



LM-79-19 TEST REPORT

for

RAB LIGHTING INC

408 W 14th St New York, NY 10014 United States

LED Lamp

Model: FHID-20-EX39-850

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25040039a

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by:

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April Zou

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May 14, 2025

1 Manager: April Zou
May 14, 2025

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

TEST SUMMARY

Tested Model	FHID-20-EX39-850 Lamp in Lithonia KAD Contour Series (Mogul Socket Version)	FHID-20-EX39-850
Luminous Efficacy (Lumens /Watt)	135.2	184.2
Total Luminous Flux (Lumens)	2944.9	4020.1
Power (Watts)	21.78	21.83
Power Factor	0.9779	0.9847
CCT (K)	5074	5065
CRI	82.9	83.5
Stabilization Time (Light & Power)	50 mins	50 mins
Note	5000K	5000K

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt	: Feb. 21, 2025
Date of Test	: Feb. 25, 2025
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2019 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

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SAMPLE PHOTO

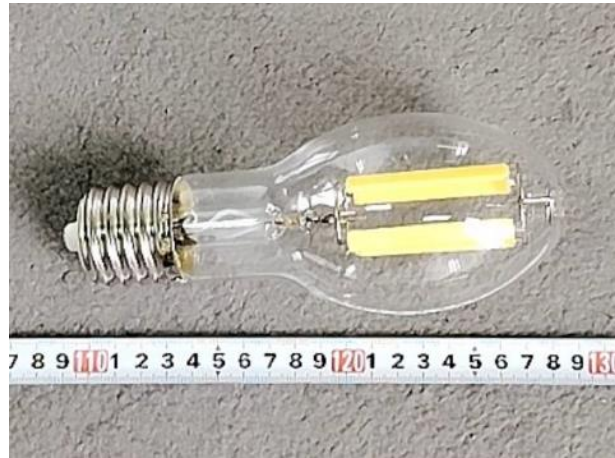


Figure 1- Overview of the sample



Sample in Lithonia KAD Contour Series (Mogul Socket Version)

Equipment Under Test(EUT)

Name	: LED Lamp
Model	: FHID-20-EX39-850
Electrical Ratings	: 120-277V, 50/60Hz, 20W
Product Description	: 5000K

TEST RESULTS (Lamp in Lithonia KAD Contour Series (Mogul Socket Version))

Test ambient temperature was 26.0 °C.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
	Test Voltage (V)	120.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.186	0.085
Power Factor	0.9779	0.8897
Test Power (W)	21.78	20.89
THD A%	14.26	15.41
Luminous Efficacy (lm/W)	135.2	139.5
Total Luminous Flux (lm)	2944.9	2913.8
Color Rendering Index (CRI)	82.9	
R9	10.4	
Correlated Color Temperature (CCT)(K)	5074	
Chromaticity Chroma x	0.3433	
Chromaticity Chroma y	0.3547	
Chromaticity Chroma u	0.2090	
Chromaticity Chroma v	0.3239	
Duv	0.0023	
Chromaticity Chroma u'	0.2090	
Chromaticity Chroma v'	0.4859	

Special Color Rendering Indices	
R1	81.3
R2	88.3
R3	92.1
R4	81.9
R5	81.4
R6	82.8
R7	87.3
R8	68.2
R9	10.4
R10	71.1
R11	80.3
R12	59.5
R13	83.2
R14	95.7

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Goniophotometer Method

Test ambient temperature was 25.1 °C.

The photometric distance is 30 m.

Luminous data was taken at 0.5 ° vertical intervals and 10 horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.185
Power Factor	0.9776
Power (W)	21.76
Luminous Efficacy (lm/W)	135.6
Total Luminous Flux (lm)	2950.8
Beam Angle (°)	109.3 (0°-180°) / 144.6 (90°-270°)
Center Beam Candle Power (cd)	632
Zonal Lumens in the 0 °-60 °Zone	79.79%
Zonal Lumens in the 60 °-90 °Zone	20.21%
Zonal Lumens in the 90 °-120 °Zone	0.00%
Zonal Lumens in the 120 °-180 °Zone	0.00%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

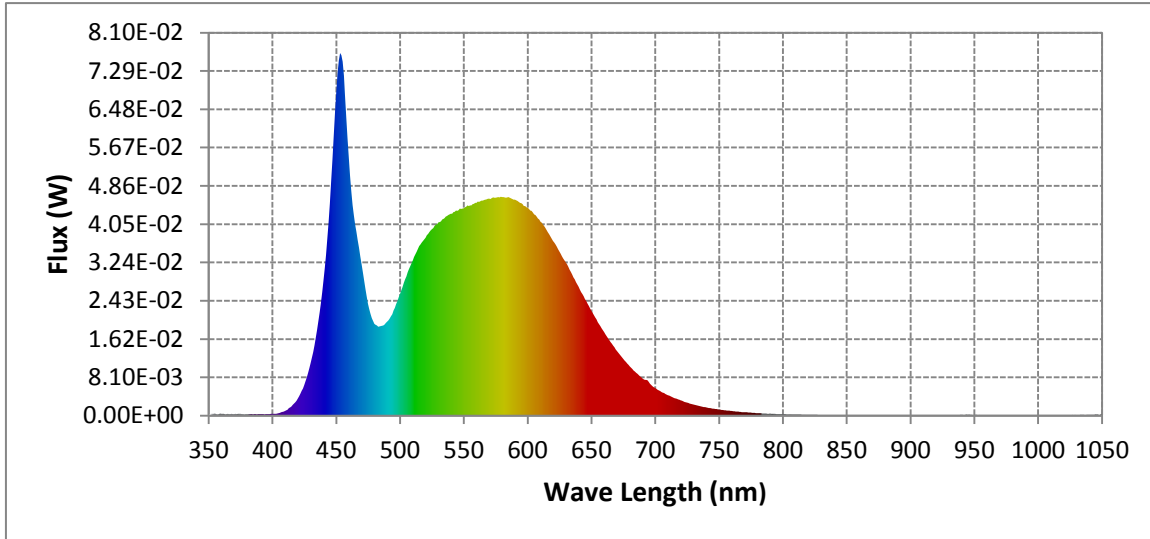
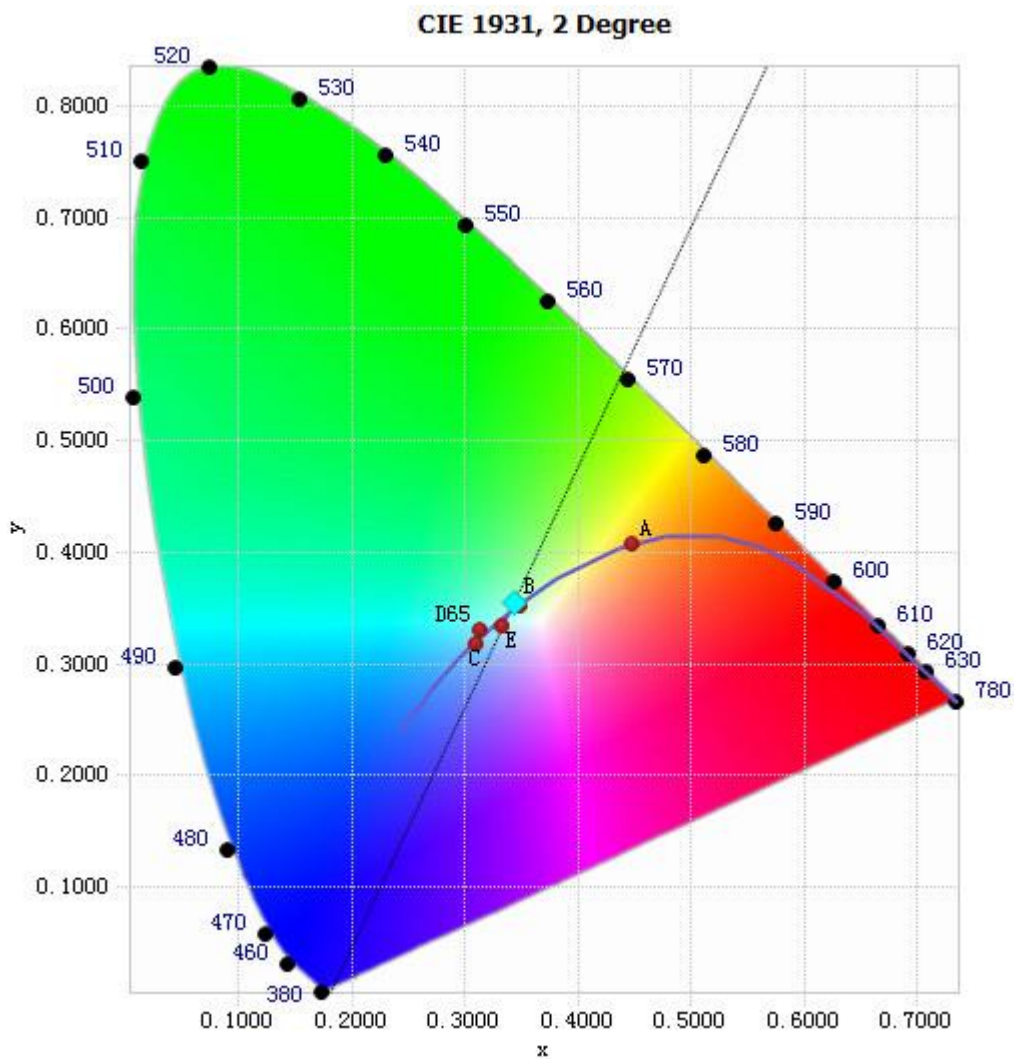


