

FAA AIRFIELD LIGHTING STANDARDS UPDATE

Present to: IES ALC
GOVERNMENT LIGHTING COMMITTEE
WASHINGTON, DC
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Agenda

- FAA Airfield Lighting Equipment Advisory Circulars (AC's) & Engineering Briefs (EB's) Published in FY 2014
- FAA Airfield Lighting Equipment Draft AC's & EB's for FY 2015
- LED's Issues
 - Stroboscopic Effects
 - Brightness
- Q & A



AC's & EB's PUBLISHED IN FY 2014

- AC 150/5340-26C - Maintenance of Airport Visual Aid Facilities (6/20/14)
- AC 150/5345-10H, Specification for Constant Current Regulators and Regulator Monitors (11/15/14)
- AC 150/5340-30H, Design and Installation Details for Airport Visual Aids (7/21/14)
- AC 5345-53C Airport Lighting Equipment Certification Program (Addendum is updated monthly)
- EB 92, Light Spacing Guidance for New Taxiway Fillet Geometry (11/29/13)



Draft AC's & EB's for FY 2015

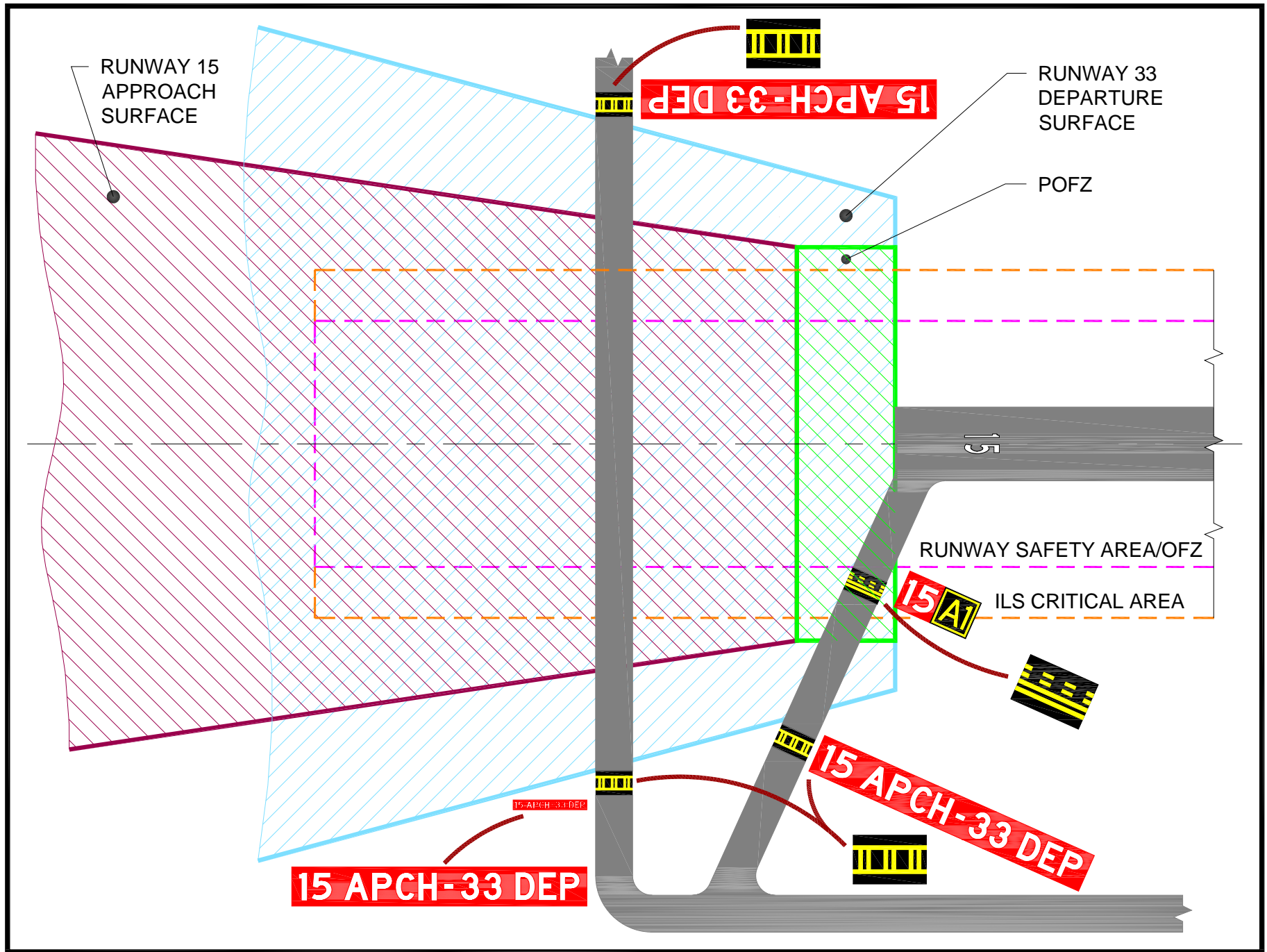
- AC 5340-18G, Standards for Airport Sign Systems
- AC 150/5345-44K, Specification for Runway and Taxiway Signs
- AC 150/5345-42G, Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
- AC 150/5345-46E, Specification for Runway and Taxiway Light Fixtures
- AC 150/5340-30J, Design and Installation Details for Airport Visual Aids
- AC 150/5345-49D, Specification L-854, Radio Control Equipment
- EB Draft No. 85, Ductile Snowplow Protection Ring and Installation Procedures
- Engineering Brief No XX– PAPI
- EB 92, Light Spacing Guidance for New Taxiway Fillet Geometry, Rev 1
- EB No XX, Orange Construction Signs
- AC 5345-55, Lighted X



