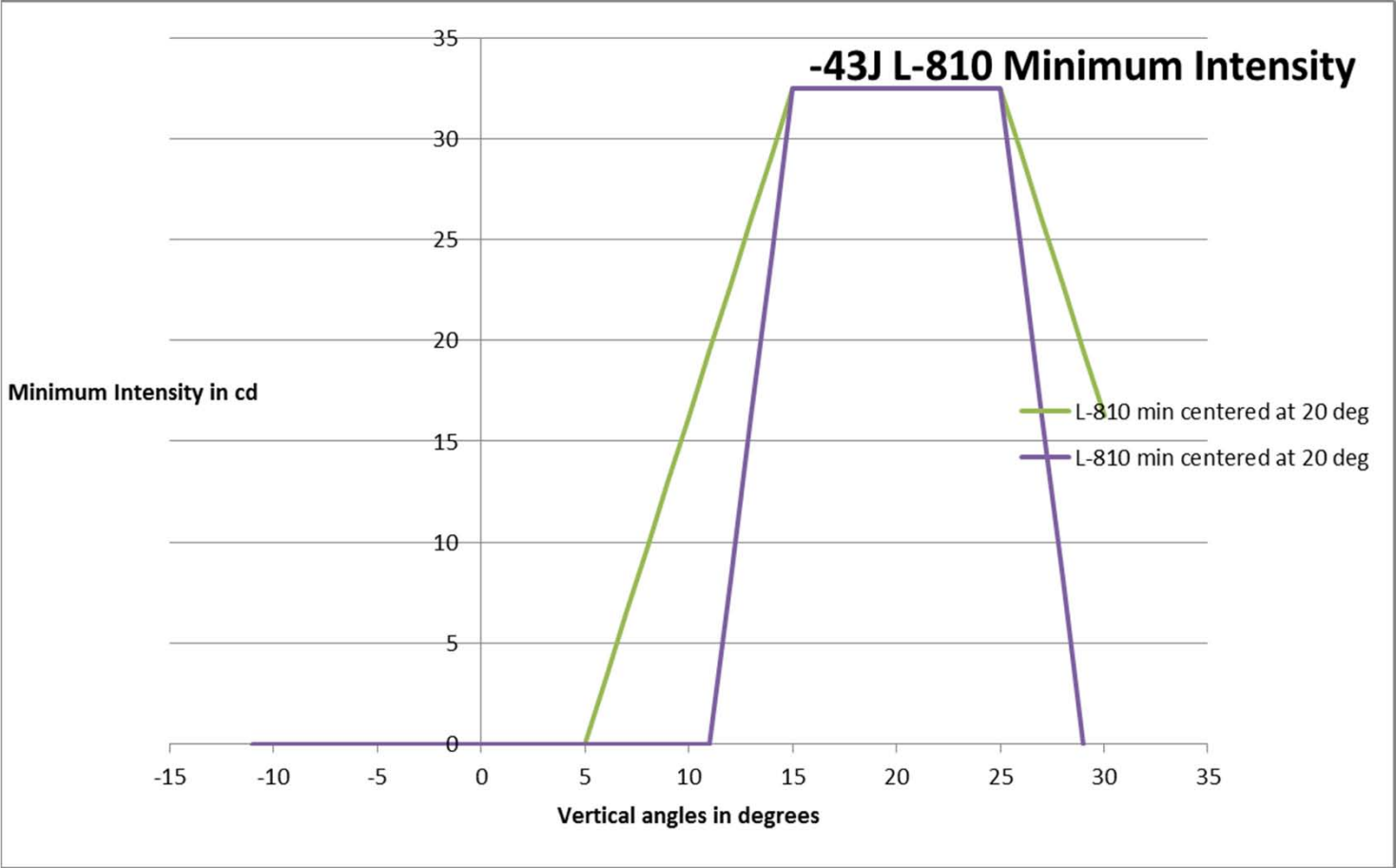
FAA AC 150/5345 – 43J



NEW SPECIFICATIONS



FAA AC 150/5345 – 43J





NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Dated – 3/11/2019

Principal Changes:

Added reference to EB98, Infrared Specifications for Aviation Obstruction Light Compatibility with Night Vision Goggles.

