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Certificate # L-2062-1 Testing

C013-2551-FR

RSW Medium Luminaire Vibration Testing per CALTRAN 611

April 20, 2017

Prepared For:

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Client Order Number:

Purchase Order: 385356

B83 Project Number:

C013-2551

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Objective

CREE, Inc. retained the services of B83 Testing & Engineering, Inc. (B83) to perform CALTRAN 611 vibration testing of a RSW Medium Luminaire.

Executive Summary

The RSW Medium Luminaire was exposed to the horizontal and vertical cyclic load tests of CALTRAN 611. At the completion of testing the luminaire functioned normally and there was no damage, reduction of electrical spacing or loosening of parts.



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1.0 Introduction

1.1 Scope of Work

CREE, Inc. (CREE) retained the services of B83 Testing & Engineering, Inc. (B83) to perform CALTRAN 611 testing of a RSW medium luminaire. The sample was to be exposed to the horizontal and vertical cyclic load tests of CALTRAN 611.

1.2 Description of Test Articles

On March 30, 2017 B83 received one (1) RSW medium luminaire. The luminaire was assigned B83 sample tracking number 172722. A photo of the RSW medium luminaire as received is shown in Figure 1, page 8.

1.3 Order of Report

The equipment used to perform the testing is listed in section 2.0. Requirements, procedures, and results of the tests performed can be found in section 3.0. Disposition of the test articles upon the completion of testing can be found in section 4.0. All figures referenced in the body of this document are located in Appendix A.

1.4 Referenced Documents

B83 Testing & Engineering, Inc. Quote

- CREE-3409, Dated March 29, 2017

Supplied by CREE, Inc.

- "CALTRAN 611 Vibration Test Plan RSW Medium" Rev A.0, Dated 3/27/17



2.0 Test Equipment

The following table lists the equipment used to perform the vibration testing.

Equipment Description	Equipment №	Cal. Due Date
Dactron Laser Vibration Controller	S/N 6875504	6-27-2017
MTS Model 244.21 Servo-Hydraulic Shaker System	S/N 1005265	Not Applicable
MTS Model 407 Servo-Hydraulic Controller	S/N 0201966D	Not Applicable
MTS Model 248.04 Servo-Hydraulic Shaker System	S/N 282	Not Applicable
MTS Model 407 Servo-Hydraulic Controller	S/N 0421066L	Not Applicable
PCB Model 353B31 Accelerometer	S/N 139233	6-24-2018
PCB Model 353B15 Accelerometer	S/N 148674	2-22-2019
Snap On Model TER25FUA Torque Wrench	S/N 3992	1-29-2018

3.0 Vibration Testing of RSW Medium Luminaire

3.1 Test Requirements

Vibration testing was to be conducted on the RSW medium luminaire in accordance with CALTRAN 611. The luminaire was to be tested first in the horizontal (Y) axis, perpendicular to the direction of the mast arm and in the vertical (Z) axis. The luminaire was to be subjected to a sine sweep to determine the fundamental resonant frequency in each axis. The sample was to be dwell tested at 0.75G peak (1.5G peak-peak) in the horizontal axis and 1.5G peak (3.0G peak-peak) in the vertical axis. The sine dwell test duration was to be 2,000,000 cycles in each axis.

The two luminaire clamp bolts were to be tightened to 125 in-lb. Testing was to be performed with the luminaire in the horizontal tenon configuration.

3.2 Test Procedure

The vibration test fixture and luminaire were secured to a vibration table and an accelerometer was bonded to the fixture adjacent to the test sample. A second accelerometer was mounted near the center of gravity of the test article. Test setup photos are shown in Figure 2, page 8 through Figure 3, page 9.

The RSW medium luminaire was powered with 120 VAC prior to, and at the completion of, testing in each axis.

A sine sweep was performed in each axis as necessary to determine the fundamental resonant frequency. The sine sweep performed, in both axes, was:

- 0.5" p-p @ 3 Hz increasing on a log slope to 0.75G peak from 5 Hz to 200 Hz.