AC 5340-18G Draft, Standards for Airport Sign Systems

- Incorporate EB 89, Taxiway Nomenclature
- Provide clarifications
- Update drawings
- Incorporate “new” Approach signs
- Distance requirement for Runway Exit signs







150/5345-46E DRAFT, Specification for Runway and Taxiway Light Fixtures

- “FAA Type” L’s fixtures added throughout the AC
- Para 3.4.1.1, Class 1 (Direct Mounted), is rearranged for clarity
- Para 3.4.1.2d is changed to allow deeper throat projection of light fixtures. This solves potential issues with light fixtures not fitting through the bottom flange cutout of existing extensions and sectional light bases.
- Para 3.4.2.2, Base Mounting, Elevated light fixture base mountings are removed from the AC and placed in AC 150/5345-42, Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories, to consolidate all light bases into a common document.
- Para 3.4.2.3, Stake Mounting, Elevated light stake mountings are removed from the AC and placed in AC 150/5345-42.
- Para 3.7.2.d, revised for clarification
- Para 3.7.2.1, Mode 1 (Series Powered) Fixtures is rewritten for clarity
- Para 3.10.1.1 is rewritten to clarify the requirement for light fixture internal hardware. The requirement for black oxide coatings is removed. A note is added about in-pavement light fixture bolts and bolt torque requirements.



150/5345-42H DRAFT, Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories

- Para 3.2.3.1, elevated light base plates are removed from AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures, and added to this AC to facilitate common hardware in one AC.
- Para 3.2.3.1.1 through 3.2.3.1.4 are added to describe elevated light base plate requirements.
- Para 3.2.3.2 is added to include elevated light fixture mounting stakes with common hardware.
- Para 3.2.3.2.1 through 3.2.3.2.6 are added to describe elevated light mounting stake requirements.
- Para 4.2.8 is added to provide test procedures for elevated light base plates.
- Figures 6 & 7 “AAA” dimension and is changed in both figures for manufacturing uniformity among one piece and sectional light bases.
- Figure 7 – AAA dimension tolerance is changed to match the tolerance in Figure 6 for better uniformity.