The requirements of EB98 are fully included with modifications in this new AC.

To be NVG compatible, red obstruction lights (L-810(L), L-864(L), and L-885(L)) must include IR emitters or be used in conjunction with a standalone IR emitter.

Since FAA AC 150/5345-43J provides for a “standalone IR emitter” that can be used in conjunction with LED red aviation obstruction lights, LED obstruction lights could still be offered without IR capability (in the near future).



NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Output Wavelength

- The IR output must be in the 800 to 900 nm range.

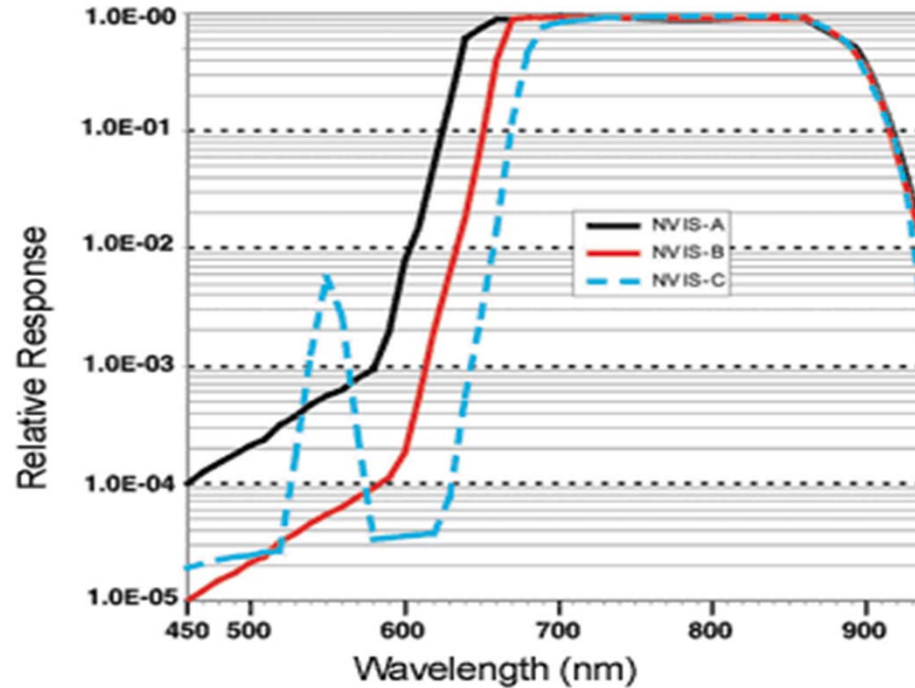
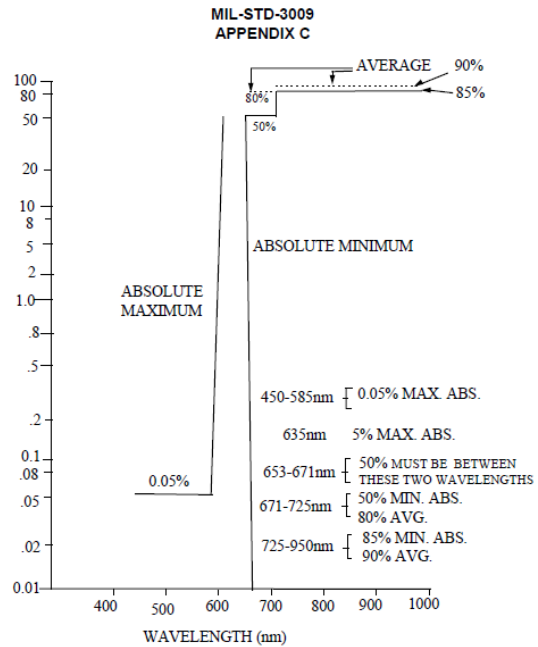


FIGURE C-5. Spectral transmission requirements for a Class B NVIS objective lens.

