



10/22/2012

Mr. Vivek Chidambaram  
Bridgelux Inc  
101 Portola Ave  
Livermore, CA 94551  
United States

Reference: File E333389 Project 12CA49116  
Subject: Letter Report for HIGH BAY LIGHTING SYSTEM

Dear Mr. Chidambaram,

Per your request, project 12CA49116 was opened, in accordance with your requested test protocol for the evaluation of Model MSLB2 High Bay Lighting System which consisted only of the Control Box, Power Supplies and Lights (outlet box excluded). Your requested test protocol for this project was to determine compliance with Dust Test (IP6X of IEC 60598) and the Moisture Test (IPX6 of IEC 60598). A copy of the test data has been included as an appendix to this report.

UL Verification Services did not select the samples, determine whether the samples were representative of production samples, witness the production of the test samples, nor were we provided with information relative to the formulation or identification of component materials used in the test samples. The Test results apply only to the actual samples tested.

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This letter will serve to report that all tests on the subject product have been completed. This concludes all work associated with the project and we are therefore closing this project.

Thank you for the opportunity to provide your company with these services. Please do not hesitate to contact us if you should have any questions or comments.

Sincerely,

Reviewed by:

Wendy Fontana  
Engineering Project Handler  
Department: 3011ANBK  
Tel: 847-664-3206  
E-mail: Wendy.a.fontana@ul.com

George Golding  
Staff Engineer  
Department: 3011ANBK  
E-mail: George.R.Golding@ul.com

## APPENDIX A

### Dust Test

TEST LOCATION: NBK					
<input checked="" type="checkbox"/> UL or Affiliate	<input type="checkbox"/> WTDP	<input type="checkbox"/> CTDP	<input type="checkbox"/> TPTDP	<input type="checkbox"/> TCP	<input type="checkbox"/> PPP
	<input type="checkbox"/> WMT	<input type="checkbox"/> TMP	<input type="checkbox"/> SMT		
Company Name UL LLC					
Address 333 Pfingsten Rd., Northbrook, IL - USA					

CLIENT INFORMATION	
Company Name	Bridgelux Inc
Address	1225 Bordeaux Dr Sunnyvale, CA 94089 United States

AUDIT INFORMATION:
Description of Tests
Per Standard No. IEC 60598-1, Edition 7.0

<input checked="" type="checkbox"/> Tests Conducted by +	Chris Jones <small>Printed name</small>	Chris Jones <small>Signature</small>
Reviewed and accepted by qualified Project Handler	Wendy Fontana <small>Printed Name</small>	Wendy Fontana <small>Signature</small>

TESTS TO BE CONDUCTED:			
Test No.	Done +++	Test Name	<input type="checkbox"/> Comments/Parameters <input checked="" type="checkbox"/> Tests Conducted by ++
1	2012-10-12	DUST TEST ON LIGHTING FIXTURE FOR DESIGNATION [ IP6X ]	Chris Jones

Instructions -

- + - When all tests are conducted by one person, printed name and signature can be inserted here instead of including printed name and signature on each page containing data. Must indicate number of pages in the data package.
- ++ - When a test conducted by more than one person, printed name and signature of person conducting the test can be inserted next to the test name instead of including printed name and signature on each page containing data. Must indicate number of pages in the data package.
- +++ - Use of this field is optional and may be employed differently.

Special Instructions -

**Client Provide the following information: For 347Vac configuration (Meanwell driver), you can light up with any voltage between 200-400VAC, 600W.**

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

<input type="checkbox"/> Electric shock	<input type="checkbox"/> Radiation
<input type="checkbox"/> Energy related hazards	<input type="checkbox"/> Chemical hazards
<input checked="" type="checkbox"/> Fire	<input type="checkbox"/> Noise
<input type="checkbox"/> Heat related hazards	<input type="checkbox"/> Vibration
<input type="checkbox"/> Mechanical	<input checked="" type="checkbox"/> Other (Specify): Explosion

TEST EQUIPMENT INFORMATION

UL test equipment information is recorded on Meter Use in UL's Laboratory Project Management (LPM) database.

TEST SAMPLE IDENTIFICATION:

The table below is provided to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received, YYYY-MM-DD	<input type="checkbox"/> Test No.	Sample No.	Manufacturer, Product Identification and Ratings
1464686	09-12-2012	1	1	LED Luminaire, MSLB2 manufactured by Bridgelux Inc.

