FOR THE SCOPE OF
ACCREDITATION UNDER NVLAP LAB
CODE 100402-0.

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G102322298 Date: August 4, 2016

REPORT NO. 102322298CRT-045

TEST OF ONE LED FILAMENT ST19 2200K DIMMABLE

MODEL NO. LED ST19 ST19-L380-C22-D-AM-F
PART NO. 99508

RENDERED TO:

VERBATIM AMERICAS
1200 W.T. HARRIS BLVD.
CHARLOTTE, NC 28269

TESTS: Electrical and Photometric tests as required to the IESNA test standard.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION The testing performed was authorized by signed quote number Qu-00647973.

STANDARDS USED:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting
ANSI NEMA ANSLG C78.377: 2011: Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number LED ST19 ST19-L380-C22-D-AM-F. The sample was received by Intertek on August 2, 2016 in undamaged condition and one sample was tested as received. The sample designation was CRT1608021039-001D.

DATE OF TESTS: August 3, 2016 through August 4, 2016.

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SUMMARY:

MODEL NO. LED ST19 ST19-L380-C22-D-AM-F
DESCRIPTION: LED Filament ST19 2200K Dimmable

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	356.1	361.1
Total Power (W)	4.830	4.847
Lumen Efficacy (Lm/W)	73.70	74.50
Power Factor ( )	0.928	0.934

Criteria	Results
Current ATHD (%)	38.71
Correlated Color Temp. (CCT-K)	2287
Color Rendering Index (CRI - Ra)	81.3
CRI - R9	8.1
DUV ( )	0.002
Chromaticity Coordinate (x)	0.502
Chromaticity Coordinate (y)	0.423
Chromaticity Coordinate (u')	0.284
Chromaticity Coordinate (v')	0.538

EQUIPMENT LIST

Equipment Used	Model No.	Control No.	Last Cal.	Cal. Due
LSI High Speed Mirror Goniometer	6440	---	07/06/16	08/06/16
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	05/02/16	05/02/17
Omega Thermometer	DPi8-C24	M263	05/02/16	05/02/17
M-D Building Products Digital Level	Smart Tool	L112	04/08/16	04/08/17
NIST Luminous Intensity Standard Source	NBS10322	N1427	12/12/14	12/12/16
NIST Luminous Intensity Standard Source	NBS10215	N1432	12/12/14	12/12/16
NIST Luminous Intensity Standard Source	960629-3	N1428	12/12/14	12/12/16
NIST Luminous Flux Standard Source	NBS10428	N1424	12/17/14	12/17/16
2M Integrating Sphere Spectrometer System	CDS 1100	N308	07/07/16	08/07/16
Yokogawa Power Analyzer	WT1600	E536	12/18/15	12/18/16
Fluke Temperature Meter	53II	D588	05/06/16	05/06/17
Extech Hygro-thermometer	445715	T1550	01/08/16	01/08/17
Elgar AC Power Supply	CW1251	--	VBU	VBU
Secondary Spectral Flux Standard Source	BS5186	RF5186	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	6836	--	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS4116	--	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS3616	--	01/27/16	01/27/17
Sorenson DC Power Supply	XG 150-10	--	VBU	VBU
Fisher Scientific Stop Watch	14-649-9	N1315	01/15/16	01/15/17

TEST METHODS:

Seasoning in Sample Orientation – LED Products
No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical Measurements – Integrating Sphere Method
A Labsphere Model CDS 1100 CCD Array Spectroradiometer and two meter or ten foot sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

Photometric and Electrical measurements – Distribution Method
A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

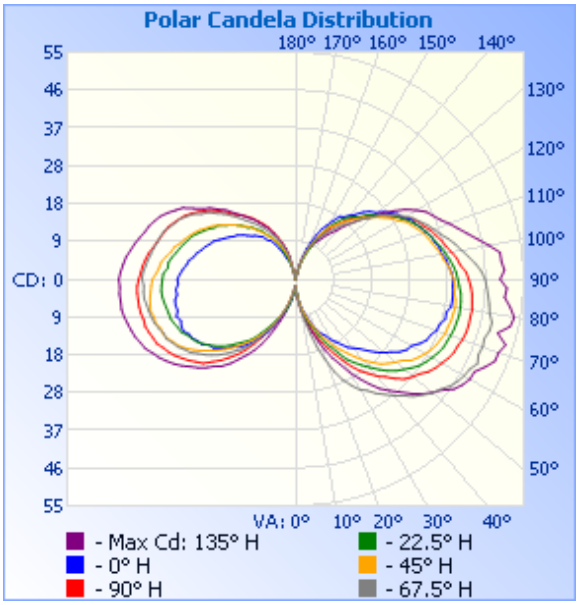
RESULTS:

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Distribution Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Light Output (Lumens)	Lumen Efficacy (lm/W)
CRT1608021039-001D	Base Up	120.00	43.23	4.847	0.934	361.1	74.50