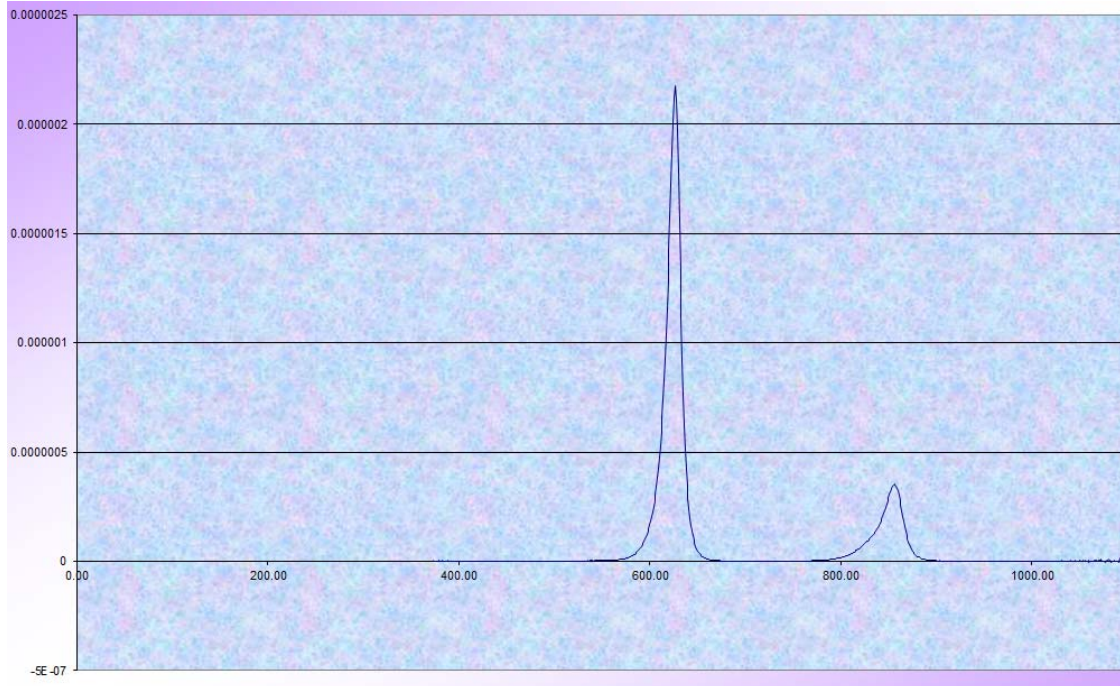


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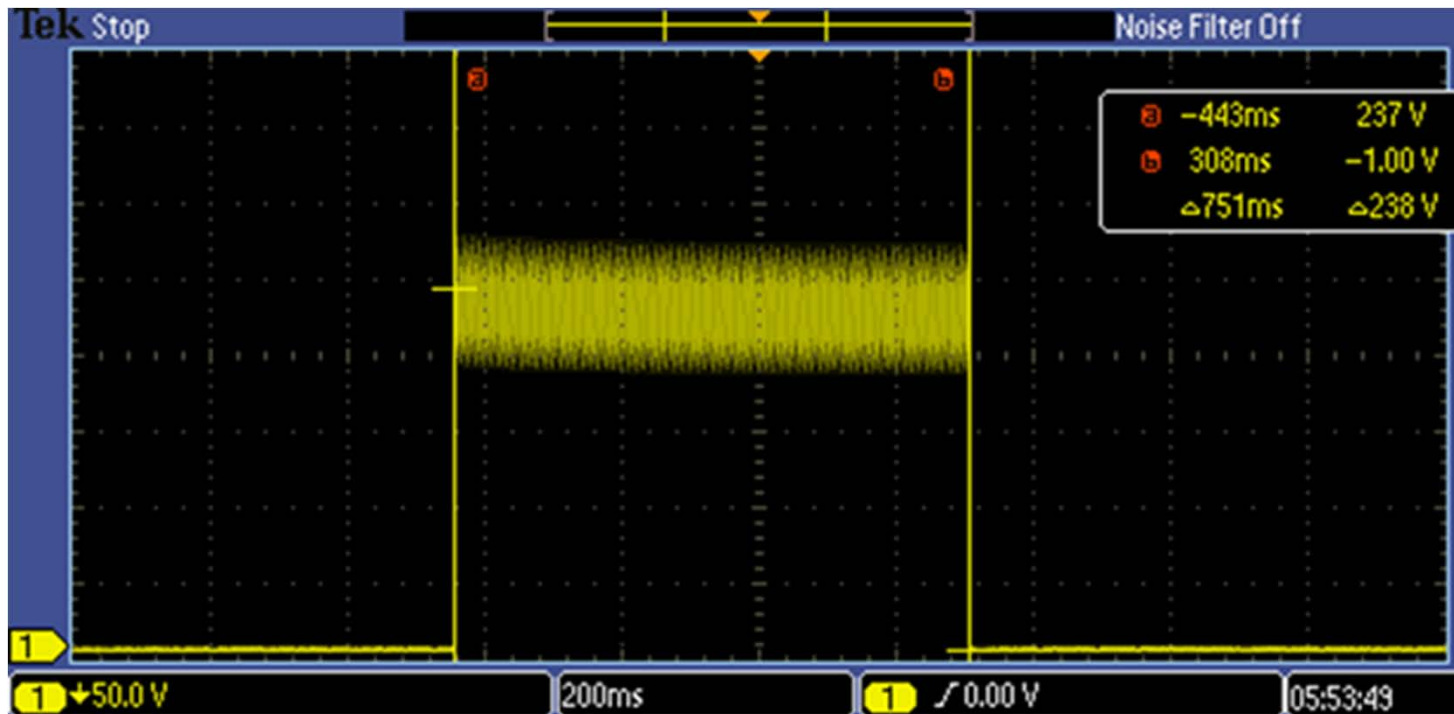


NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Timing Synchronization

- The IR radiation must be synchronized with the visible light both in flash duration, and flash rate. The IR emitters must be on when the visible light is on, and off when the visible light is off.





NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Minimum IR Radiant Intensity in the 800-900nm range:

IR radiation angular distribution must match the visible light photometric angular distribution for the applicable product type.

- 4 mW/sr for L-810(L) applications
- 246mW/sr for L-864(L) and L-885(L) applications
- Analogous to luminous intensity in cd = lumen/sr
 - Not to be confused with radiance or irradiance
 - Sum of energy from 800-900nm instead of the photopically corrected
- Peak value for flashing applications



NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Monitoring / Control

- IR emitters must be monitored in accordance with the requirements in FAA AC 150/5345-43J.
 - Section 3.3.5.2.2
 - Failures must be monitored (outage or flasher failure).
 - FAA EB67D section 2.6 must be considered.
 - Monitor signals must be failsafe.
 - Must be provisions to permit connection to a remote alarm device.
- IR emitter failure and visible light failure can be coupled or de-coupled. In either case, an alarm signal must be generated to indicate the failure.



NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Certified systems with IR capability.

- Testing must be conducted to demonstrate compliance with the new requirements contained in FAA AC 150/5345-43J as stated above.

Certified systems that are now being modified to include IR capability.

- The manufacturer must submit the design details of the modification to Intertek so that an engineering review can be done to determine what FAA AC 150/5345-43J and FAA EB67D testing must be repeated.
- Testing must be conducted to demonstrate compliance with the new IR requirements contained in FAA AC 150/5345-43J as stated above.

Stand-alone IR emitters.

- Testing must be conducted to demonstrate compliance with all applicable requirements found in FAA AC 150/5345-43J and FAA EB67D. Proper system integration must be demonstrated for all systems that the stand alone IR emitter is intended to be used with.

NEW SPECIFICATIONS



FAA AC 150/5345 – 43J

Current Note on the FAA AC 150/5345-53D Addendum:

“IR element present is not tested nor certified under this program as to compatibility with any night vision equipment.”

This note will not be necessary for products certified to **FAA AC 150/5345 – 43J**.



