NVLAP Lab Code 200571-0

327 Campus Drive, Aurora, Ohio 44202 Phone: 330-995-1335 Fax: 330-995-6188

Test Report

PO Number: TCP-8433 Model No. LED10BR30D27K

SUBMITTED TO

Technical Consumer Products
325 Campus Drive
Aurora, OH 44202

Customer Information

Requestor's Name	Tammie Madden	Company Name	TCP
Address	325 Campus Drive		
City	Aurora	Telephone:	330-995-1337
State	OH	Fax:	330-995-6188
Zip Code	44202	Email:	tmadden@tcpi.com
Date of Receipt:	7/10/13	Date of this Report:	8/13/13

This Test Report covers the Lamp Model Numbers shown below.

Quantity	Model No.
27	LED10BR30D27K

At the customers request this report has been generated to provide test data for the following tests: Electrical, photometric and colorimetric tests, transient test, operating frequency, noise, dimensional, lumen maintenance at 1000, 3000 and 6000 hours, rapid cycle stress test, color maintenance at 6000 hours, electromagnetic and radio frequency interference, 120 degree zonal lumen percentage, color spatial uniformity and center beam intensity testing. The tests as requested are in compliance with ISO 17025, NVLAP and Energy Star requirements. The Photometric measurements are in compliance with LM79:2008. Technical Consumer Products-Compliance Testing Laboratory is only responsible for the validity of the test data. The test results relate only to the lamps tested.

* THIS REPORT CONTAINS DATA THAT IS NOT COVERED BY THE NVLAP ACCREDITATION

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Test Standards and Specifications

PO Number : TCP-8433

The following standards and specifications were used in part or totally for each test sample:

- **Color Measurements**

[22/C02] IES LM-58:1994
Spectroradiometric Measurements
[22/C03] CIE Pub. 13.3:1995
Method of Measuring and Specifying Color Rendering of Light Sources
[22/S01] IES LM-58:1994
Spectroradiometric Measurements
[22/S02] CIE Pub. 13.3:1995
Method of Measuring and Specifying Color Rendering of Light Sources
[22/S03] IES LM-79:2008 (Sec. 12)
Solid State Lighting Luminaires - Color Characteristic Measurements
[22/S04] IES LM-16:1993
Practical Guide to Colorimetry of Light Sources
[22/S05] CIE Pub. 15:2004
Colorimetry

- **Electrical Measurements**

[22/E10] IES LM-9:1988
Fluorescent Lamps - Electrical Measurements
[22/E11] IES LM-9:1999
Fluorescent Lamps - Electrical Measurements
[22/E14] IES LM-51:2000
High Intensity Discharge (HID) Lamps - Electrical Measurements
[22/E15] IES LM-66:1991
Single-Ended Compact Fluorescent Lamps - Electrical Measurements
[22/E16] IES LM-66:2000
Single-Ended Compact Fluorescent Lamps - Electrical Measurements
[22/E16a] IES LM-66:2011
Single-Ended Compact Fluorescent Lamps - Electrical Measurements
[22/E18] ANSI C78.375:1997
Fluorescent Lamps - Electrical Measurements
[22/E22] ANSI C78.389:2004
High Intensity Discharge Lamps - Methods of Measuring Characteristics
[22/E23] ANSI C78.5:1997
Compact Fluorescent Lamps - Run-up and Start-up Times
[22/E24] ANSI C78.5:2003
Compact Fluorescent Lamps - Run-up and Start-up Times
[22/E26] ANSI C82.2:2002
Ballast for Fluorescent Lamps - Methods of Measurement
[22/S07] ANSI C82.77:2002
Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment

- **Life Tests**

[22/L06] IES LM-40:2001
Fluorescent Lamps - Life Test Performance
[22/L07] IES LM-47:2001
High Intensity Discharge Lamps - Life Test Performance
[22/L08] IES LM-49:2001
Incandescent Filament Lamps - Life Test Performance
[22/L10] IES LM-65:2001
Single-Ended Compact Fluorescent Lamps - Life Test Performance
[22/L10a] IES LM-65:2010
Single-Ended Compact Fluorescent Lamps - LifeTest Performance
[22/L11] EPA CFL v. 4.2 (Appendix B)
ENERGY STAR? Reflector CFL Elevated Temperature Test Procedure