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.49E-04	485	1.89E-02	590	4.57E-02	695	7.20E-03
385	2.84E-04	490	1.99E-02	595	4.50E-02	700	5.87E-03
390	3.06E-04	495	2.23E-02	600	4.40E-02	705	5.03E-03
395	3.34E-04	500	2.57E-02	605	4.26E-02	710	4.33E-03
400	3.73E-04	505	2.94E-02	610	4.10E-02	715	3.75E-03
405	5.65E-04	510	3.28E-02	615	3.93E-02	720	3.24E-03
410	1.02E-03	515	3.59E-02	620	3.70E-02	725	2.76E-03
415	1.95E-03	520	3.76E-02	625	3.47E-02	730	2.36E-03
420	3.63E-03	525	3.95E-02	630	3.24E-02	735	2.03E-03
425	6.48E-03	530	4.09E-02	635	2.99E-02	740	1.75E-03
430	1.12E-02	535	4.18E-02	640	2.73E-02	745	1.51E-03
435	1.82E-02	540	4.27E-02	645	2.47E-02	750	1.30E-03
440	2.86E-02	545	4.34E-02	650	2.22E-02	755	1.15E-03
445	4.49E-02	550	4.39E-02	655	1.98E-02	760	9.85E-04
450	6.85E-02	555	4.45E-02	660	1.77E-02	765	8.50E-04
455	7.49E-02	560	4.50E-02	665	1.56E-02	770	7.40E-04
460	5.48E-02	565	4.55E-02	670	1.37E-02	775	6.39E-04
465	4.04E-02	570	4.59E-02	675	1.20E-02	780	5.45E-04
470	3.21E-02	575	4.61E-02	680	1.04E-02		
475	2.37E-02	580	4.62E-02	685	9.06E-03		
480	1.94E-02	585	4.62E-02	690	7.90E-03		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3433, 0.3547)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