NEW SPECIFICATIONS

FAA Engineering Brief 83A, In-Pavement Light Fixture Bolts

Dated – December 26, 2018

Purpose:

The FAA developed this information and guidance related to the use of bolts to secure airport runway and taxiway in pavement lights to the light bases. The method to determine the required clamping force is given based on the governing commercial aircraft for that airport. Installation torque necessary to achieve that required clamping force is also discussed in detail.

Scope and Applicability:

Recommended for all bolted connections that secure runway and taxiway in pavement lights to light bases.

Mandatory for activities that are funded under federal programs including Airport Improvement Program (AIP).

Section 2.0 of EB83A states that “The airport should phase in the requirements of this Engineering Brief as bolts are replaced.”



NEW SPECIFICATIONS

FAA Engineering Brief 83A, In-Pavement Light Fixture Bolts

Related airfield lighting specifications:

FAA AC 150/5345-42H (Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories) –

Section 3.2.4.5 states that bolts must be provided with each spacer ring, and if spacer rings are not provided, then bolts must be supplied with bases or extensions. Bolts must be 18-8 stainless or coated bolts per EB83. Anti-seize is recommended with stainless steel bolts.

FAA AC 150/5345-46E (Specification for Runway and Taxiway Light Fixtures) –

Class 2 base mounted dimensional requirements are found in 3.4.1.2. There is no specification for the size of the bolt hole.

3.9m allows for some of the bolt holes to be threaded for light fixture removal apparatus.

Horizontal shear force of 3000lbs.



NEW SPECIFICATIONS

FAA Engineering Brief 83A, In-Pavement Light Fixture Bolts

Related airfield lighting specifications:

FAA AC 150/5340-26C (Maintenance of Airport Visual Aid Facilities) –

Section 5.3.4.i states that bolts and lock washers should not be re-used. Refers the reader to EB83.

5.3.4.1.4 requires bi-monthly checks of bolt torque.



NEW SPECIFICATIONS

FAA EB83A

What does EB83A require?:

Section 2.0:

Unique color for coated bolts.

Three month corrosion inspection.

Air-driven wrenches are not recommended.

Use anti-seize on non-coated bolts.

Friction coefficients for coated bolts to be determined by the particular configuration using a bolt tension calibrator. Section 3.0 also includes lubricated bolts.

No re-use of two-part lock washers. No helical or split-type lock washers.



NEW SPECIFICATIONS

FAA EB83A

What does EB83A require?:

Section 2.0:

Bolt coatings should be considered to mitigate galvanic corrosion.

Maintain flatness of all mating surfaces and tighten bolts evenly in a star pattern.

Replace all bolts of a light fixture if 50% or more of the bolts need replacement.

Airport management, or its agent must select bolts based on the governing commercial aircraft (heaviest wheel load of an aircraft with at least 250 departures).

Light fixture manufacturers should be consulted with regards to derived clamping force



NEW SPECIFICATIONS

FAA EB83A Approach to Establishing the Bolted Joint:

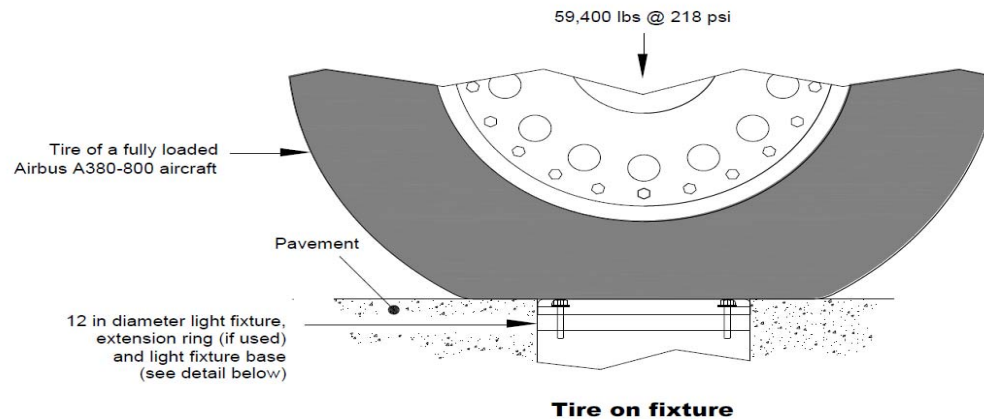
Understanding the torque / tension relationship:

