



INTERTEK AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM

IESALC Government Contacts Subcommittee Meeting

IESALC Technology Meeting

Monterey, CA October 22, 2019

Jeremy N. Downs, P.E. – ALECP Program Administrator



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 (Either 8-year requalification or update to new specification)

- Non-compliance found during manufacturer challenge process



CURRENT PROGRAM STATISTICS

- 59 program participants
 - (4 pending)
- 68 licensed manufacturing facilities
 - (6 pending)
- Certifications since the Spring Government Contacts Meeting in April 2019
 - 22 new or re-qual. certificates
 - 46 revised certificates
 - 12 de-listings



NEW SPECIFICATIONS

Cancellation dates:

Each new AC states that it cancels the previous version

Effective dates:

FAA AC 150/5345-53D section 12.a.v

The previous equipment certificates automatically expire on the given effective date.

Effective dates are usually six months from the issue date.



NEW SPECIFICATIONS

FAA AC 150/5345 – 43J (Specification for Obstruction Lighting Equipment)

Issue date – March 11, 2019

Effective date – March 11, 2020

Principal Changes:

1) 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.

2) 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:

3) Change to L-810 photometric requirements

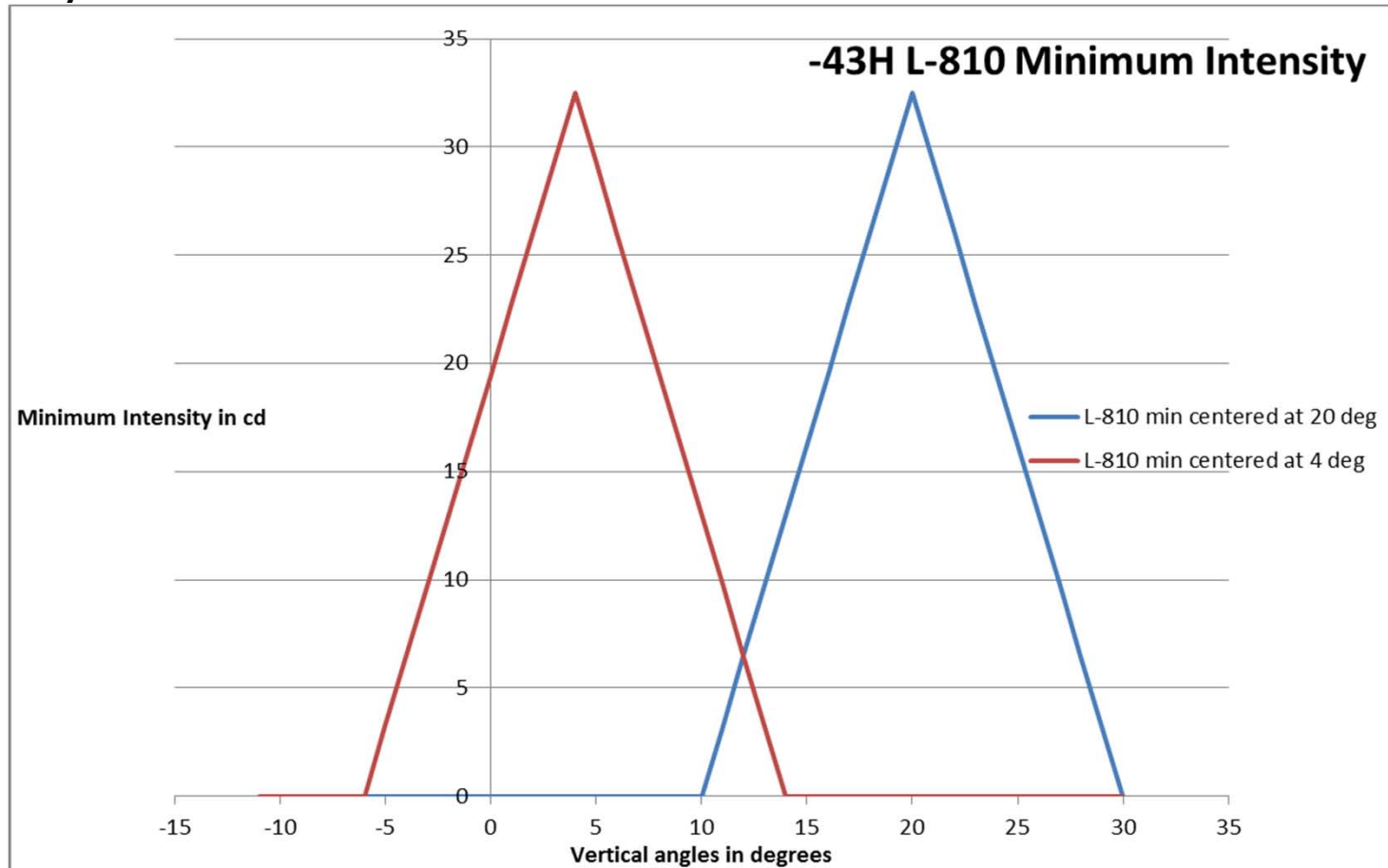
3.4.1.2 Note added to require 32.5cd minimum “over the minimum vertical beam spread of 10 degrees”.