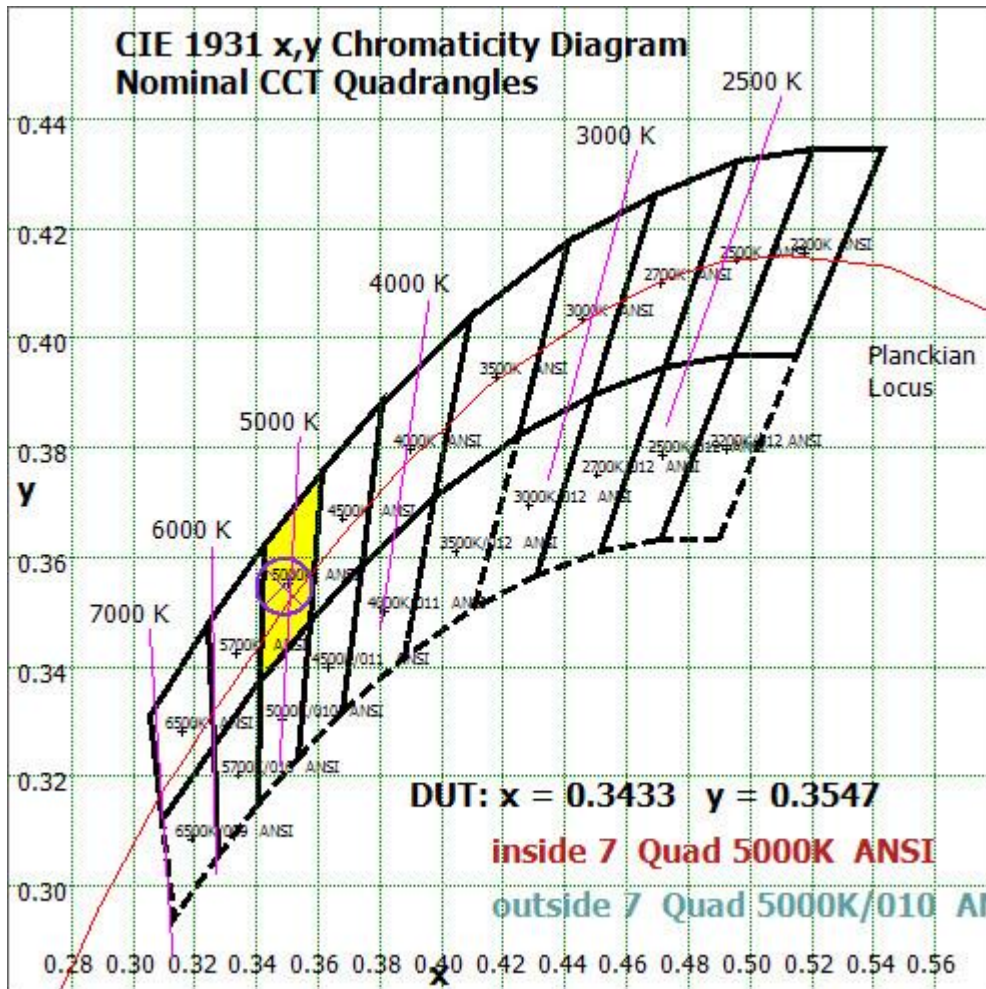


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

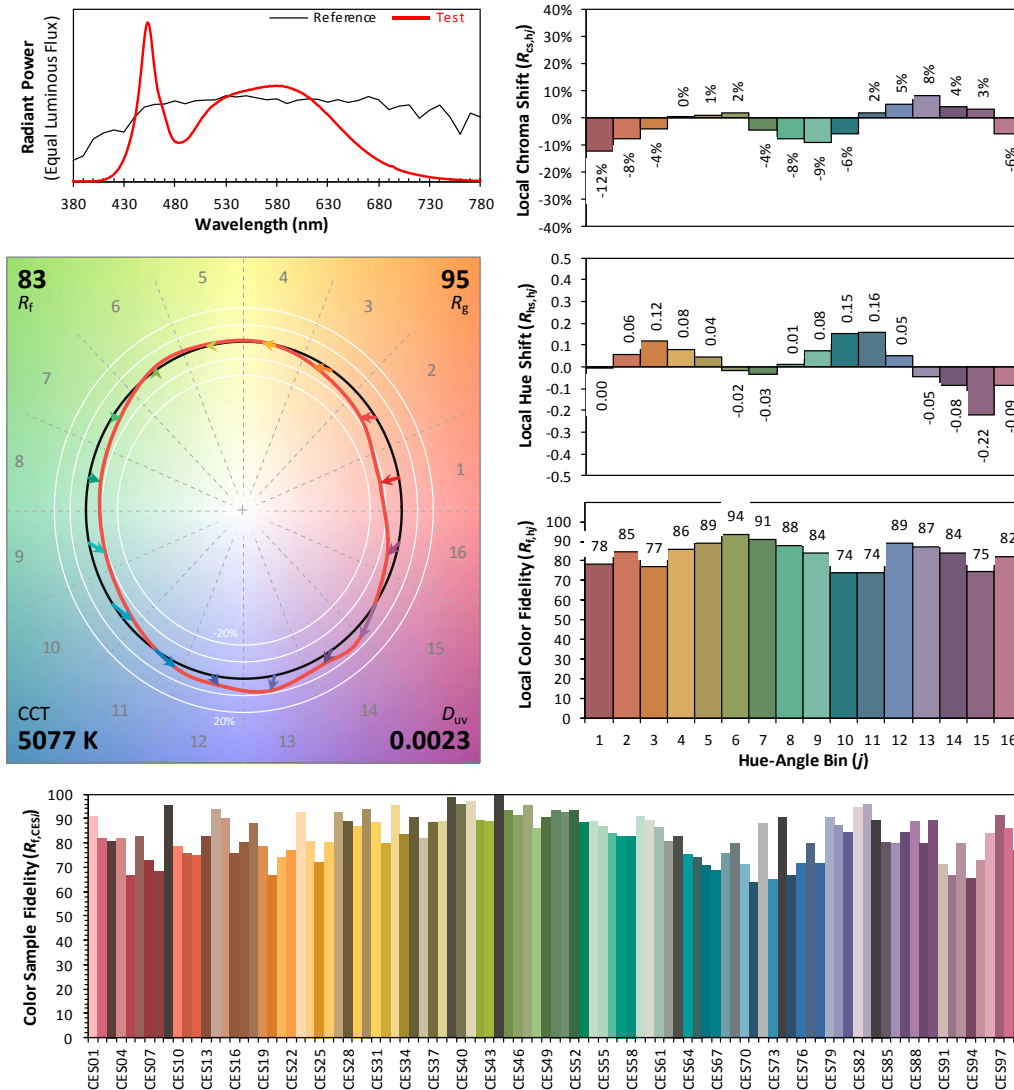
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: RAB LIGHTING INC

Date: 2025/02/25

Model: FHID-20-EX39-850



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.3433	CIE 13.3-1995 (CRI) R_a 83 R_9 10
	y	0.3547	
	u'	0.2090	
	v'	0.4859	

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

IESNA Luminaire Flux Distribution Table

Zone	Lumens	Luminaire %
FL - Front-Low (0-30)	322.1	10.9
FM - Front-Medium (30-60)	989.5	33.5
FH - Front-High (60-80)	368.9	12.5
FVH - Front-Very High (80-90)	2.6	0.1
Total Forward Light	1683.1	57

BL - Back-Low (0-30)	276.1	9.4
BM - Back-Medium (30-60)	766.6	26
BH - Back-High (60-80)	222.3	7.5
BVH - Back-Very High (80-90)	2.7	0.1
Total Back Light	1267.7	43