The sweep rate was logarithmic at 1.0 octave/minute. The transmissibility (CG of test article/test fixture) between the control accelerometer and the response accelerometer was used to determine the resonant frequencies within the test bandwidth. The sine



sweep plots were submitted to CREE for review and CREE personnel selected the dwell test frequencies. The dwell test was then performed as defined in section 3.1 of this report.

3.3 Test Results

One RSW medium luminaire (B83 SN 172722) was exposed to the required sine sweep and dwell testing on April 3, 2017 through April 11, 2017. The luminaire completed 2,000,000 cycles in both the horizontal and vertical axes for a total of 4,000,000 cycles without issue. At the completion of testing there was no damage, reduction of electrical spacing, or loosening of parts and the luminaire functioned normally when powered with 120 VAC.

A summary of the test levels is shown in the table below:

Axis	Cycles	Dwell Frequency (Hz)	Transmissibility	Test Fixture		Luminaire CG	
				Acceleration (G)	Displacement (inch p-p)	Acceleration (G)	Displacement (inch p-p)
Horizontal	2,000,000	75.0	1.3	0.58	0.0020	0.75	0.0026
Vertical	2,000,000	32.0	5.7	0.26	0.0050	1.5	0.0287

Control response plots and transmissibility plots from the sine sweep testing are shown in Figure 4, page 9 through Figure 7, page 11. The vibration test log are clamp bolt torque log are shown in Figure 8, page 11 through Figure 9, page 12.

The temperature and humidity of the test lab at the start of testing was 24°C, 25% RH.

4.0 Disposition of Test Articles

Upon completion of testing, the RSW medium luminaire was returned to CREE, Inc.



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Appendix A – Referenced Figures