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



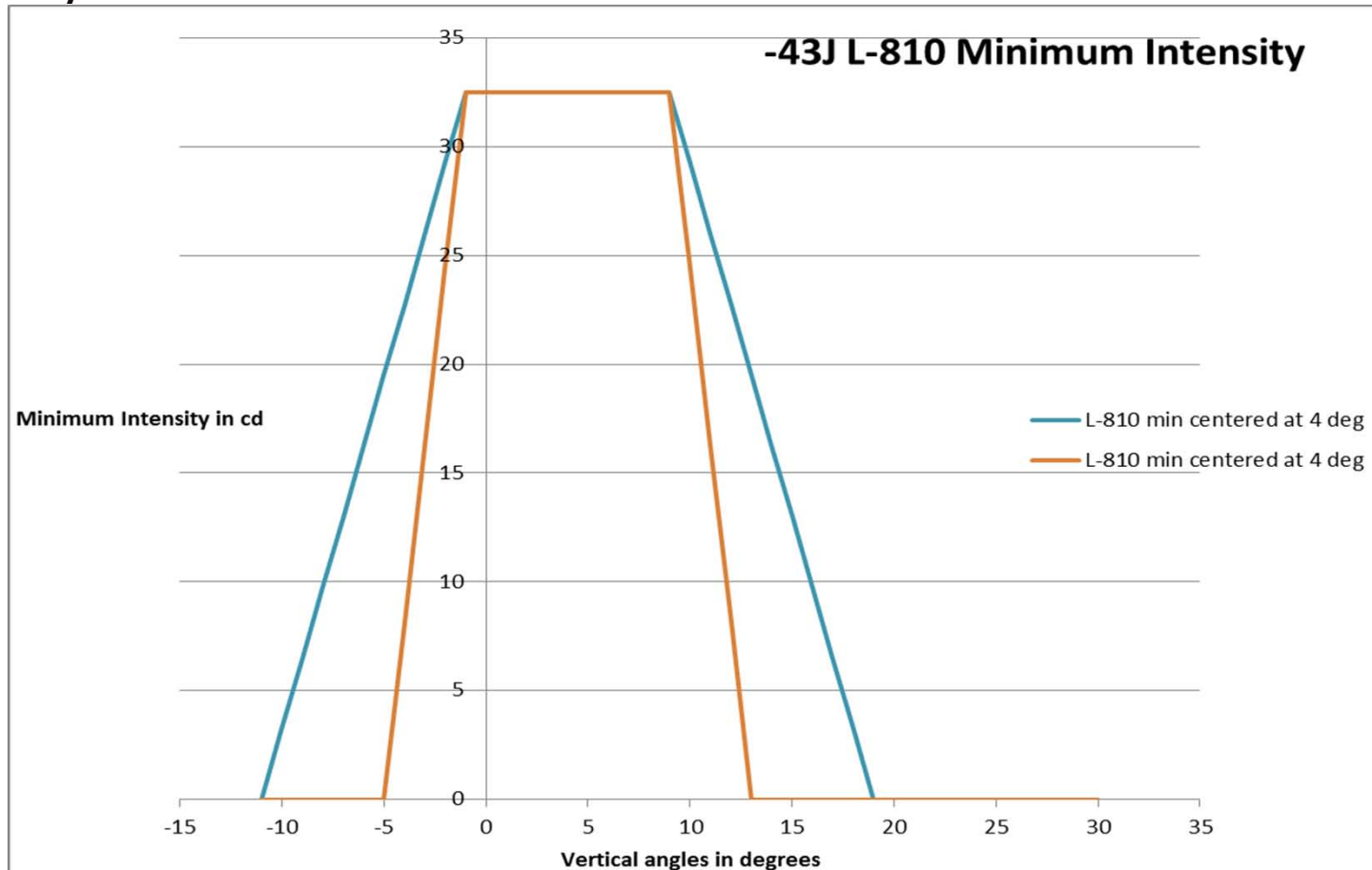
FAA AC 150/5345 – 43J



NEW SPECIFICATIONS



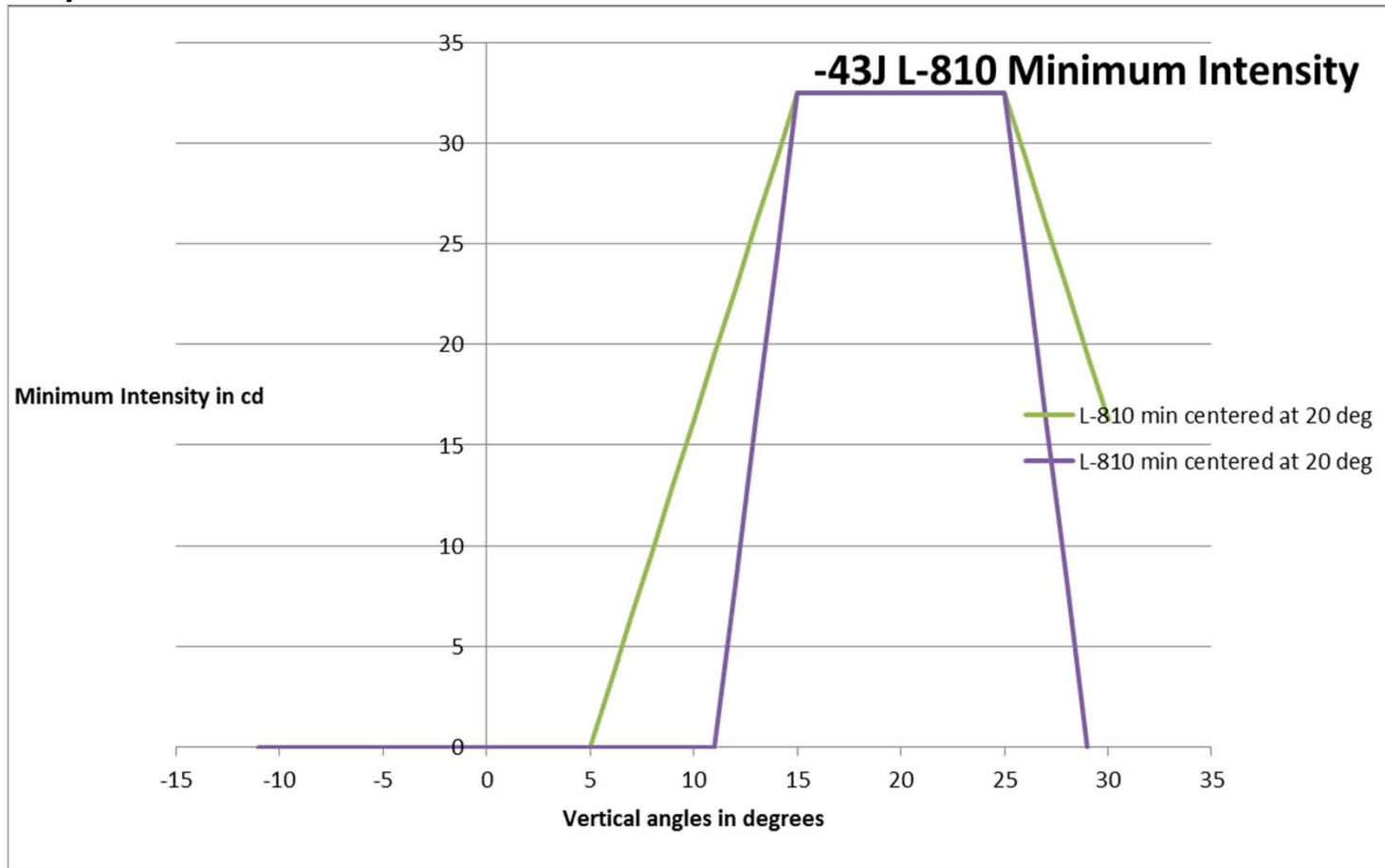
FAA AC 150/5345 – 43J



NEW SPECIFICATIONS



FAA AC 150/5345 – 43J



NEW SPECIFICATIONS



FAA AC 150/5345 – 43J

Principal Changes:

4) 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.

NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Output Wavelength

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

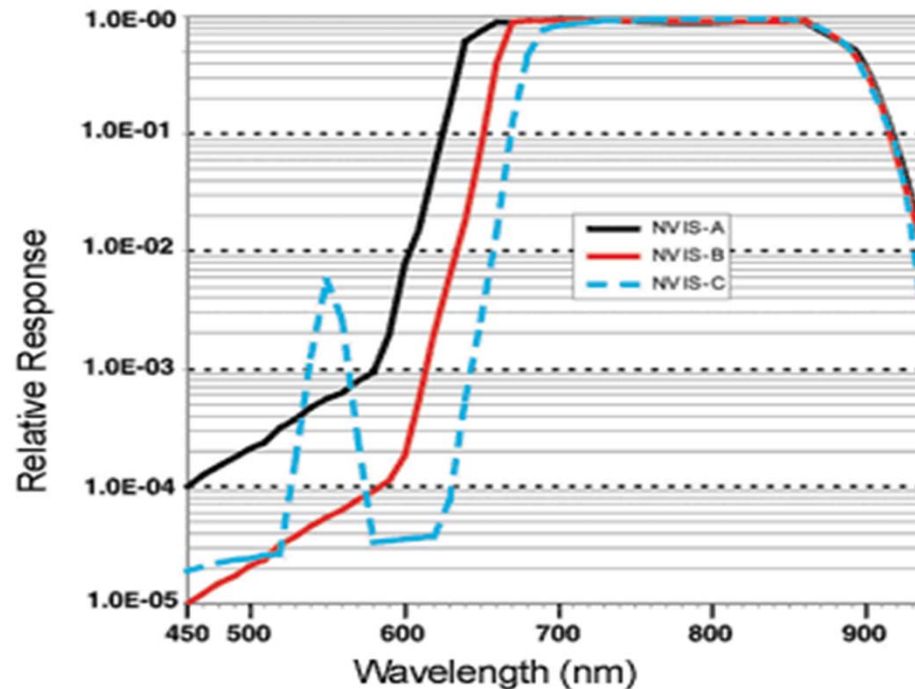
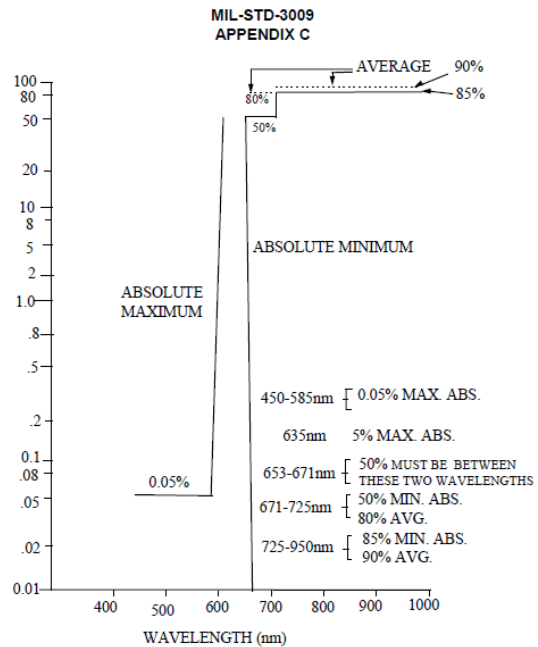


FIGURE C-5. Spectral transmission requirements for a Class B NVIS objective lens.

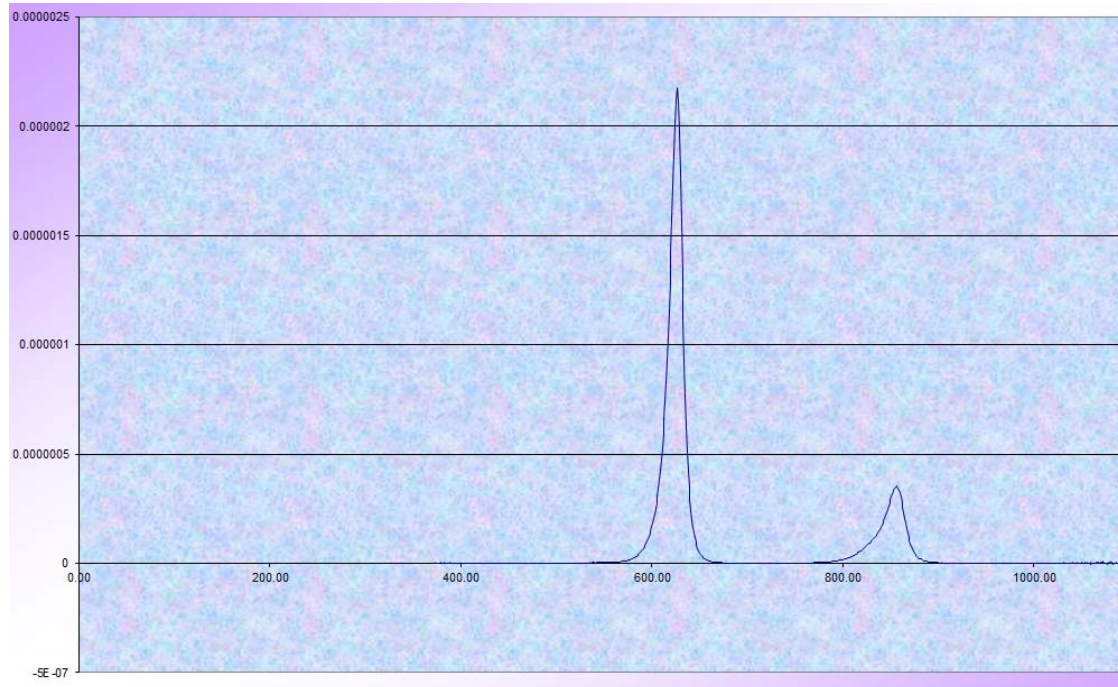


NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

Output Wavelength

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





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 luminous intensity
- Peak value for flashing applications (effective intensity calculations are not applied)



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.