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	2	2	2	2	2
5	4	3	4	4	4
10	6	7	7	8	8
15	9	10	9	14	11
20	12	13	12	21	15
25	15	17	16	27	18
30	17	21	19	31	23
35	19	25	22	34	27
40	22	28	26	37	31
45	24	31	29	40	34
50	28	34	31	43	37
55	31	36	34	45	39
60	32	38	36	47	41
65	35	39	38	48	42
70	36	40	38	48	43
75	37	40	39	48	43
80	38	40	39	48	43
85	38	40	38	47	43
90	38	39	38	46	42
95	37	38	37	44	40
100	36	37	36	41	38
105	35	35	34	38	36
110	33	34	33	35	35
115	32	32	31	33	33
120	30	29	28	30	30
125	28	27	26	27	27
130	25	24	23	23	24
135	23	21	21	19	21
140	20	19	18	17	18
145	19	16	16	14	15
150	15	13	13	12	12
155	12	9	10	10	9
160	8	5	6	7	6
165	3	2	2	2	3

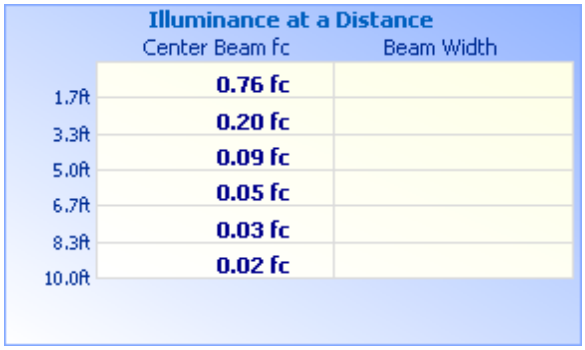


RESULTS:

Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



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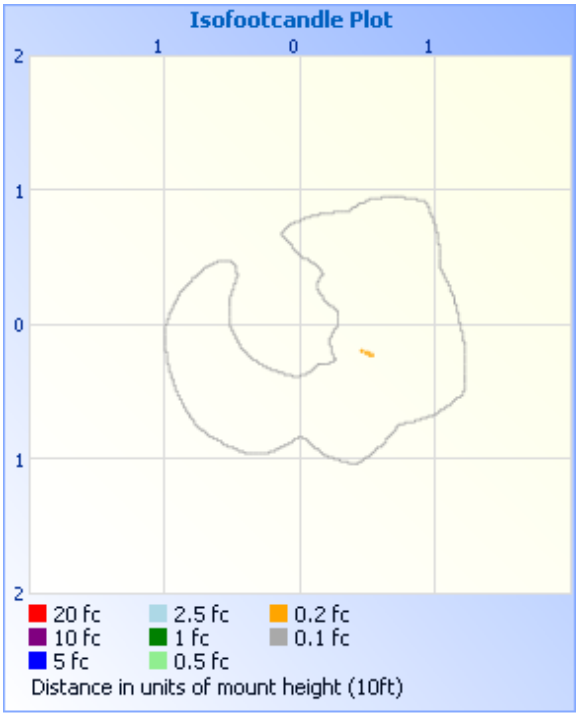


Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	10.2	2.8
0-40	24.7	6.8
0-60	78.3	21.7
60-90	120.9	33.5
0-90	199.2	55.2
90-180	161.9	44.8
0-180	361.1	100.0

Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	0.4	0.1
10-20	2.6	0.7
20-30	7.3	2.0
30-40	14.5	4.0
40-50	22.7	6.3
50-60	30.8	8.5
60-70	37.3	10.3
70-80	41.2	11.4
80-90	42.4	11.7
90-100	40.6	11.2
100-110	36.1	10.0
110-120	30.5	8.5
120-130	23.4	6.5
130-140	15.8	4.4
140-150	9.7	2.7
150-160	4.7	1.3
160-170	1.1	0.3
170-180	0.0	0.0

RESULTS:

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Current ATHD (%)
CRT1608021039-001D	Base Up	120.06	43.40	4.830	0.928	38.71

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ( )
356.1	73.70	2287	81.3	8.1	0.002