Figure 1: RSW Medium Luminaire – B83 SN 172722

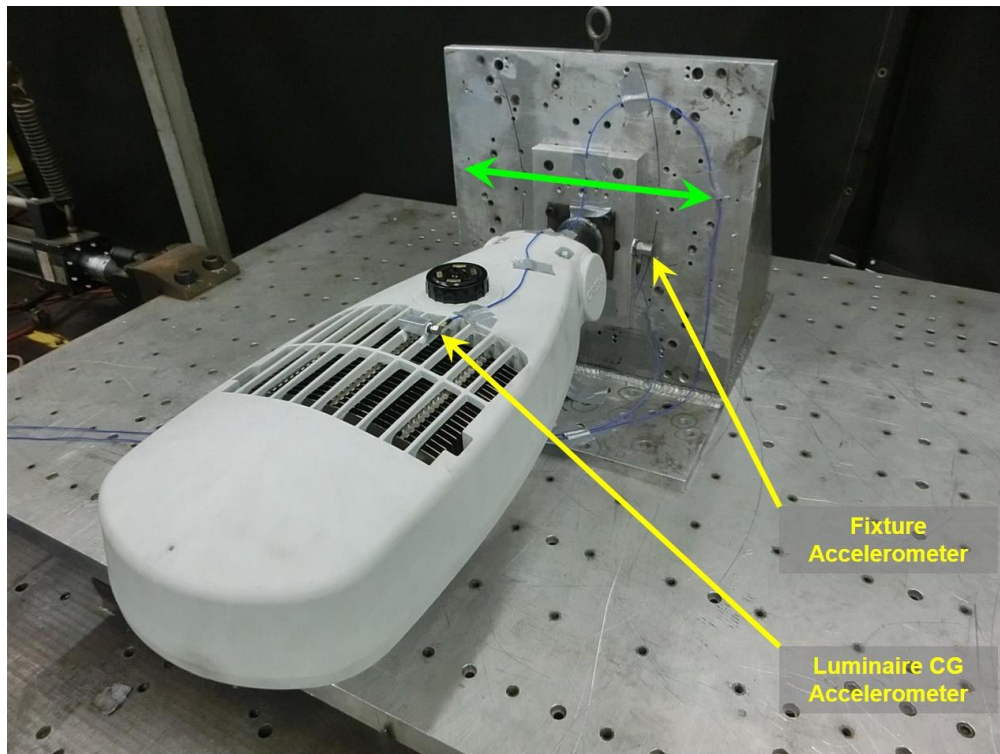


Figure 2: Horizontal (Y) Axis Test Setup

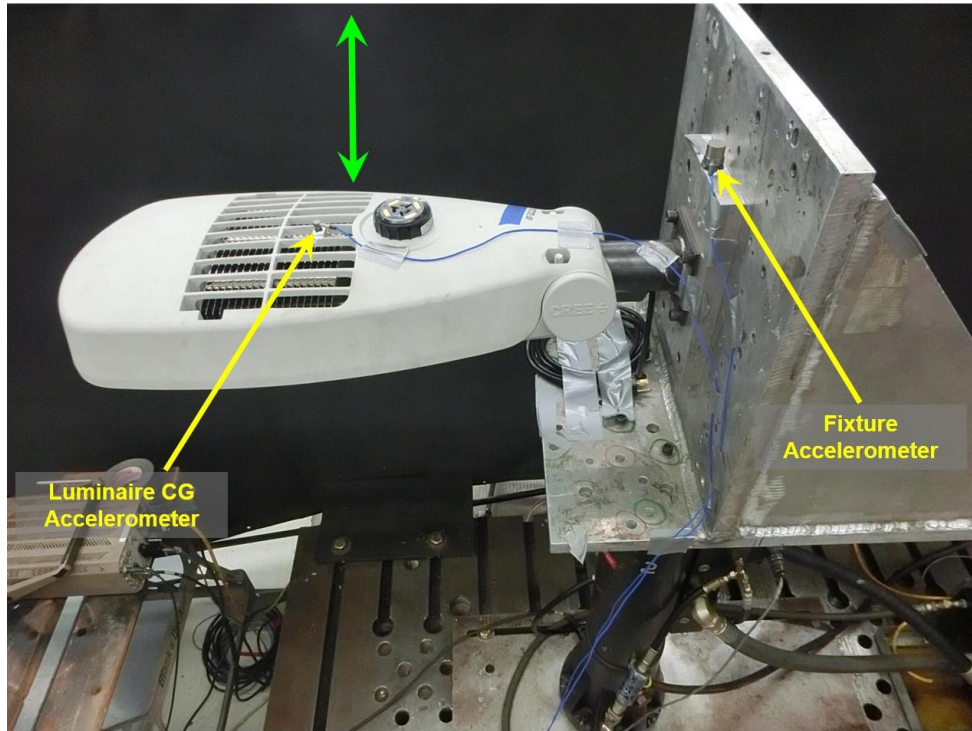


Figure 3: Vertical (Z) Axis Test Setup

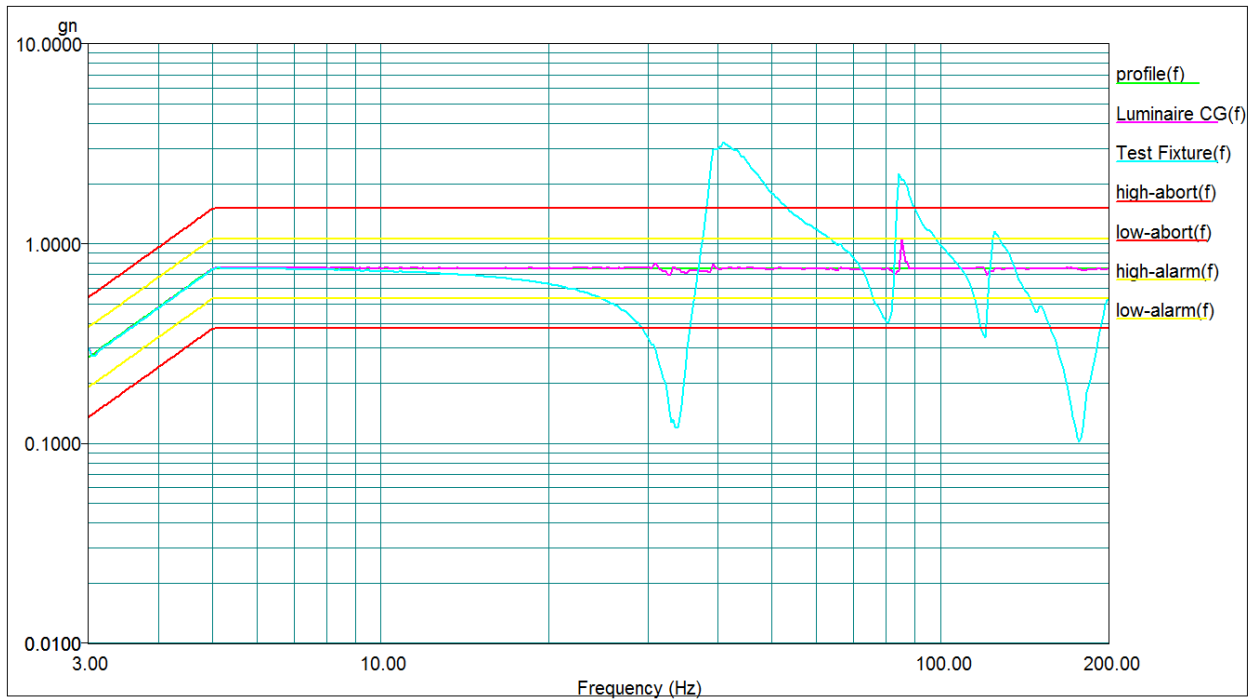


Figure 4: Horizontal (Y) Axis Sine Sweep Acceleration Plot

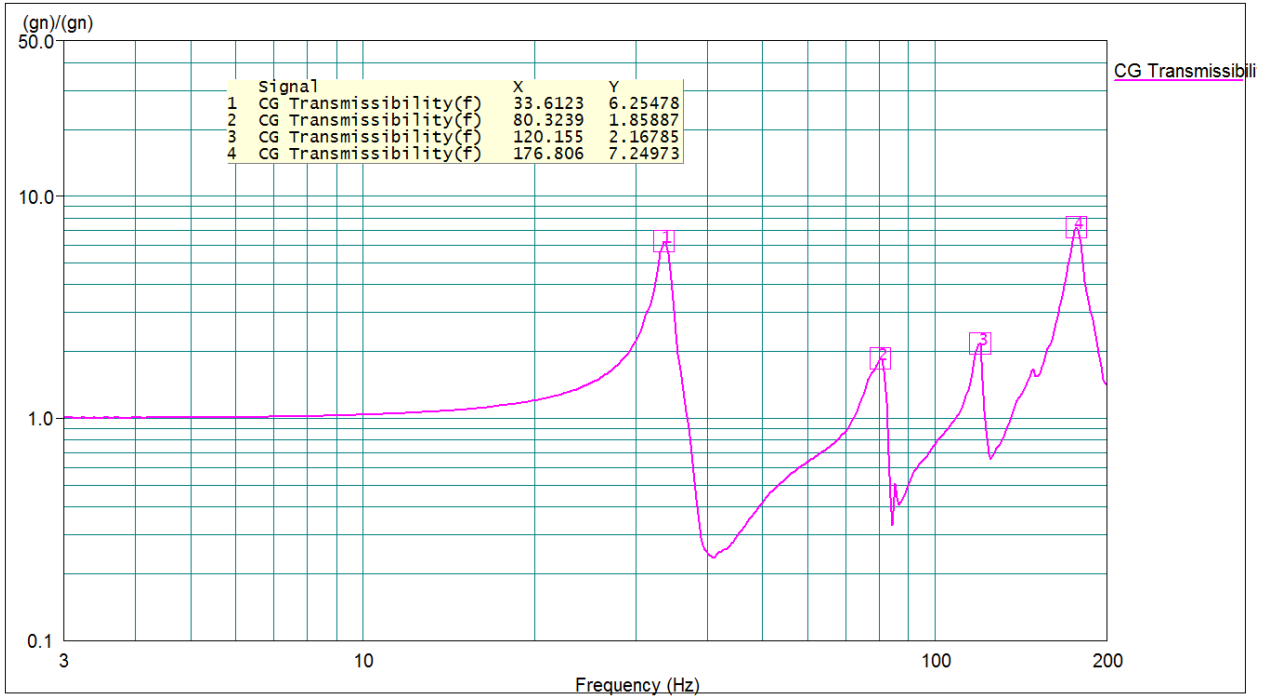


Figure 5: Horizontal (Y) Axis Sine Sweep Transmissibility Plot