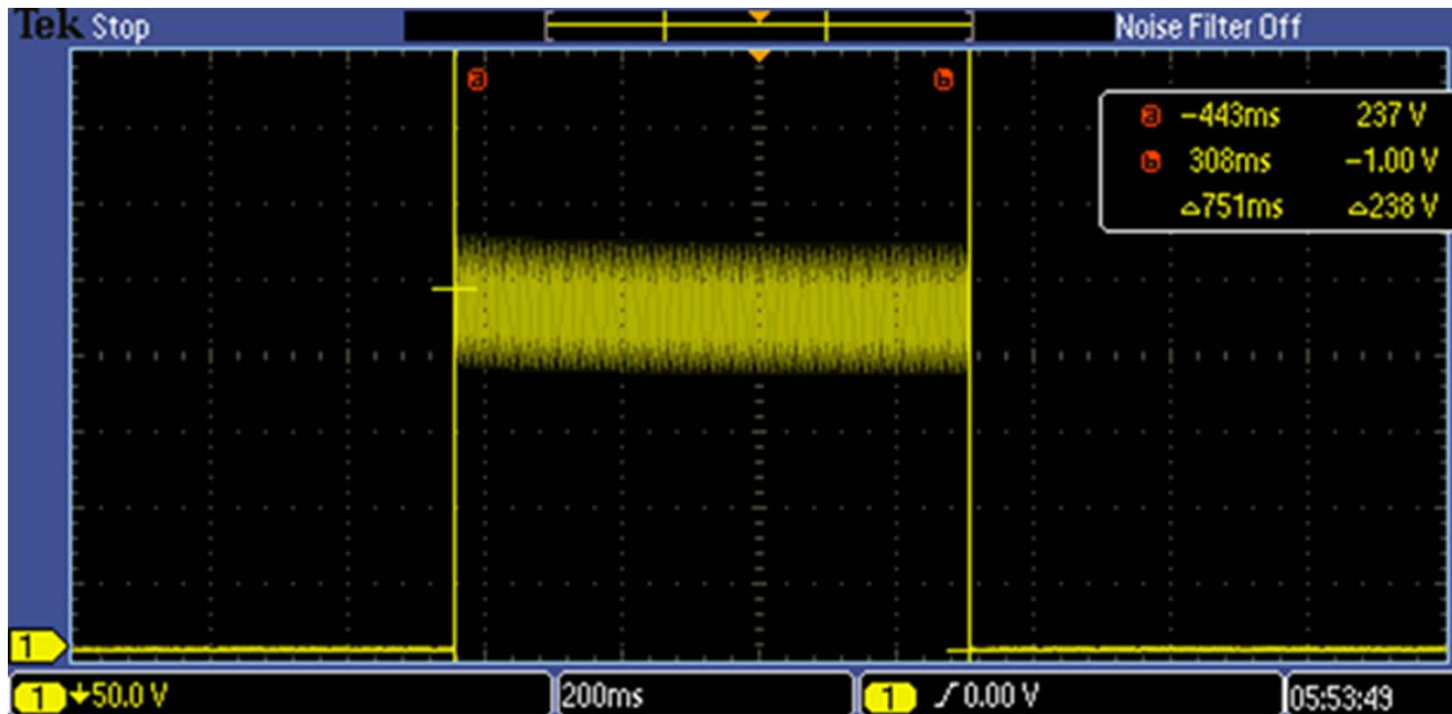


NEW SPECIFICATIONS

FAA AC 150/5345 – 43J

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

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.

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 is not 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 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 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 AC 150/5345-42J (Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories)

Issue Date: September 12, 2019

Effective Date: March 12, 2020

Principal Changes:

L-894 – Elevated Light Cover

0.63” max height was removed.

Now references the general yield point height requirement of 3”

- FAA AC 150/5300-13A, Change 1, paragraph 307b(4)
- FAA AC 150/5220-23, 3.2.c(1)(c)



NEW SPECIFICATIONS

FAA AC 150/5345 – 42J

Principal Changes:

Clarified standard thread sizes.

0.88" max thread depth was removed.