- **Photometric Measurements**

[22/P06a] IES LM-9:1988
Fluorescent Lamps - Total Flux Measurements
[22/P07a] IES LM-9:1999
Fluorescent Lamps - Total Flux Measurements
[22/P08a] IES LM-20:1994
Reflector Type Lamps -Total Flux Measurements
[22/P08b] IES LM-20:1994
Reflector Type Lamps - Intensity Measurements
[22/P11a] IES LM-51:2000
High-Intensity Discharge Lamps -Total Flux Measurements
[22/P12a] IES LM-66:1991
Single-Ended Compact Fluorescent Lamps - Total Flux Measurements
[22/P12b] IES LM-66:1991
Single-Ended Compact Fluorescent Lamps - Intensity Measurements
[22/P13a] IES LM-66:2000
Single-Ended Compact Fluorescent Lamps - Total Flux Measurements
[22/P13b] IES LM-66:2000
Single-Ended Compact Fluorescent Lamps - Intensity Measurements
[22/P13c] IES LM-66:2011
Single-Ended Compact Fluorescent Lamps - Total Flux Measurements
[22/P13d] IES LM-66:2011
Single-Ended Compact Fluorescent Lamps - Intensity Measurements
[22/P14] EN/IEC 60969, Ed. 1.2: 2001
Self-Ballasted Lamps for General Lighting Services - Performance Requirements
[22/S09] IES LM-79:2008 (Sec. 9)
Solid State Lighting Luminaires - Total Flux Measurements (Luminous Efficacy)

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TEST METHODS

Electrical Photometric and Colorimetric Measurements

Total light output (luminous flux) was measured using an integrating sphere, a spectroradiometer and software. The spectral luminous flux measurements were made using the spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Each lamp was operated in the designated orientation at its rated voltage. Each lamp preburned for 5 hours on a test rack adjacent to the sphere. After transfer to the sphere the lamps were allowed to stabilize before measurements were made. The chromaticity coordinates, correlated color temperature and color rendering index for each lamp are calculated from the spectral radiant flux measurements taken at 0.4 nm intervals over the range of 380-780 nm. The calibration of the sphere spectroradiometer system is traceable to the National Institute of Standards and Technology. Electrical measurements including voltage, current, power and power factor are measured using a power analyzer. The ambient temperature condition inside the sphere was maintained at 77 ºF ± 1.8 ºF and was measured at a position inside the sphere. The operating frequency was measured with an oscilloscope, at an ambient temperature of 77 ºF +/- 1.8 ºF.

*Operating frequency

The light output frequency was determined for each lamp at 100%, 50% and 30% of the rated input power. A photodiode amplifier was used to get the profile of the lamp's flicker frequency on the oscilloscope, at different levels.

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***Transient Protection Test**

During the test, each lamp was operated at its rated voltage and in its designated orientation. The ambient room temperature was maintained at 77 ºF ± 1.8 ºF. An instrument with a surge simulator module was used to generate the 2500-volt ring wave across the lamp base contacts. Seven strikes were performed on each lamp sample.

Rapid Cycle Stress Test

Lamps were operated on a two-minutes on / two-minutes off time cycle at its rated voltage. The lamps are cycled once for every two hours of the required minimum rated life.

Lumen and Color Maintenance

The lamps were burned in their designated orientation at their rated voltage. After burning 1000 hours on a continuous duty cycle the lumen maintenance was measured. The lamps are then placed back on the life test rack in their designated orientation and burned to 3000 hours. The lumen maintenance was again measured. The lamps are then placed back on the life test rack in their designated orientation and burned to 6000 hours. The lumen maintenance was again measured at this final interval. The color maintenance was measured at the 6000 hour interval.

***Noise Level**

The noise level for each sample was determined by using a sound level meter. The sample was placed inside of a sound chamber with a sound floor level of ≤20 dbA. The dbA reading of each lamp was noted as pass/fail when read on the sound rating A range. Each sample was operated in its designated orientation at its rated voltage.