UL - Uplight-Low (90-100)	0	0
UH - Uplight-High (100-180)	0	0
Total Up Light	0	0

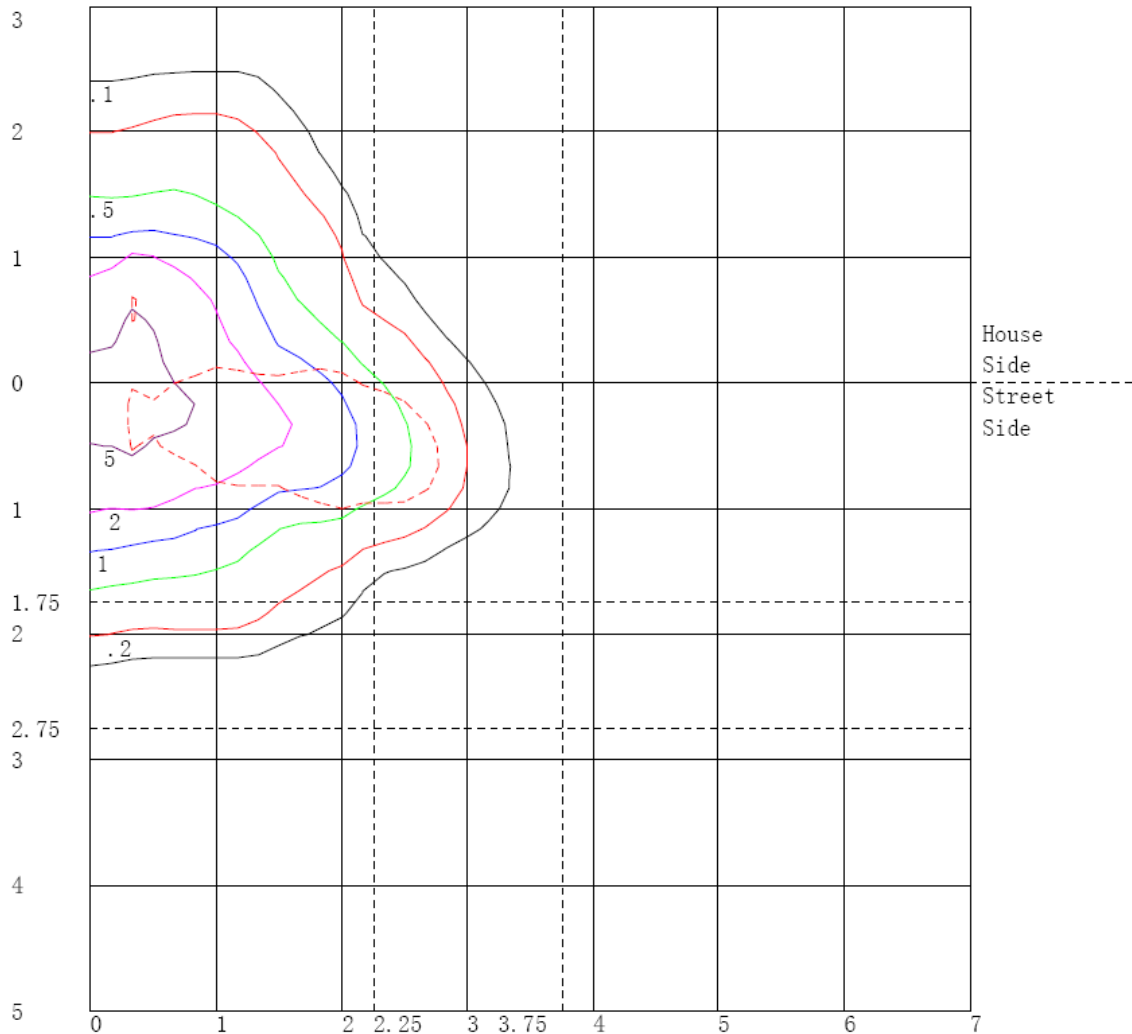
BUG (Back, Up, Glare) Rating	B1-U0-G1
IES Classification	Type I
Longitudinal Classification	Short

Table 5: Flux Distribution Data

Zone	Downward Lumens	Upward Lumens	Total Lumens
House Side	1267.7	0	1267.7
Street Side	1683.1	0	1683.1

Table 6: Flux Distribution Table

Isoillumiance Plots of Horizontal Illuminance



Distance In Units Of Mounting Height
 Values Based On 10 Foot Mounting Height
 1/2 Maximum Candela Trace Shown As Dashed Curve
 (+) = Maximum Candela Point

Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

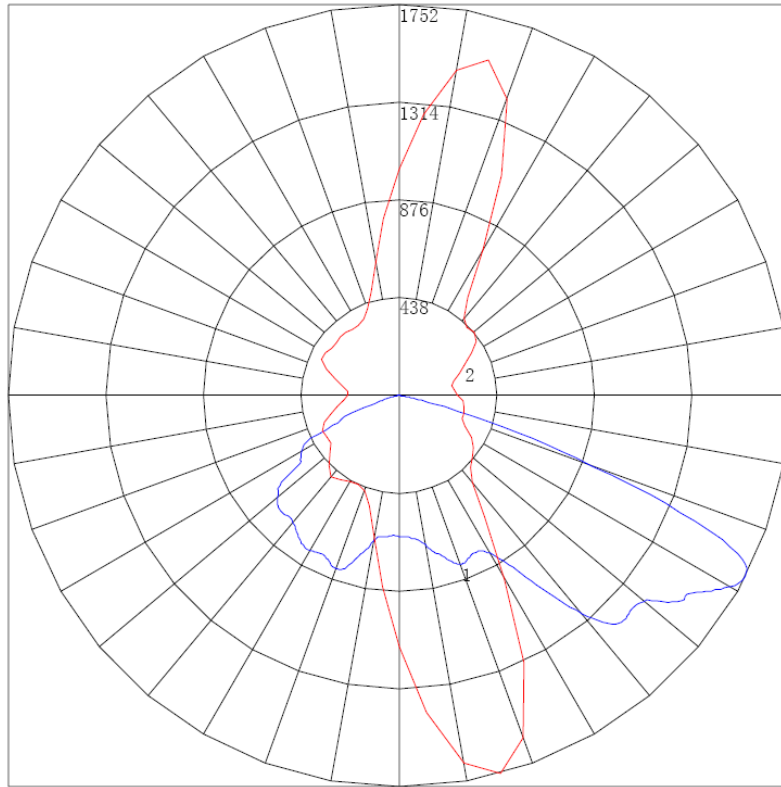


Chart 6: Maximum Plane and Cone Plots of Candela

Maximum Candela = 1752.36 Located At Horizontal Angle = 285, Vertical Angle = 62.5

1 - Vertical Plane Through Horizontal Angles (285 - 105) (Through Max. Cd.)

2 - Horizontal Cone Through Vertical Angle (62.5) (Through Max. Cd.)