The requirement for the cover to be sloped was removed (this was only in draft)



NEW SPECIFICATIONS



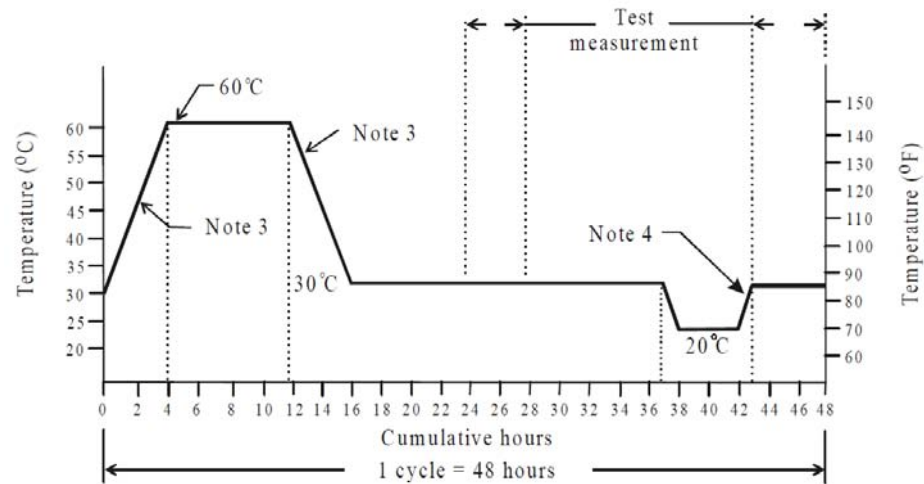
FAA AC 150/5345-28H (Precision Approach Path Indicator (PAPI) Systems)

Issue Date: July 29, 2019

Effective Date: January 29, 2019

Principal changes:

1) Humidity Test



Test was added to section 4.14 to verify compliance with the existing requirement.

References MIL-STD-810F, Method 507.4, Figure 507.4-1 (1 January 2000)

Proper operation, no corrosion or excessive internal condensation



NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

2) Chromaticity – Section 3.2.1, Item 7.b

Alternative was provided for both lighting technologies (LED and incandescent) to use the same red chromaticity requirements.

Incandescent PAPI red sector can comply with either EB67D or SAE AS25050 red chromaticity requirements.



NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

3) Dew and Frost Prevention

Section 3.2.2(4) – The light unit must prevent dew or frost/ice from accumulating on its lens surfaces.

May be accomplished by thermostatically activated heating or

Intrinsic heat management (such as incandescent lamps)



NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

3) Dew and Frost Prevention

Currently no test method, or specific design parameters

Low temperature section 4.3 states that dew for frost is cause for rejection

Developing a test procedure now

- EB67D, section 2.13 arctic kit test method could be used for guidance?

- How to consistently create frost/ice and/or dew?

- Applicable temperatures?

- Typical natural conditions to consider?



NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

4) Horizontal Light Beam Coverage – Section 3.2.4.1.3

PAPI must be designed to be capable of modifying the horizontal light beam coverage.

May be accomplished using baffles or blanking devices.

Listed as an option in 1.1.4(3).



NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

4) Horizontal Light Beam Coverage – Section 3.2.4.1.3 (continued)

If the horizontal light beam coverage adjustment feature is integral to the PAPI light fixture design...

Section 4.9(8) requires photometric tests without the horizontal light beam coverage adjustment features in use, and with the full possible adjustment in place.

Photometric tests include all beam pattern requirements of 3.2.1.

(Intensity distribution, transition width, straightness, flatness, and chromaticity)

NEW SPECIFICATIONS



FAA AC 150/5345-28H

Principal changes:

4) Horizontal Light Beam Coverage – Section 3.2.4.1.3 (continued)

Intensity distribution:

Figure 3-1. PAPI Light Distribution Requirements

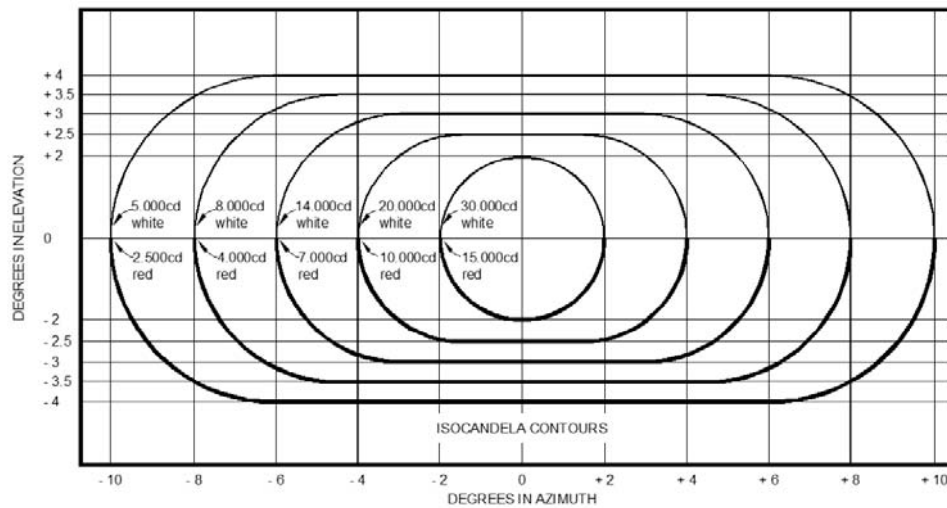
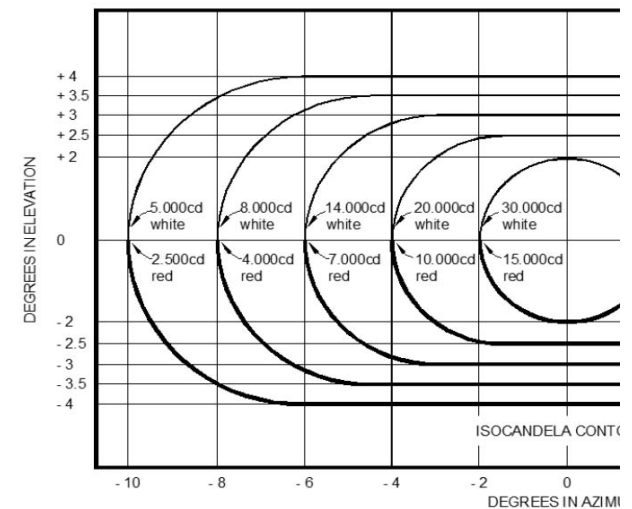


Figure 3-1. PAPI Light Distribu





NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

4) Horizontal Light Beam Coverage – Section 3.2.4.1.3 (continued)

White to Red Transition:

Width must be:

less than 3 minutes of arc at 0° horizontal

(Equal to 0.05° or 10.5 inches at 1,000 feet)

less than 5 minutes of arc at $\pm 10^\circ$ horizontal

(Equal to 0.08° or 17.5 inches at 1,000 feet)

Straightness/Flatness must be:

Within 3 minutes of arc

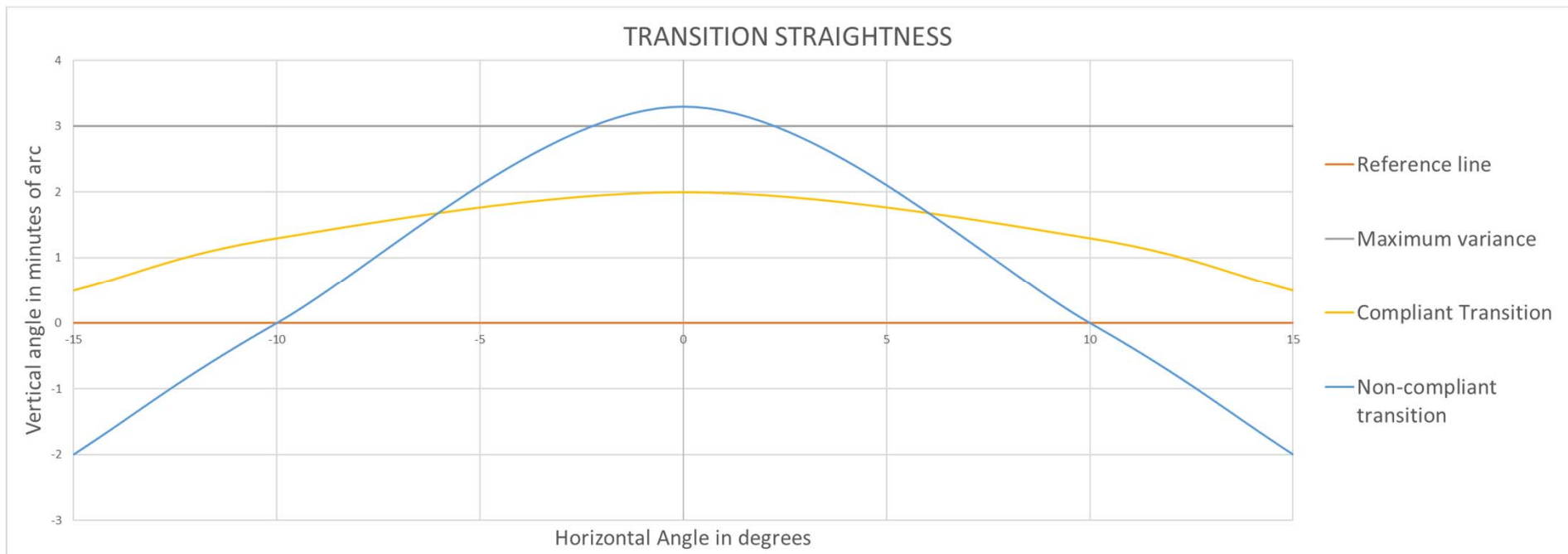
NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