Sound Ratings	Sound Ratings Average Noise Rating (dB)
A	20-24
B	25-30
C	31-36

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Equipment List :

Description	Manufacturer	Model
1.5 Meter Integrating Sphere	Everfine	Spektron
AC Power Source	California Instruments	2001L
AC Power Source	California Instruments	4500LS
Spectroradiometer	Optronics Laboratories, Inc.	OL770
Photometer	Optronics Laboratories, Inc.	OL730/CV
Power Analyzer	Yokogawa, Inc.	WT210
High Voltage DC Power Source	Xantrax	XHR 150-7
Digital Thermocouple Meter	Fluke	54II
Precision shunt	Guildline	9230A-30-0.1
6 1/2 Digit Multimeter	Agilent	34401A
Lamp Reference Standard	GE	100watt, 120volt
Oscilloscope	Yokogawa, Inc.	DL1620L
Oscilloscope	Yokogawa, Inc.	DLM2022
EMC Transient Test System	KeyTek	EMC Pro
Preburn test rack	TCP-CTL	na
Life Test rack	TCP-CTL	na
Rapid Cycle Test rack	TCP-CTL	na
Draft free enclosure	TCP-CTL	na
Thermal chamber	ESPEC	LHU113
Elevated Temperature Life Test Rack	option A, B & C	na
Date Logger	Yohogawa	MV200
Sound Meter	Larson Davis	825
Timer	VWR	Traceable Talking Timer
PC	Dell	various

Approved Signatory: Bipin **Date:** 8-13-13

Model # LED10BR30D27K **SPHERE:** Sherman **Technician:** John Terbizan

PO# TCP-8433 **Rated Life:** 50,000 **Date:** 7/23/13

LP Type: LED BR30 **Cal File:** R2 994-100 S 3-20-13.cal **Approved Signatory:** Bijon

Date: 8-13-13

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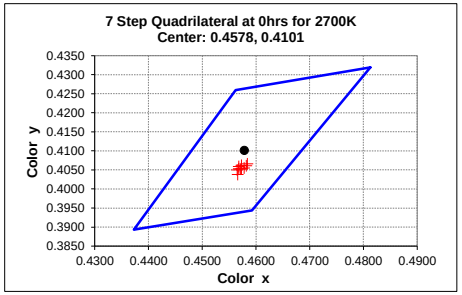
0 HOUR RESULTS

	Lp. #	Volts	Amps	Watts	pf (≥.7)	0 Hr. Lumens	CCT	CRI (≥80)	Sph Temp (°F)	x Value	y Value	u' Value	v' Value	Duv	7-Step Color Compliance	LPW (>40)	Stabilization Time	R9
Base Up	P-8433-1	119.98	0.1049	10.49	0.869	765	2689	83	76.9	0.4578	0.4055	0.2635	0.5251	-0.0017	PASS	72.9	1:00	19
	P-8433-2	119.98	0.1059	11.08	0.873	792	2697	82	76.4	0.4571	0.4052	0.2631	0.5249	-0.0018	PASS	71.5	0:45	18
	P-8433-3	119.99	0.1025	10.65	0.867	767	2695	83	75.9	0.4573	0.4054	0.2632	0.5250	-0.0017	PASS	72.0	0:45	18
	P-8433-4	119.98	0.1064	11.12	0.871	748	2693	83	75.9	0.4566	0.4038	0.2634	0.5242	-0.0023	PASS	67.3	0:45	20
	P-8433-5	119.98	0.1038	10.78	0.866	773	2688	82	76.6	0.4582	0.4061	0.2634	0.5254	-0.0015	PASS	71.7	0:45	17