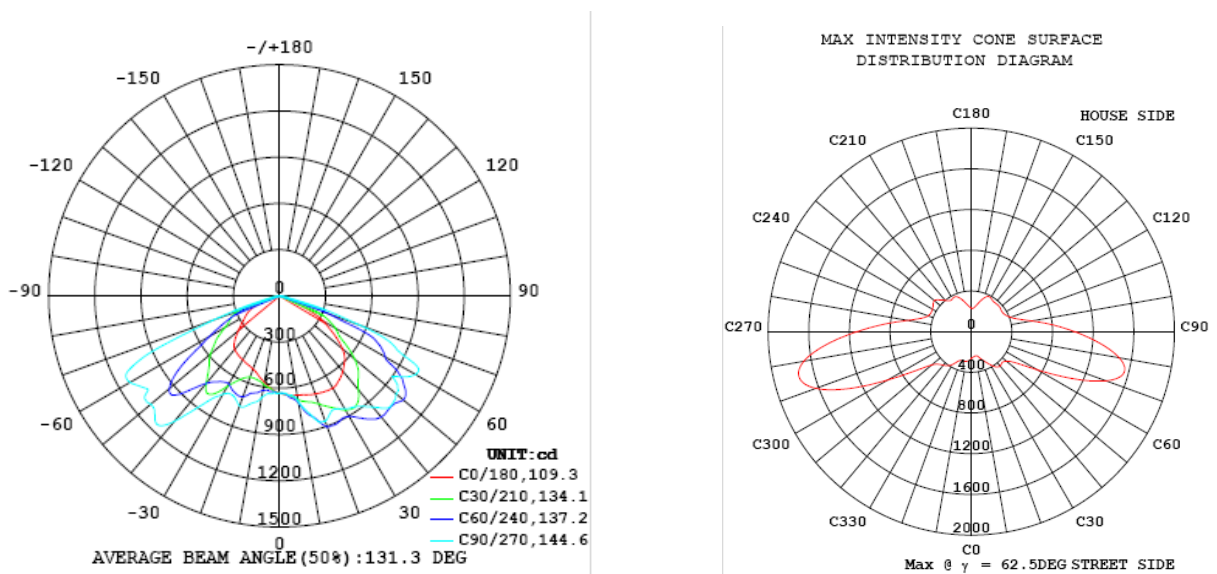


Chart 7: Polar Candela Distribution

Streetlight Coefficient of Utilization Curve

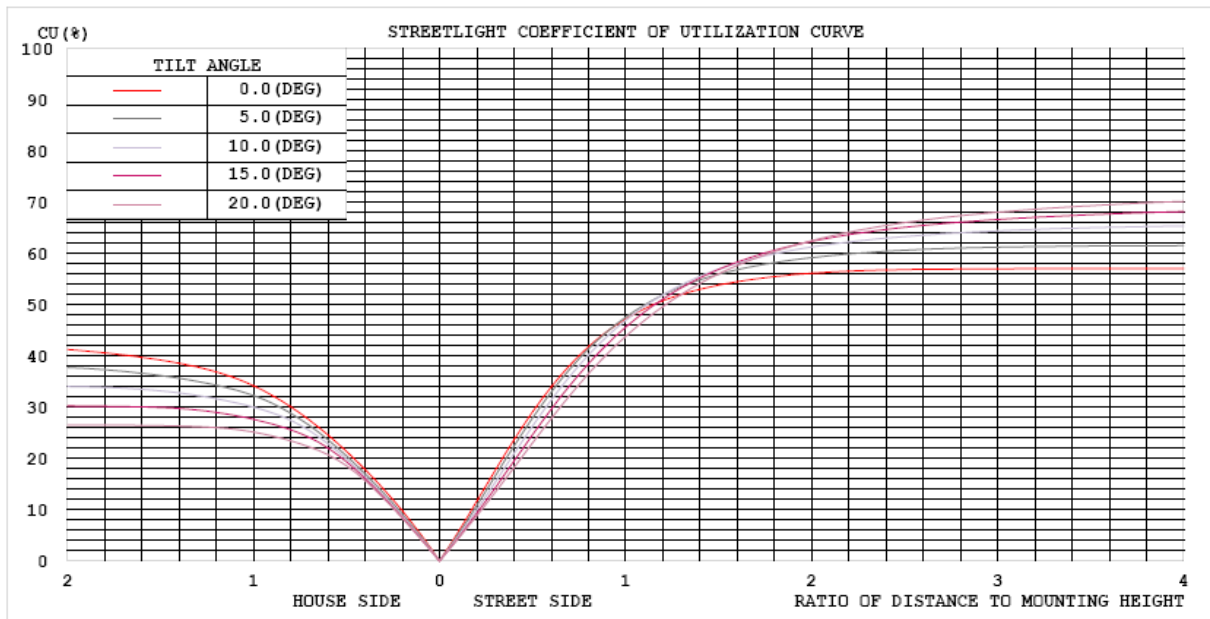


Chart 8: Coefficient of Utilization Curve

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) γ (DEG)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
0	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632
5	644	645	644	644	644	646	647	647	648	650	651	652	652	653	651	651	651	648	645
10	653	652	657	660	666	674	683	690	692	696	699	700	702	705	708	707	704	701	695
15	664	663	671	681	693	702	712	726	747	771	789	801	808	814	819	819	818	814	804
20	678	678	686	696	706	722	746	772	791	816	849	882	905	911	911	905	891	878	865
25	687	684	689	701	723	761	800	840	883	908	911	910	904	895	884	869	852	836	817
30	690	688	696	718	753	800	856	895	905	900	893	894	904	915	923	920	899	873	846
35	672	677	704	739	784	838	869	863	848	851	880	924	974	1013	1032	1025	989	936	876
40	639	641	659	691	749	796	796	785	795	831	882	949	1026	1097	1138	1145	1104	1030	942
45	598	581	577	618	690	725	725	736	756	793	859	931	1021	1123	1201	1225	1197	1118	1017
50	534	521	513	523	547	586	637	670	692	741	832	949	1049	1131	1208	1237	1200	1108	990
55	428	417	413	422	435	461	495	536	585	681	788	869	982	1127	1267	1302	1222	1079	909
60	325	311	305	308	336	373	417	452	480	524	587	641	794	1087	1380	1518	1457	1251	1020
65	178	169	165	185	226	273	327	375	380	363	386	475	692	1033	1338	1431	1325	1102	856
70	52.8	51.5	50.8	55.9	61.4	77.4	118	140	189	230	258	219	340	587	874	1004	925	745	551
75	13.7	13.3	12.6	12.2	12.3	13.2	14.2	16.2	30.6	50.2	64.0	55.3	67.3	133	251	312	269	207	153
80	6.99	6.91	7.10	7.18	6.68	6.76	6.77	6.92	7.30	8.05	9.09	10.3	13.0	19.3	30.6	39.0	38.8	34.1	30.0
85	1.80	1.79	1.90	2.04	2.01	2.07	2.06	2.07	2.23	2.37	2.51	2.68	3.03	3.58	4.34	5.11	5.31	5.05	4.71
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) γ (DEG)	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
0	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632
5	644	642	637	632	630	626	622	618	614	611	610	608	606	605	606	604	606	607	607
10	687	676	663	651	639	625	615	608	600	595	591	585	578	576	571	570	569	570	573
15	792	776	759	742	723	701	680	656	631	607	584	567	557	550	539	535	533	534	536
20	851	835	824	819	816	808	789	756	713	669	628	591	561	539	522	511	506	505	508
25	805	794	793	799	816	836	853	857	845	804	738	665	605	558	526	505	494	491	494
30	822	808	802	805	816	830	849	871	894	901	876	802	699	606	545	507	486	480	485
35	828	795	781	784	794	805	821	840	861	891	922	918	829	681	569	508	478	469	476
40	851	782	742	728	733	744	763	785	808	829	855	895	892	764	600	505	465	453	463
45	911	810	740	709	705	712	721	733	749	763	775	786	809	768	602	469	420	413	427
50	868	764	710	695	698	714	733	721	695	676	667	644	585	525	440	364	343	349	365
55	751	621	571	589	597	601	623	645	629	565	495	439	402	355	316	294	286	293	308
60	808	625	504	443	416	408	420	443	447	423	391	389	382	347	304	270	252	253	267
65	636	459	361	344	359	344	323	313	323	346	366	381	370	333	279	235	206	204	223
70	385	261	197	174	170	157	145	145	159	184	232	263	237	200	171	151	132	129	133
75	114	79.3	57.9	41.1	33.9	31.2	36.7	44.7	40.5	52.6	60.8	66.9	80.0	74.1	62.4	56.4	53.3	53.0	53.0
80	25.6	21.6	17.5	14.4	12.8	12.4	12.7	12.5	11.3	10.2	10.0	10.7	18.0	20.6	18.0	16.5	16.3	18.0	17.8
85	4.38	4.16	4.06	3.93	3.82	3.78	3.74	3.63	3.45	3.35	3.29	3.31	3.54	3.64	3.52	3.43	3.31	3.50	3.53
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8: Luminous Intensity Data