AC 150/5345-44K Draft, Specification for Runway and Taxiway Signs

- New Approach Hold Sign & Orange Construction Signs
- Incorporate 3rd party certifier's testing recommendations, and provide clarifications for sign color and reflectivity requirements.
- Clarify sign warranty requirements to be compliant with AC 150/5345-53, Airport Lighting Equipment Certification Program
- Update/check all referenced documents in the AC.
- Update some drawings



AC 150/5345-49D DRAFT, Specification L-854, Radio Control Equipment

- Change low end of environmental temperature range from -67° F (-55° C) to -40° F (-40° C) for better parts availability.
- Paragraph 3.4.3b(1) – delete operation of the Type II Receiver at 450 – 512 MHz due to no currently certified manufacturers.
- FAA Spectrum Management currently deliberating with NTIA about 450 -512 MHz band use.

Draft AC 150/5340-30J, Design and Installation Details for Airport Visual Aids

- Update reference to runway guard light intensity requirements. Reference AC 150/5345-46 rather than attempting to paraphrase.
- Update/check all referenced documents in the AC.
- Clarifications
- Update some figures



Engineering Brief (EB) Draft No. 85, Ductile Snowplow Protection Ring and Installation Procedures

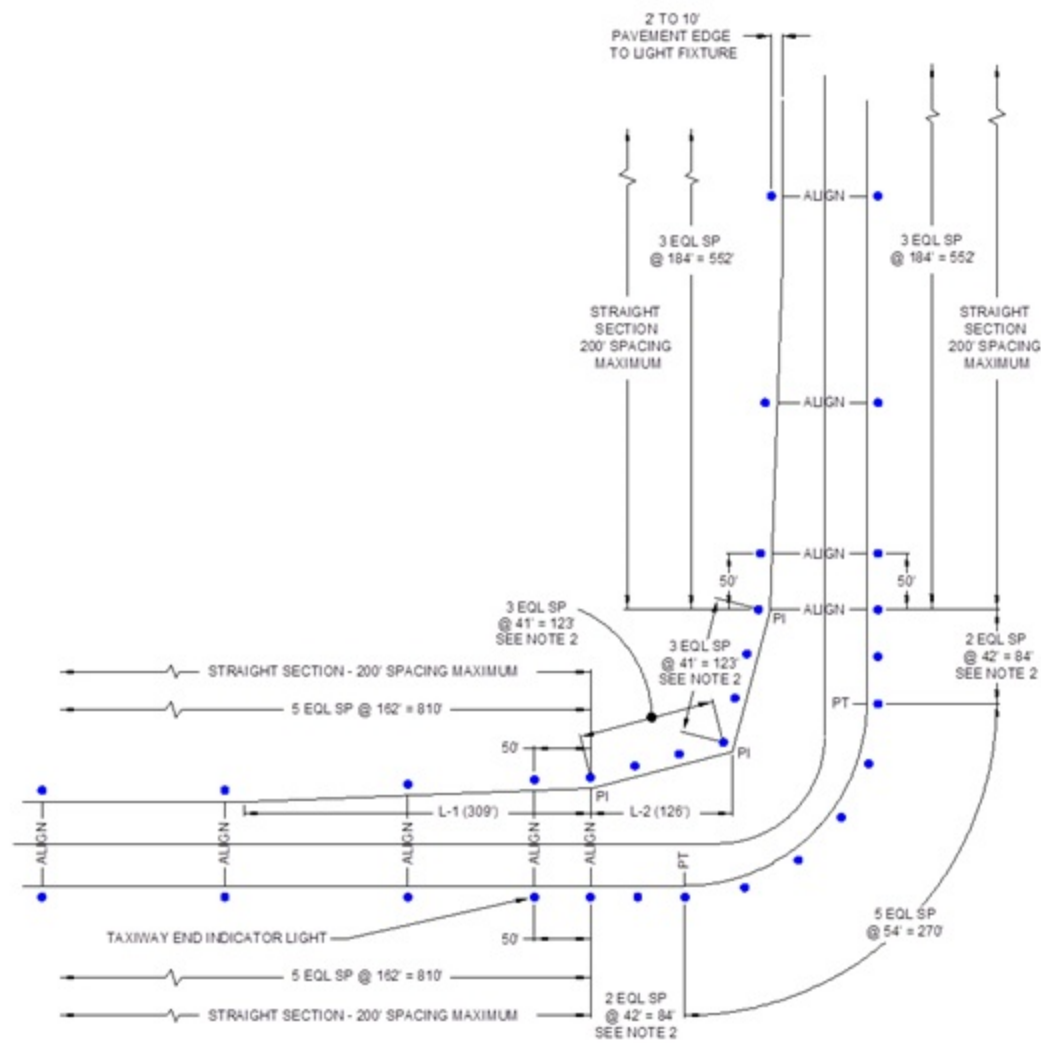
- This EB introduces a design that uses ductile iron castings to minimize machining and reduce cost. The proposed snowplow ring design protects in-pavement light fixtures from snowplow blade impacts during wintertime conditions at airports without adversely affecting light fixture photometric performance. Installation procedures (with photographs) are added to achieve repeatable installations and optimal protection of light fixtures.