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

DUST TEST ON LIGHTING FIXTURE FOR DESIGNATION [ IP6X ]:  
 Clause 9.2 of IEC 60598-1, Edition 7.0

SAMPLES

Sample No.	Cat. or Model No.	Lamp W	Lamp Type +	Rated Input Voltage, V	Mount ++	Optics +++	Reflector
1	MSLB2		LED	200-440Vac		Clear Lens	Internal

+ - ANSI - Incandescent  
 CF - Compact Fluorescent  
 F - Fluorescent  
 MH - Metal Halide  
 MV - Mercury Vapor  
 HPS - High Pressure Sodium  
 \_\_\_\_\_ - \_\_\_\_\_

++ - AS - Angle Stanchion  
 C - Ceiling  
 P - Pendant  
 W - Wall  
 \_\_\_\_\_ - \_\_\_\_\_

+++ - G - Globe  
 R - Refractor  
 \_\_\_\_\_ - \_\_\_\_\_

METHOD

This method is further supported by [00-LC-S0367](#).

**[x]** Screws securing enclosure parts were tightened to a torque equal to two-thirds of that specified in Table 4.1 of IEC 60598-1.

The test apparatus consisted of a closed dust chamber, which maintained talcum powder in suspension. The test chamber volume was sufficient to allow uniform distribution of the dust. The effective volume of the test chamber was 2.33m<sup>3</sup>.

The sample fixture was operated at rated input voltage until equilibrium temperatures were obtained. While operating, the fixture was placed in the dust test chamber and the talcum powder was placed in suspension. The fixture was de-energized after one minute of exposure to the circulating dust and allowed to cool for a period of three (3) hours while exposed to the talcum powder atmosphere. [See the table under "RESULTS" for actual test conditions.]

The talcum powder used passed through a square-meshed sieve having a nominal wire diameter of 0.050 mm and a nominal width between wires of 0.075 mm. The amount of talcum powder installed in the test chamber was [ 2kg/m<sup>3</sup> of test chamber volume ] [ 4.66 kg ].

RESULTS

Sample No.	Test Duration, h	Test Voltage, V	Stable Temp. °C	Temp. Measured at	Ambient °C	Relative Humidity %	Barometric Pressure [ mm Hg ] [ mbar ]
1	3	210	172	Optic	22	28	753

SCREW/GLAND TORQUE DATA

Sample No.	Screw/Gland Location	Screw/Gland size	Nominal Screw Diameter or ID of Gland	Number of Screws	Torque/Force Applied, Nm
1	<b>Control Box</b>	<b>10-14 x ½ in.</b>	<b>0.164</b>	<b>4</b>	<b>1.2</b>
1	<b>Lens securement bracket</b>	<b>¼-20 x ½ in.</b>	<b>0.245</b>	<b>24</b> <b>4 per</b> <b>LED</b> <b>housing</b>	<b>5.333</b>

**Note: The LED Drivers (power supplies) are potted. Dust cannot get to live parts**

[X] For sample No. 1 talcum powder did not enter the enclosure (IP6X rating).

Ambient Temperature	shall be 15 to 35°C, preferably 25°C
Relative Humidity	shall be 25 to 75%, preferably 50%
Barometric Pressure	shall be 860 to 1,060 mbar (645 mmHg to 795 mmHg)

**SCREW TORQUE VALUES**

NOMINAL DIAMETER OF SCREW				TORQUE VALUE <sup>(1)</sup>						
				SETSCREWS <sup>(2)</sup>			OTHER SCREWS & NUTS			
>		≤		100%	66%	66%	100%	66%	66%	66%
mm	in.	mm	in.	N-m	N-m	lbf-in.	N-m	N-m	lbf-in.	lbf-ft.
0	0	2.8	0.110	0.20	0.133	1.180	0.4	0.267	2.360	--
2.8	0.110	3.0	0.118	0.25	0.167	1.475	0.5	0.333	2.950	--
3.0	0.118	3.2	0.126	0.30	0.20	1.770	0.6	0.40	3.540	--
3.2	0.126	3.6	0.142	0.40	0.267	2.360	0.8	0.533	4.720	--
3.6	0.142	4.1	0.161	0.70	0.467	4.130	1.2	0.80	7.081	--
4.1	0.161	4.7	0.185	0.80	0.533	4.720	1.8	1.2	10.621	--
4.7	0.185	5.3	0.209	0.80	0.533	4.720	2.0	1.333	11.801	--
5.3	0.209	6.0	0.236	--	--	--	2.5	1.667	14.751	1.229
6.0	0.236	8.0	0.315	--	--	--	8.0	5.333	47.204	3.934
8.0	0.315	10.0	0.394	--	--	--	17.0	11.333	100.308	8.359
10.0	0.394	12.0	0.472	--	--	--	29.0	19.333	171.114	14.260
12.0	0.472	14.0	0.551	--	--	--	48.0	32.0	283.224	23.602
14.0	0.551	16.0	0.630	--	--	--	114.0	76.0	672.657	56.055

(1) The 100% values are those from IEC 60598-1, Table 4.1. The 66% values are actually 2/3 of the 100% values.