Table--3 UNIT: cd

C (DEG) \ γ (DEG)	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280
0	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632
5	609	610	608	610	609	609	611	612	615	620	622	626	628	631	634	637	639	642	641
10	574	572	576	580	586	588	592	597	605	615	623	632	641	649	657	664	670	676	677
15	537	543	551	555	564	576	589	605	622	639	653	667	681	692	704	714	723	734	740
20	512	521	530	542	560	583	608	636	663	683	696	706	714	723	732	744	760	776	791
25	502	516	533	559	597	639	677	703	711	706	691	676	669	670	680	694	715	738	762
30	498	520	556	612	679	732	747	730	702	677	661	656	660	667	681	707	738	770	797
35	495	535	617	720	781	772	725	686	673	674	680	688	700	716	746	793	851	915	970
40	486	558	685	764	744	698	681	687	706	726	741	756	779	813	866	952	1062	1171	1248
45	460	564	670	670	649	663	704	762	829	877	893	885	873	872	917	1014	1144	1273	1376
50	395	456	485	522	587	686	832	967	1025	1005	935	859	808	790	828	941	1093	1253	1375
55	326	349	386	426	505	689	881	967	914	824	759	714	682	654	702	853	1051	1282	1475
60	293	331	370	397	408	460	548	612	611	562	525	506	512	555	673	873	1122	1409	1644
65	256	293	330	349	352	353	356	353	356	360	369	381	401	447	558	762	1023	1317	1575
70	146	166	196	242	287	288	273	247	221	220	198	168	147	174	204	304	452	627	808
75	56.9	64.6	74.8	88.2	79.3	65.3	51.9	44.4	38.7	34.0	32.1	35.0	40.4	50.5	66.5	91.1	129	178	232
80	17.9	19.2	21.2	22.0	14.4	11.4	11.1	11.8	13.0	13.4	13.3	13.6	15.1	18.3	21.2	24.8	29.6	35.9	42.0
85	3.61	3.67	3.64	3.62	3.52	3.51	3.58	3.67	3.93	4.10	4.20	4.29	4.47	4.67	4.85	4.91	5.23	5.77	6.28
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9: Luminous Intensity Data

Table--4 UNIT: cd

C (DEG) \ γ (DEG)	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355				
0	632	632	632	632	632	632	632	632	632	632	632	632	632	632	632				
5	643	645	645	645	644	644	643	645	645	645	647	648	647	646	646				
10	679	681	681	680	679	676	674	672	671	674	666	662	659	659	655				
15	742	745	747	746	745	740	729	717	706	696	689	687	679	673	668				
20	806	819	825	824	815	800	780	764	750	734	714	701	696	690	683				
25	784	807	827	842	857	861	857	844	820	788	754	720	702	695	691				
30	815	829	836	838	842	846	854	859	851	830	791	749	719	703	698				
35	996	993	965	920	877	849	826	802	796	799	789	759	729	707	690				
40	1275	1250	1183	1083	987	888	805	755	729	731	735	728	701	676	656				
45	1425	1417	1367	1244	1074	903	773	687	649	646	663	683	674	643	617				
50	1436	1428	1379	1283	1163	1010	831	690	598	562	573	593	603	585	555				
55	1568	1527	1376	1197	1070	973	833	672	537	484	464	469	490	479	451				
60	1716	1600	1327	997	769	679	588	498	441	402	362	354	364	370	354				
65	1675	1576	1264	876	589	436	373	362	375	331	273	226	210	202	195				
70	925	925	755	538	385	322	272	210	157	119	81.0	59.6	55.4	55.2	55.5				
75	281	280	202	99.6	66.8	55.4	53.6	29.2	21.8	17.4	14.4	12.5	12.9	13.3	14.6				
80	46.3	42.4	30.1	19.1	12.2	9.50	8.50	7.91	7.45	7.09	6.89	6.84	7.18	7.76	7.68				
85	6.23	5.40	4.36	3.51	3.00	2.78	2.77	2.70	2.63	2.51	2.40	2.24	2.27	2.35	2.23				
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				

Table 10: Luminous Intensity Data

TEST RESULTS (Bare Lamp)

Test ambient temperature was 26.0 °C.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

Sphere-Spectroradiometer Method

Parameter	Result		Special Color Rendering Indices	
Test Voltage (V)	120.0	277.0	R1	82.3
Voltage frequency (Hz)	60	60	R2	88.7
Test Current (A)	0.185	0.083	R3	91.9
Power Factor	0.9847	0.9115	R4	82.9
Test Power (W)	21.83	20.89	R5	82.4
THD A%	15.16	17.84	R6	83.2
Luminous Efficacy (lm/W)	184.2	189.7	R7	87.3
Total Luminous Flux (lm)	4020.1	3962.8	R8	69
Color Rendering Index (CRI)	83.5		R9	13
R9	13		R10	71.9
Correlated Color Temperature (CCT)(K)	5065		R11	81.7
Chromaticity Chroma x	0.3433		R12	60.7
Chromaticity Chroma y	0.3519		R13	84
Chromaticity Chroma u	0.2101		R14	95.6
Chromaticity Chroma v	0.3230			
Duv	0.0009			
Chromaticity Chroma u'	0.2101			
Chromaticity Chroma v'	0.4845			

Table 11: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Goniophotometer Method

Test ambient temperature was 25.1 °C.

The photometric distance is 2.47 m.

Luminous data was taken at 0.5 ° vertical intervals and 10 horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.185
Power Factor	0.9850
Power (W)	21.84
Luminous Efficacy (lm/W)	185.7
Total Luminous Flux (lm)	4055.0
Beam Angle (°)	340.1 (0°-180°) / 346.8 (90°-270°)
Center Beam Candle Power (cd)	22.0
Maximum Beam Candle Power (cd)	473.2 (At: C=180.0, Gamma=92.5)
Spacing Criteria	5.98 (0°-180°) / 6.03 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	18.75%
Zonal Lumens in the 60 °-90 °Zone	30.59%
Zonal Lumens in the 90 °-120 °Zone	31.12%
Zonal Lumens in the 120 °-180 °Zone	19.55%