EB No. 92 Rev. 1, Light Spacing Guidance for New Taxiway Fillet Geometry Per AC 150/5300-13A, Change 1, Airport Design.

- This EB introduces guidance and new requirements for edge lighting the new taxiway fillet geometries designed for cockpit over centerline rather than the judgmental over steer currently used throughout the NAS. The EB provides proposed design examples that show proposed edge light layouts.





NOTES:

1. L-1, L-2 AND L-3 DIMENSIONS ARE FOR TDG-4 AND ARE USED ONLY AS AN EXAMPLE.
2. SINGLE STRAIGHT REQUIRED, MAXIMUM 50' SPACING.
3. PI = POINT OF INTERSECTION.

90° TAXIWAY TURN

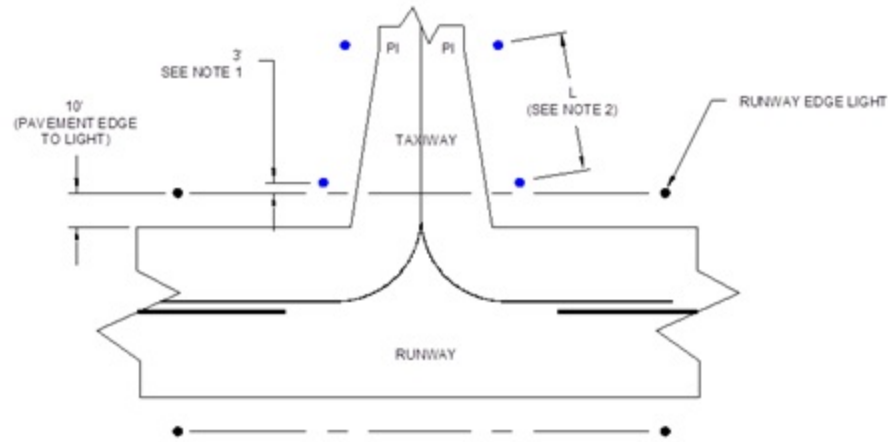


FIGURE 2A. SAMPLE LAYOUT FOR RUNWAY AND TAXIWAY INTERSECTION
($L = 3' \leq L < 10'$)