(2) Headless screws that, when tightened, do not protrude from the hole.

TORQUE TESTS ON THREADED GLANDS <sup>(1)</sup>									
DIAMETER OF TEST ROD <sup>(2)</sup>				FORCE					
				METAL GLANDS			MOLDED GLANDS		
>		≤		100%	66%	66%	100%	66%	66%
mm	in.	mm	in.	N	N	lbf	N	N	lbf
0	0	14	0.551	25	16.667	3.747	15	10	2.248
14	0.551	20	0.787	30	20	4.496	20	13.333	2.997
20	0.787	--	--	40	26.667	5.995	30	20	4.496

(1) The 100% values are those from IEC 60598-1, Table 4.2. The 66% values are actually 2/3 of the 100% values.

(2) Threaded glands are to be fitted with a cylindrical metal rod having a diameter equal to the nearest whole number in millimeters below the inside diameter of the packing. The gland shall be tightened by means of a suitable wrench. The specified force shall be applied for 1 min. at a point 250 mm (9.8 in.) from the axis of the gland.

APPENDIX B

Moisture Test

TEST LOCATION: NBK						
<input checked="" type="checkbox"/> UL or Affiliate	<input type="checkbox"/> WTDP	<input type="checkbox"/> CTDP	<input type="checkbox"/> TPTDP	<input type="checkbox"/> WMT	<input type="checkbox"/> TMP	<input type="checkbox"/> SMT
Company Name						
Address 333 Pfingsten Rd., Northbrook, IL - USA						

CLIENT INFORMATION	
Company Name	Bridgelux Inc
Address	1225 Bordeaux Dr Sunnyvale, CA 94089 United States

AUDIT INFORMATION:
Description of Tests
Per Standard No. IEC 60598-1:2008

<input checked="" type="checkbox"/> Tests Conducted by +	Joe Frano	<i>Joe Frano</i>
	Printed name	Signature
<input type="checkbox"/> Authorized Signatory (CTDP, TPTDP, SMT)	Printed name	Signature, and include date for CTDP, TPTDP, WMT, TMP, SMT
Reviewed and accepted by qualified Project Handler	Wendy Fontana	Wendy Fontana
	Printed Name	Signature

[] TESTS TO BE CONDUCTED:			
Test No.	DONE +++	Test Name	<input type="checkbox"/> Comments/Parameters <input type="checkbox"/> Tests Conducted by ++
1	2012/10/19	TEST FOR INGRESS OF MOISTURE ON LUMINAIRES FOR DESIGNATIONS IPX5 AND IPX6	

Test Equipment- See "TEST EQUIPMENT INFORMATION"  
 Samples - See "TEST SAMPLE IDENTIFICATION"

Instructions -  
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 ++ - When a test conducted by more than one person, printed name and signature of person conducting the test can be inserted next to the test name instead of including printed name and signature on each page containing data. Must indicate number of pages in the data package.  
 +++ - Use of this field is optional and may be employed differently.

Special Instructions -



RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

<input type="checkbox"/> Electric shock	<input type="checkbox"/> Radiation
<input type="checkbox"/> Energy related hazards	<input type="checkbox"/> Chemical hazards
<input checked="" type="checkbox"/> Fire	<input type="checkbox"/> Noise
<input type="checkbox"/> Heat related hazards	<input type="checkbox"/> Vibration
<input type="checkbox"/> Mechanical	<input checked="" type="checkbox"/> Other (Specify): Explosion

TEST EQUIPMENT INFORMATION

UL test equipment information is recorded on Meter Use in UL's Laboratory Project Management (LPM) database.

TEST SAMPLE IDENTIFICATION:

The table below is provided to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received, YYYY-MM-DD	<input type="checkbox"/> Test No.	Sample No.	Manufacturer, Product Identification and Ratings
1464686	09-12-2012	1	1	LED Luminaire, MSLB2 manufactured by Bridgelux Inc.