	Lp. #	Volts	Amps	Watts	pf (≥.7)	0 Hr. Lumens	CCT	CRI (≥80)	Sph Temp (°F)	x Value	y Value	u' Value	v' Value	Duv	7-Step Color Compliance	LPW (>40)	Stabilization Time	R9
Base Down	P-8433-6	119.98	0.1079	11.22	0.867	774	2702	82	76.8	0.4568	0.4053	0.2629	0.5248	-0.0017	PASS	69.0	0:45	17
	P-8433-7	119.97	0.1051	10.98	0.870	741	2690	82	76.9	0.4584	0.4066	0.2633	0.5256	-0.0014	PASS	67.5	0:45	17
	P-8433-8	119.98	0.1038	10.79	0.867	748	2701	82	76.9	0.4573	0.4062	0.2629	0.5253	-0.0014	PASS	69.3	0:45	16
	P-8433-9	119.97	0.1050	10.96	0.870	757	2703	82	76.9	0.4565	0.4050	0.2628	0.5247	-0.0018	PASS	69.1	0:45	18
	P-8433-10	119.97	0.1067	11.13	0.869	757	2706	82	77.1	0.4568	0.4059	0.2626	0.5251	-0.0015	PASS	68.0	0:45	17
	Grand AVG.	**119.98**	**0.1052**	**10.92**	**0.869**	**762**	**2696**	**82**	**76.6**	**0.4573**	**0.4055**	**0.2631**	**0.5250**	**-0.0017**		**69.8**	**0:46**	
	Compliance				**Complies**	**Complies**	**Complies**	**Complies**						**Complies**	**Complies**	**Complies**		

LUMEN & COLOR MAINTENANCE

	Date:																	
	Lp. #	1000 Hr. Lumens	1000 Hr. Lumen Maint.	1000 Hr. u' Color Maint.	1000 Hr. v' Color Maint.	3000 Hr. Lumens	3000 Hr. Lumen Maint.	3000 Hr. u' Color Maint.	3000 Hr. v' Color Maint.	6000 Hr. Lumens	6000 Hr. Lumen Maint.	6000 Hr. u' Color Maint.	6000 Hr. v' Color Maint.	12500 Hr. Lumens	12500 Hr. Lumen Maint.	12500 Hr. u' Color Maint.	12500 Hr. v' Color Maint.
Base Up	P-8433-1									0				0	0.0%		
	P-8433-2									0				0	0.0%		
	P-8433-3									0				0	0.0%		
	P-8433-4									0				0	0.0%		
	P-8433-5									0				0	0.0%		
Base Down	P-8433-6									0				0	0.0%		
	P-8433-7									0				0	0.0%		
	P-8433-8									0				0	0.0%		
	P-8433-9									0				0	0.0%		
	P-8433-10									0				0	0.0%		
	Grand AVG.									0				0	**0.0%**		
	Compliance		**TBD**	**TBD**	**TBD**		**TBD**										



TCP COMPLIANCE TEST LAB

Model # LED10BR30D27K
PO# TCP-8433
LP Type: LED BR30

SPHERE: Sherman
Rated Life: 50,000
Cal File:

Technician: John Terbizan
Date: 7/28/13
Approved Signatory: Bipin
Date: 8-13-13

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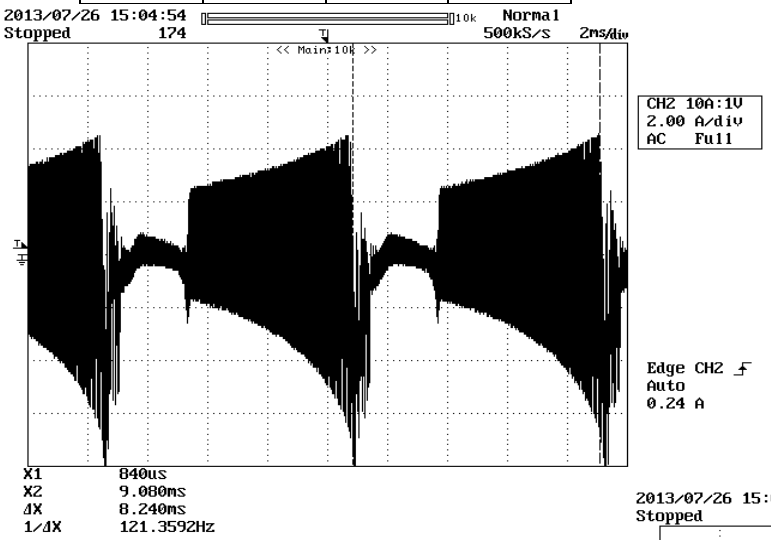
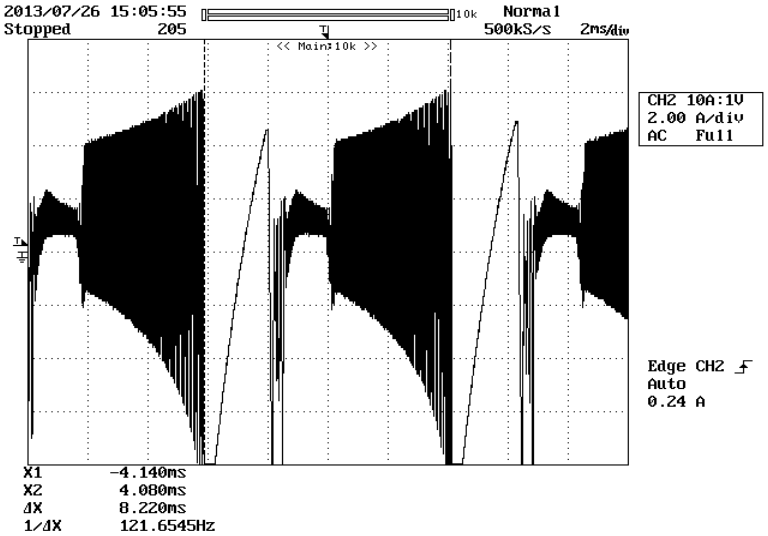
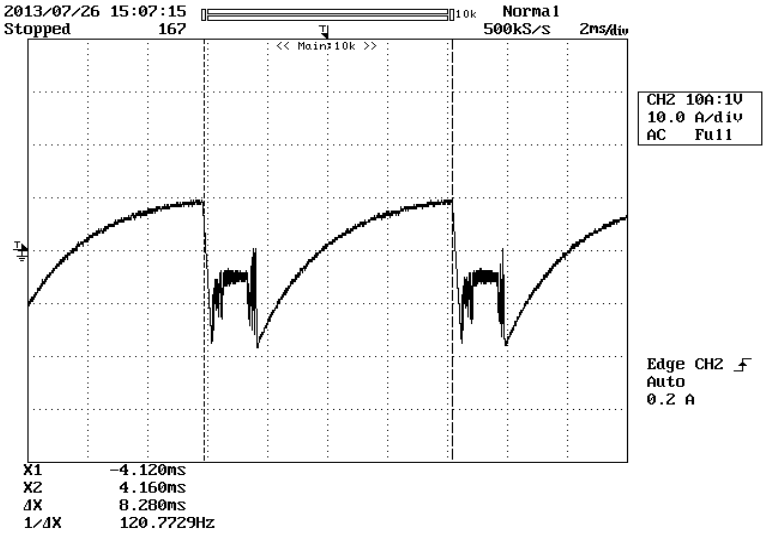
Date:	7/28/13		
Lp. #	L.O. = Hi Ballast Freq (≥120 Hz)	L.O. = Med Ballast Freq (≥120 Hz)	L.O. = Lo Ballast Freq (≥120 Hz)
TCP-8433	121.4	121.7	120.8
Compliance	Complies	Complies	Complies







Model # LED10BR30D27K
PO# TCP-8433
LP Type: LED BR30

SPHERE: Sherman
Rated Life: 50,000
Cal File:

Technician: John Terbizan
Date: 07/19/13
Approved Signatory: Bipin
Date: 8-13-13

NVLAP Lab Code 200571-0

Date:	7/19/13
Lp. #	**Transient Protection PASS/FAIL**
T-8433-1	PASS
T-8433-2	PASS
T-8433-3	PASS
T-8433-4	PASS
T-8433-5	PASS
Compliance	**Complies**

Date:	8/9/13
Lp. #	**Noise (dbA)**
N-8433-1	23.2

	Date:		
	Lp. #	**Rapid Cycles Endured (25K)**	**Rapid Cycles Endured (50K)**
Base Up	**RC-8433-1**		
	RC-8433-2		
	RC-8433-3		
	RC-8433-4		
	RC-8433-5		
Base Down	**RC-8433-6**		
	RC-8433-7		
	RC-8433-8		
	RC-8433-9		
	RC-8433-10		
	Compliance	**TBD**	**TBD**