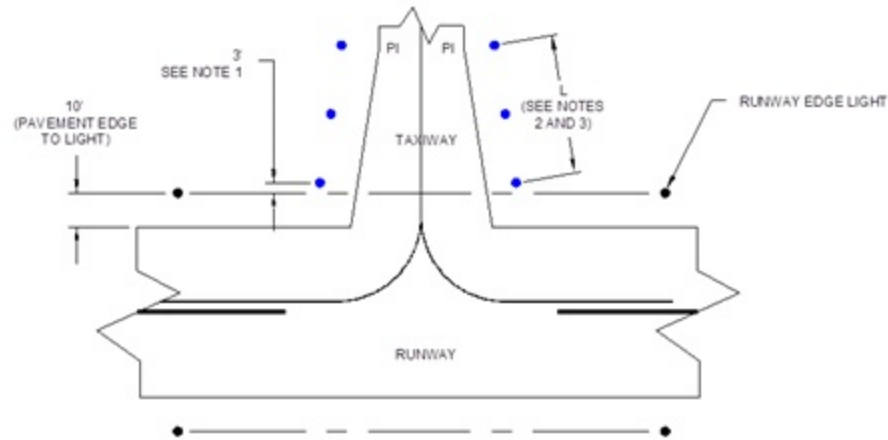


FIGURE 2B. SAMPLE LAYOUT FOR RUNWAY AND TAXIWAY INTERSECTION
($L = 10' \leq L \leq 40'$)

TABLE 1			
SECTION LENGTH (L)	NUMBER, EDGE LIGHTS (N) PER SIDE	MAXIMUM SPACING	SPACING
$L < 3'$	1	N/A	N/A
$3' \leq L < 10'$	2	10'	L
$10' \leq L \leq 40'$	3	20'	$L / 2$
$L > 40'$	$[(L/\text{MAX}) + 1]^*$	20'	$L / (N-1)$

* ROUND VALUE UP TO THE NEXT WHOLE NUMBER

SPACING NOTES:

1. THE LAST TAXIWAY EDGE LIGHT AT A RUNWAY/TAXIWAY INTERSECTION MUST BE PLACED AT AN ADDITIONAL 3 FEET FROM THE RUNWAY EDGE LIGHT OFFSET LINE. THE OFFSET IS NECESSARY TO MINIMIZE ANY POTENTIAL CONFLICT WITH WITH RUNWAY EDGE LIGHTS.
2. SEE TABLE OPPOSITE FOR SPACING REQUIREMENTS.
3. INSTALL ONLY ONE LIGHT WHERE TAXIWAY AND TAPER INTERSECT WHEN $L < 3$ FEET.

ENGINEERING BRIEF No. XX

Guidance for the Assembly and Installation of Temporary Orange Signs During Construction

- This Engineering Brief provides guidance about commonly used materials and the method of assembly for temporary safety orange construction signs.



Figure 13. Construction Ahead Signs



Figure 14. Construction on Ramp



Figure 15. Take-Off Run Available Signs

Draft EB- PAPI

- **Engineering Brief** - disseminate additional information about how PAPI Obstruction Clearance Surfaces (OCS) are evaluated by FAA Flight Inspection. In addition, provide information about how to deal with obstructions that are outside the 20 degrees PAPI OCS imaginary plane.



LED Stroboscopic Effect Issues

- Port of Friday Harbor Airport (KFR)
- NASA ASRS Report at ATL
- LED OFTG Recommendation



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LED Stroboscopic Effect at KFR

- Pilot report at Port of Friday Harbor Airport (KFR) LED Medium Intensity Runway Edge Lights (MIRLs)
 - “Strobing” effect has been observed at times when the MIRLs are viewed thru the propeller of single-engine planes with 3-bladed propellers.
 - “Strobing” effect was noticeable when the lights were on 10% or 30% brightness but not at 100% brightness.
- Study conducted by KFR’s consultant determine that the stroboscopic effect created by PWM LED MILR when “shuttered” by the rotating propeller. (Note: study doesn’t include twin- or jet-engine aircraft because pilot doesn’t look at the lights thru the propeller)



LED Stroboscopic Effect at ATL

NASA ASRS Report

- NASA Aviation Safety Reporting System (ASRS)
3/24/15 ATL LED Runway Lights Propeller Strobe Effect
- Aircraft: Cessna 210 Centurion / Turbo Centurion 210C, 210D
- C210 pilot experiences flashing runway edge and centerline lights during a night visual approach to Runway 26R at ATL. When propeller RPM is varied the strobe effect is varied and it is decided that the effect is caused by propeller interaction with the LED lights which are apparently flashing at a high rate.