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

TEST FOR INGRESS OF MOISTURE ON LUMINAIRES FOR DESIGNATIONS IPX6

IPX5: Clause 9.2.6 of IEC 60598-1, Edition 7.0

IPX6: Clause 9.2.7 of IEC 60598-1, Edition 7.0

SAMPLES

Sample No.	Cat. or Model No.	Lamp W	Lamp Type +	Rated Input Voltage, V	Mount ++	Optics +++
1	MSLB2		LED	200-440Vac		Clear Lens

- + - ANSI - Incandescent                      ++ - AS - Angle Stanchion                      +++ - G - Globe
- CF - Compact Fluorescent                      C - Ceiling    R - Refractor
- F - Fluorescent                                      P - Pendant    - - - - -
- MH - Metal Halide                                  W - Wall
- MV - Mercury Vapor                                  - - - - -
- HPS - High Pressure Sodium
- - - - -

METHOD

Each test sample given above was mounted and wired as intended.

The sample luminaire was switched on and operated at rated input voltage and brought to a stable operating temperature.

**[x]** The sample luminaires rated **IPX6** were each switched off and immediately subjected to a stream of water from a hose having a 12.5 mm nozzle, delivering 100 l +/- 5 percent of water per minute, with water pressure at the nozzle of 100 kN/m<sup>2</sup>. The pressure was adjusted to achieve the specified delivery rate and to assure that the core of the substantial stream of water measured approximately 12 cm in diameter at 2.5 m distance from the nozzle. The distance from nozzle to the luminaire was 3 m. The test duration was not less than 3 min. The water was at a temperature of 15°C ± 10°C.

RESULTS

[x] The results for sample No. 1 comply with the requirements for an IPX6 rating, since water did not enter the luminaire enclosure.

TEST PARAMETERS

Sample No.	Test Duration, h	Test Voltage, V	Stable Temp. °C	Temp. Measured at	Ambient °C	Relative Humidity %	Barometric Pressure [ mm Hg ] [ mbar ]
1	3 min	210	49	Optic	22	39	734

SCREW/GLAND TORQUE DATA

Sample No.	Screw/Gland Location	Screw/Gland size	Nominal Screw Diameter or ID of Gland	Number of Screws	Torque/Force Applied, Nm
1	<b>Control Box</b>	<b>10-14 x ½ in.</b>	<b>0.164</b>	<b>4</b>	<b>1.2</b>
1	<b>Lens securement bracket</b>	<b>¼-20 x ½ in.</b>	<b>0.245</b>	<b>24</b> <b>4 per LED housing</b>	<b>5.333</b>

**Note: The LED Drivers (power supplies) are potted. Water cannot get to live parts**

Ambient Temperature	shall be 15 to 35°C, preferably 25°C
Relative Humidity	shall be 25 to 75%, preferably 50%
Barometric Pressure	shall be 860 to 1,060 mbar (645 mmHg to 795 mmHg)

### SCREW TORQUE VALUES

NOMINAL DIAMETER OF SCREW				TORQUE VALUE <sup>(1)</sup>						
				SETSCREWS <sup>(2)</sup>			OTHER SCREWS & NUTS			
>		≤		100%	66%	66%	100%	66%	66%	66%
mm	in.	mm	in.	N-m	N-m	lbf-in.	N-m	N-m	lbf-in.	lbf-ft.
0	0	2.8	0.110	0.20	0.133	1.180	0.4	0.267	2.360	--
2.8	0.110	3.0	0.118	0.25	0.167	1.475	0.5	0.333	2.950	--
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3.2	0.126	3.6	0.142	0.40	0.267	2.360	0.8	0.533	4.720	--
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4.7	0.185	5.3	0.209	0.80	0.533	4.720	2.0	1.333	11.801	--
5.3	0.209	6.0	0.236	--	--	--	2.5	1.667	14.751	1.229
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12.0	0.472	14.0	0.551	--	--	--	48.0	32.0	283.224	23.602
14.0	0.551	16.0	0.630	--	--	--	114.0	76.0	672.657	56.055

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DIAMETER OF TEST ROD <sup>(2)</sup>				FORCE					
				METAL GLANDS			MOLDED GLANDS		
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mm	in.	mm	in.	N	N	lbf	N	N	lbf
0	0	14	0.551	25	16.667	3.747	15	10	2.248
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