Table 12: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

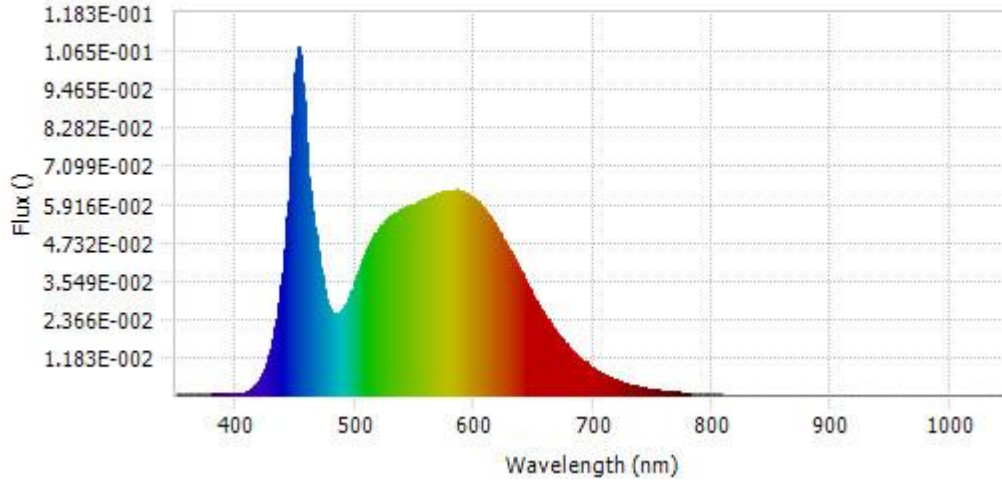
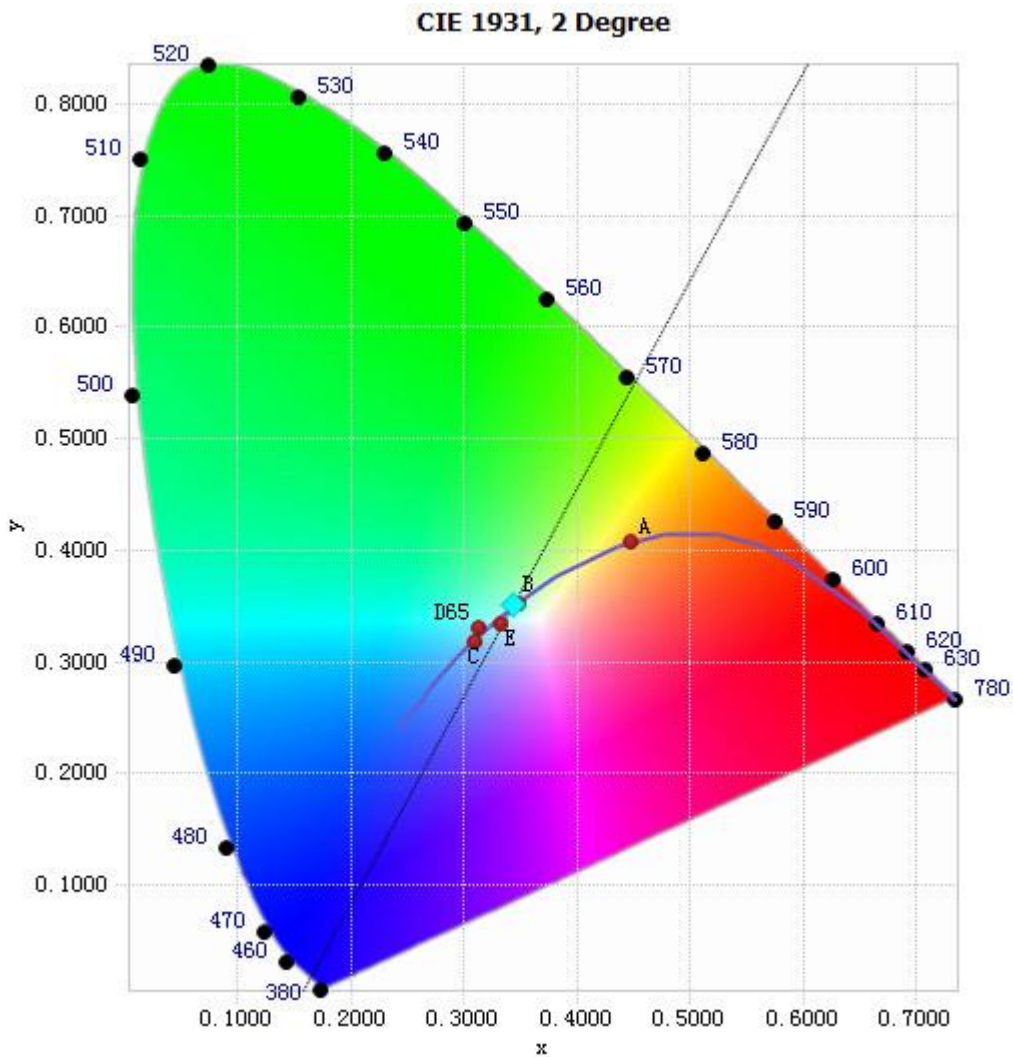


Chart 9: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.47E-04	485	2.54E-02	590	6.32E-02	695	1.02E-02
385	3.98E-04	490	2.69E-02	595	6.21E-02	700	8.30E-03
390	3.98E-04	495	3.04E-02	600	6.08E-02	705	7.17E-03
395	4.46E-04	500	3.52E-02	605	5.88E-02	710	6.23E-03
400	4.36E-04	505	4.05E-02	610	5.67E-02	715	5.42E-03
405	6.55E-04	510	4.50E-02	615	5.41E-02	720	4.63E-03
410	1.35E-03	515	4.91E-02	620	5.11E-02	725	4.00E-03
415	2.61E-03	520	5.14E-02	625	4.79E-02	730	3.42E-03
420	4.89E-03	525	5.38E-02	630	4.48E-02	735	2.95E-03
425	9.01E-03	530	5.56E-02	635	4.12E-02	740	2.51E-03
430	1.57E-02	535	5.66E-02	640	3.76E-02	745	2.17E-03
435	2.59E-02	540	5.77E-02	645	3.41E-02	750	1.88E-03
440	4.13E-02	545	5.86E-02	650	3.06E-02	755	1.62E-03
445	6.66E-02	550	5.92E-02	655	2.75E-02	760	1.39E-03
450	9.97E-02	555	6.02E-02	660	2.44E-02	765	1.21E-03
455	1.02E-01	560	6.09E-02	665	2.16E-02	770	1.05E-03
460	7.27E-02	565	6.17E-02	670	1.90E-02	775	9.15E-04
465	5.41E-02	570	6.24E-02	675	1.67E-02	780	7.95E-04
470	4.20E-02	575	6.29E-02	680	1.46E-02		
475	3.10E-02	580	6.33E-02	685	1.28E-02		
480	2.59E-02	585	6.36E-02	690	1.11E-02		

Table13: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3433, 0.3519)