The relationship between torque and tension can be approximated with the below equation, but it must be verified by testing in a bolt tension calibrator.

$$T(\text{torque}) = K (\text{friction coefficient}) \times D (\text{nominal bolt diameter}) \times F (\text{clamping force})$$

Determining the required clamping force:

The required clamping force must be determined by the calculations detailed in Appendix A and B of EB83A. The calculations require the wheel load and tire pressure of the airport's governing commercial aircraft (heaviest wheel load of an aircraft with at least 250 departures).





NEW SPECIFICATIONS

FAA EB83A Approach to Establishing the Bolted Joint:

Selecting the appropriate bolt:

The appropriate bolt is then selected by verifying that the required clamping load is less than 75% of the proof or yield load of the bolt. Consideration must also be made to corrosion properties, and compatibility with other materials.

Testing to determine installation torque:

The installation torque must then be determined through testing with a bolt tension calibrator. All components of the full assembly must be included in the mock-up for testing to fully understand the torque / tension relationship.



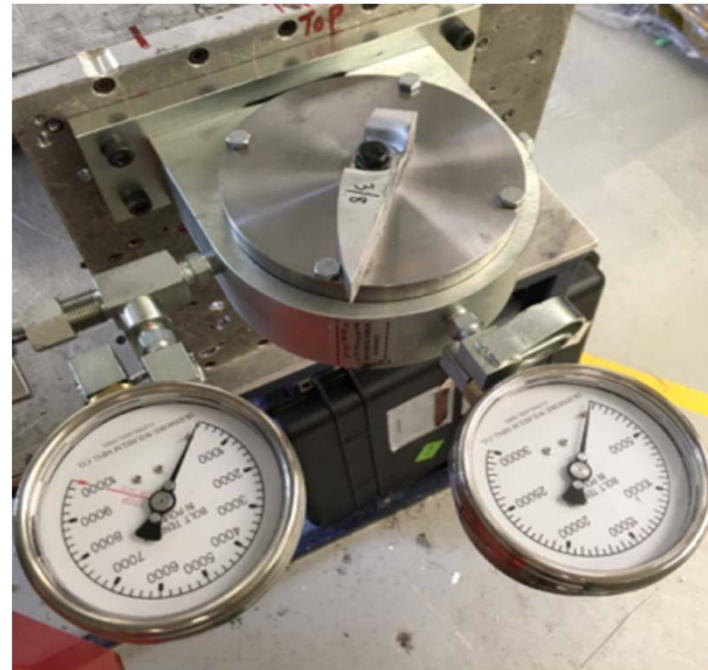
NEW SPECIFICATIONS

FAA EB83A Testing

Skidmore-Wilhem Bolt Tension Calibrator Testing:

Section 2.0 and 8.1 requires that a mock-up of each of the airport's in pavement light fixture bolted joint configurations be tested. The mock-ups must consider the following:

- Bolt (type, coatings, supplier, head markings)
- Lock-washer (manufacturer, material, size)
- Anti-seize compound (brand, product identification)
- Light fixture (manufacturer, material type)
- Light Base (Class IA or IB, threaded inserts)
- Spacer rings (quantity, thickness, o-rings)





NEW SPECIFICATIONS

FAA EB83A Other Related Testing

FAA AC 150/5345-46E Light Fixture Vibration test

FAA AC 150/5345-42H section 4.3.4 Type L-868 Class IA and Class IB Flange Bolt Torque Test:

Install 6 bolts and torque to failure.

Confirms that the bolt will fail before the female threads in the base

Corrosion Testing:

ASTM B117 procedure with cyclic exposure and drying cycles

Should test the complete assembly to assess the galvanic effects of the different materials.



ILLUMINATING ENGINEERING SOCIETY
AVIATION LIGHTING COMMITTEE