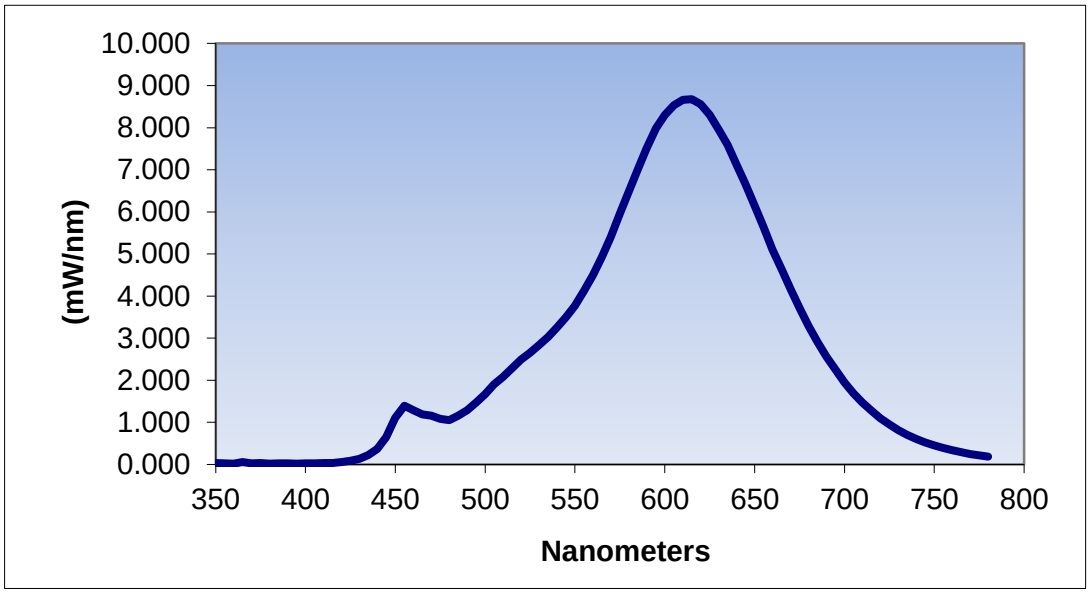
CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.502	0.423	0.284	0.538

RESULTS:

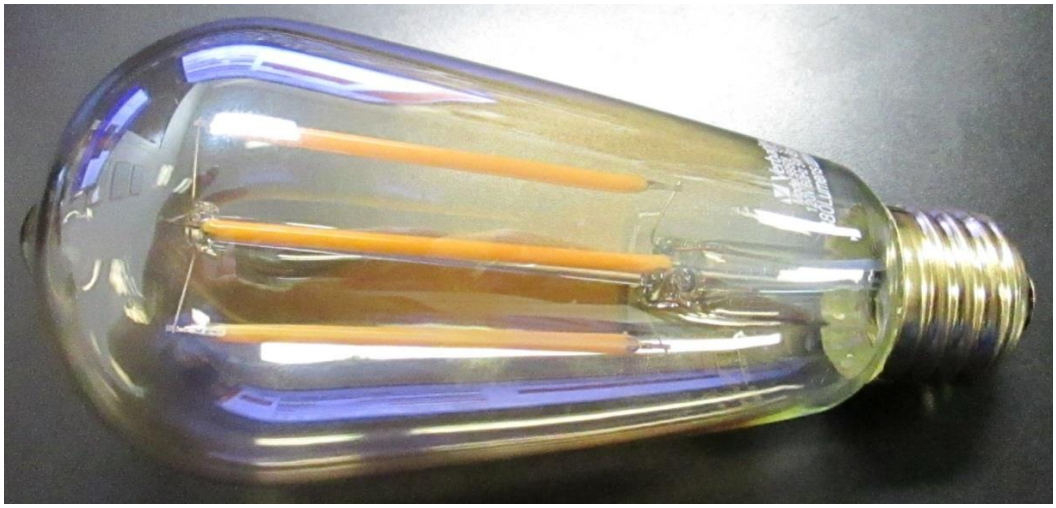
Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.031	460	1.286	570	5.407	680	3.289
355	0.024	465	1.187	575	5.952	685	2.903
360	0.021	470	1.157	580	6.479	690	2.554
365	0.055	475	1.078	585	7.001	695	2.256
370	0.026	480	1.054	590	7.516	700	1.946
375	0.032	485	1.154	595	7.982	705	1.692
380	0.021	490	1.284	600	8.307	710	1.473
385	0.027	495	1.466	605	8.529	715	1.277
390	0.024	500	1.670	610	8.663	720	1.098
395	0.020	505	1.906	615	8.680	725	0.956
400	0.024	510	2.079	620	8.555	730	0.819
405	0.022	515	2.282	625	8.308	735	0.704
410	0.030	520	2.485	630	7.955	740	0.605
415	0.033	525	2.656	635	7.590	745	0.522
420	0.052	530	2.838	640	7.119	750	0.451
425	0.086	535	3.025	645	6.657	755	0.391
430	0.133	540	3.254	650	6.152	760	0.335
435	0.222	545	3.499	655	5.646	765	0.288
440	0.365	550	3.771	660	5.104	770	0.248
445	0.651	555	4.120	665	4.636	775	0.213
450	1.103	560	4.494	670	4.162	780	0.184
455	1.393	565	4.932	675	3.710		

Spectral Data Over Visible Wavelengths



PRODUCT PICTURE:



CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Melanie Brittain

Melanie Brittain
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Report Reviewed By:

Ryan Siddon

Ryan Siddon
Engineer
Lighting Division

Attachments: IES File - CRT1608021039-001D