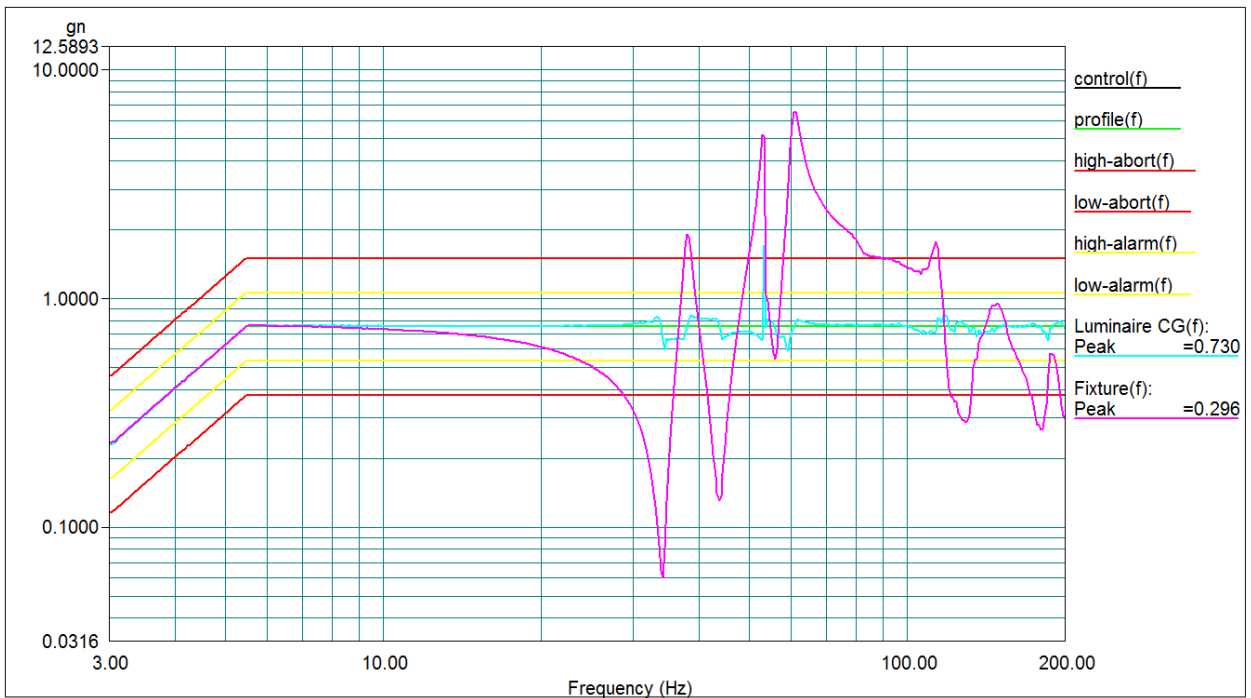


Figure 6: Vertical (Z) Axis Sine Sweep Acceleration Plot

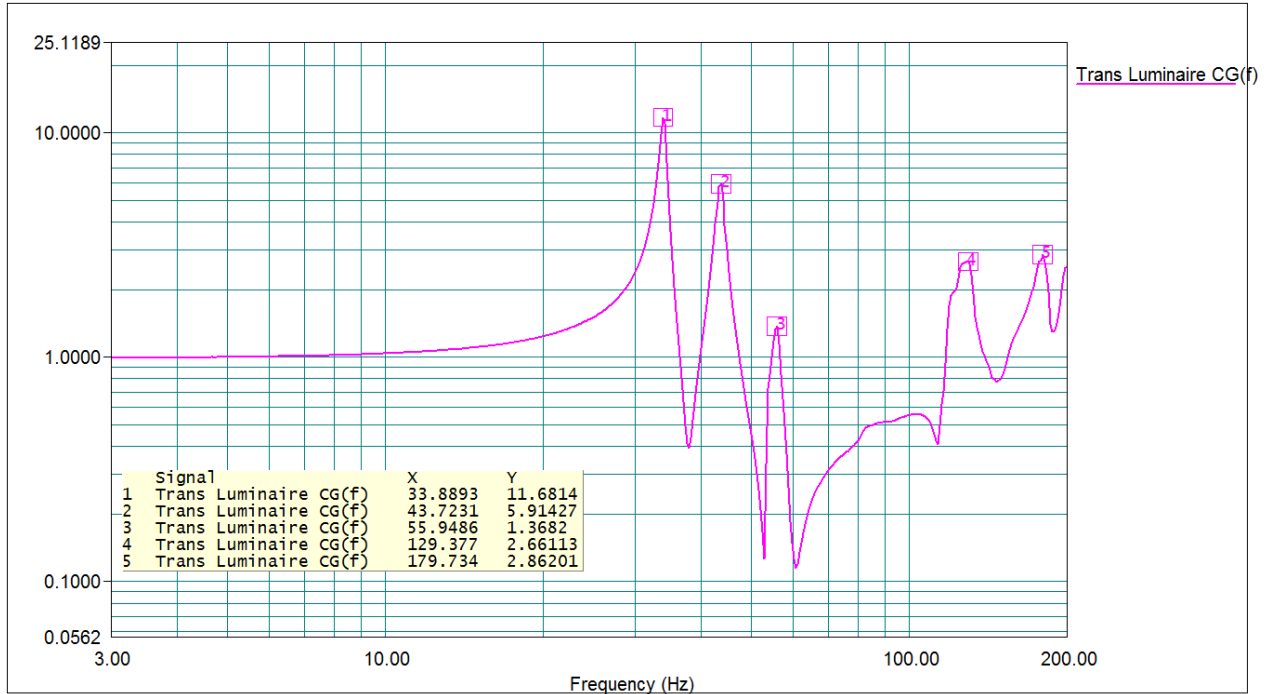


Figure 7: Vertical (Z) Axis Sine Sweep Transmissibility Plot

Cycles	Test Notes
Horizontal (Y) Axis	
-	LED illuminates when powered with 120 VAC.
-	Horizontal (Y) axis sine sweep performed.
-	Sine sweep response plot reviewed. 75 Hz dwell frequency chosen by CREE personnel.
0	Horizontal (Y) axis dwell test start at 75 Hz, 0.75g at luminaire CG
2,000,000	Horizontal (Y) axis dwell test complete. No clamp bolt torque loss. LED illuminates when powered with 120 VAC.
Vertical (Z) Axis	
-	LED illuminates when powered with 120 VAC.
-	Vertical (Z) axis sine sweep performed.
-	Sine sweep response plot reviewed. 32 Hz dwell frequency chosen by CREE personnel.
0	Vertical (Z) axis dwell test start at 32 Hz, 1.5g at luminaire CG.
2,000,000	Vertical (Z) axis dwell test complete. No clamp bolt torque loss. LED illuminates when powered with 120 VAC.

Figure 8: Test Log



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Axis	Inspection Point	Clamp Bolt Torque (in-lb)
Horizontal (Y) Axis	Start	125, 125
	End	125, 125
Vertical (Z) Axis	Start	125, 125
	End	125, 125

Figure 9: Clamp Bolt Torque Log