FAA/Industry LED OFTG Recommendation

- LED Operational Flight Test Group (OFTG) engaged ERAU and addressed “Blinking, strobing, and almost complete disappearance of LED lights have been reported by three-bladed propeller airplane pilots while looking through the propeller disk on approach. This has been tentatively identified as being related to the existence of a resonance frequency between the propeller blade configuration and rpm, and the pulse width modulation frequency of the LED runway edge lights. Much more data is needed to identify the various potential blade configurations and rpm ranges at risk, as well as the various types of LED airfield lighting affected. “



What we know....

- RPI presented a paper “UNDERSTANDING FLICKER IN AIRFIELD LIGHTING APPLICATIONS” at 2014 FAA Worldwide Airport Technology Transfer Conference
- “Flicker Parameters for Reducing Stroboscopic Effects from Solid-state Lighting System” RPI, Volume 11, Issue 1, May 2012
- EB 67D, Para. 2.15 Light Fixture Flicker - All light fixtures that use pulse width modulation (PWM) to facilitate LED brightness changes must not cause perceptible flicker to a moving human observer (example: pilot in an aircraft) throughout the range of brightness steps.



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LED Brightness ASAP Report #1 at ATL

- Sometime before January 18, 2015, a pilot and a co-pilot filed an ASAP report on the brightness issue they faced during the landing operation on rwy 8L at ATL.
- While approaching runway 8L, the pilots complained the lights were too bright & asked ATC the lights to be step down. However the ATC indicated that he's not allowed to step it down in order to maintain the RVR level. And per the controller, in order to maintain that RVR level the lights have to be on Step 5. This action is per the FAA Order 7110.65 since the Step 5 setting was according to the RVR value.
- However FAA Order 7110.65 also states that the ATC would turn it down to lower step when the pilot request, but ATL ATC insisted that he's not allowed to.
- It was pointed out during this meeting that the brightness issue would also occur with incandescent light fixture at step 5 setting during low visibility conditions.



LED Brightness ASAP Report #1 at ATL

RECOMMENDATIONS

- Continue dialog with ATL engineers to monitor the situation
- Get photometrics for both lighting systems (Incandescent & LED) at ATL so we can compare if they are the same. This action would be parallel to the on-going effort taken by FAA/Industry LED Forum Workgroup.
- The RVR is AT system, installed and maintained by FAA.
- Since the intensity level setting is required by Order 7110.65 in order to maintain a certain RVR level. The RVR systems take current output. At Step 5 it takes 6.6A output as they would know the equivalent RVR level. So if they lower the step, they would change their criteria. This is an issue with ATC Handbook, RVR system parameters, and flight procedures.
- We recommend forwarding this issue to FAA Flight Standard Office to discuss with FAA Air Traffic HQ & NATCA regarding their policy of step 5 setting during low visibility and to develop new procedure for setting the light at lower steps during the low visibility condition to reduce brightness issues experienced by the pilots.



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LED Brightness ASAP Report #2 at ATL

- ASAP Report 3/13/2014
- Tower controller unable to dim new LED lighting during departures
- Low visibility and low ceilings at night in ATL. While waiting in line for T/O for runway 9L heard 2 Delta aircraft ask the tower controller to dim the lights on the departure runway. She responded she was unable to do so due to FAA rules. While in position and hold I agreed with the preceding pilots and found the runway lights to be extremely bright. In fact, on the takeoff roll when the F/O made the required 80 knot call I found it very difficult during my cross check to read my airspeed indicator. While on climb out we heard the following A/C make the same request to the tower controller. That was 3 requests that I heard to have the lights dimmed during my brief time on the frequency.



Q & A



Thank You!



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