4) Horizontal Light Beam Coverage – Section 3.2.4.1.3 (continued)

White to Red Transition: Full Beam





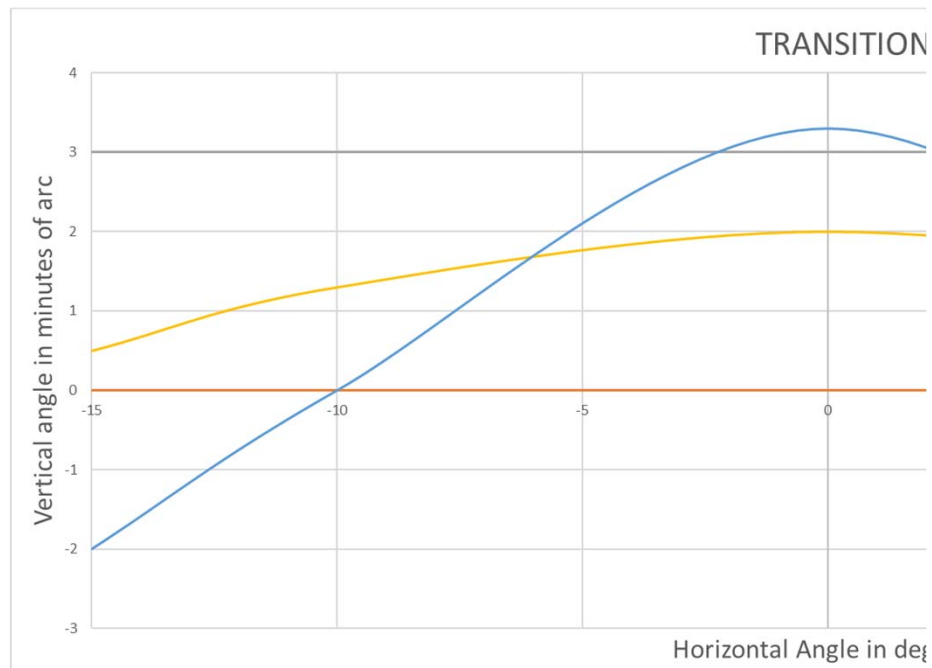
NEW SPECIFICATIONS

FAA AC 150/5345-28H

Principal changes:

4) Horizontal Light Beam Coverage – Section 3.2.4.1.3 (continued)

White to Red Transition: With Horizontal Beam Coverage Full Adjustment





NEW SPECIFICATIONS

FAA AC 150/5345-28H

LED PAPI considerations for light source failure requirements

Related specification sections :

- 3.3.5 – lamp failure must not cause damage to remaining lamps (style A)

- 3.4.1 – lamp failure must not cause damage to remaining lamps (style B)

- 4.13(2)e – must demonstrate light source failure during testing

FAA EB 67D section 2.6 – requires that the unit shuts down if more than 25% of LEDs fail



NEW SPECIFICATIONS

FAA AC 150/5345-28H

LED PAPI considerations for light source failure requirements

Un-related FAA specification resource:

FAA-E-3007 (LED PAPI specification) – requires that the light output is monitored, and if 25% of either the red or white LEDs fail, the entire LHA must be shut down.

Summary:

The red LEDs and the white LEDs must be treated as separate sources for the 25% evaluation, and the entire unit (white and red) must be shut down if 25% of either the red or white LEDs fail.

NEW SPECIFICATIONS



FAA AC 150/5345-28H

International standard comparisons for PAPI

TP312, 5th edition	ICAO Annex 14 8th edition	
Paragraph	Paragraph	Description
5.3.16.14	5.3.5.29	day and night operations
5.3.16.13	5.3.5.30	transition less than 3' at 300m, 0 degrees
5.3.16.13	NA*	transition less than 5' at 300m, +/-15 degrees
Figure B-19	NA*	transition must be flat within 3' of arc out to +/-15 degrees.
Appendix 5A	5.3.5.31	red $y < 0.320$
Figure A1-1a	Figure A1-1a	Incandescent white and red color
Figure A1-1b	Figure A1-1b	LED white and red color
5.3.16.12	5.3.5.32	Figure A2-23 photometry (B-19 for TP312)
NA	5.3.5.35	deposits of contaminants on the lens shall interfere to the least extent possible, shall not affect the contrast between colors and the transition elevation.
5.3.16.15	NA	deposits of contaminants on the lens do not interfere with the light signals, or adversely affect the required photometry.

* - Further Guidance provided in ICAO Design Manual Part 4