Chart 10: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

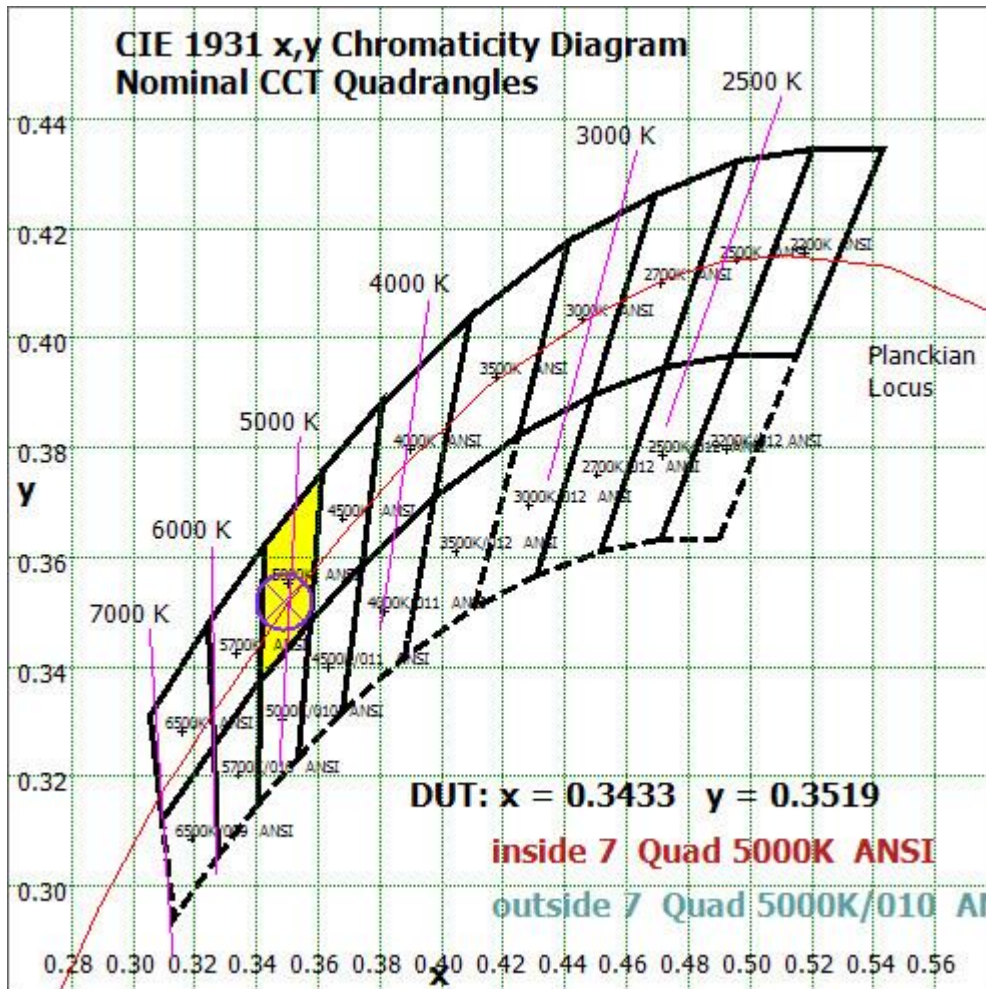


Chart 11: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

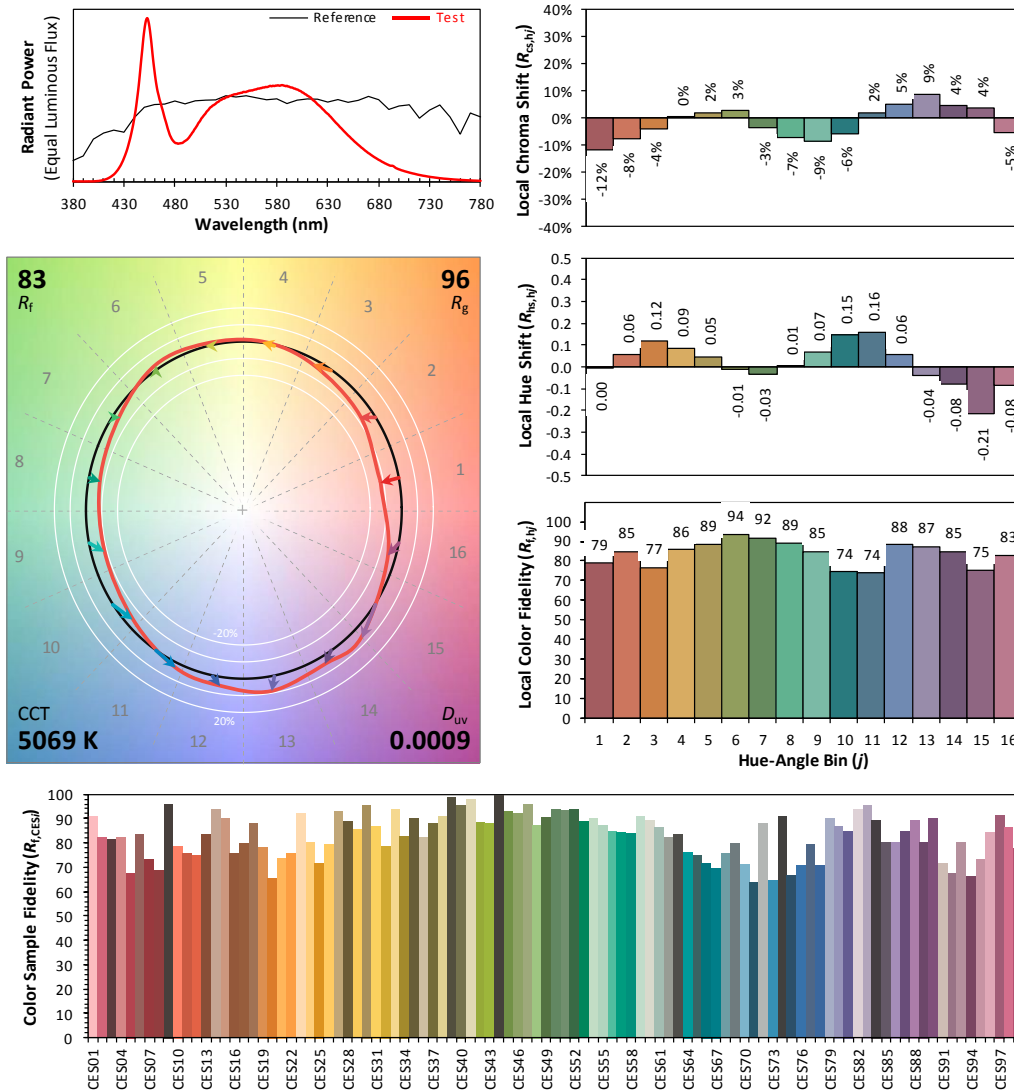
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: RAB LIGHTING INC

Date: 2025/02/25

Model: FHID-20-EX39-850



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.3433	CIE 13.3-1995 (CRI) R_a 83 R_g 13
	y	0.3519	
	u'	0.2101	
	v'	0.4845	

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 12: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 11 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	4.21	0.10%
10- 20	27.341	0.67%
20- 30	74.257	1.83%
30- 40	140.226	3.46%
40- 50	217.023	5.35%
50- 60	297.098	7.33%
60- 70	368.284	9.08%
70- 80	421.287	10.39%
80- 90	450.763	11.12%
90-100	453.476	11.18%
100-110	428.716	10.57%
110-120	379.545	9.36%
120-130	312.936	7.72%
130-140	233.088	5.75%
140-150	149.406	3.68%
150-160	73.677	1.82%
160-170	22.251	0.55%
170-180	1.428	0.04%
Total	4055.0	100%

$\gamma(^{\circ})$	Lumens	% Total
0-130	3575.162	88.17%
130-180	479.85	11.83%
0-180	4055.0	100%

Table 14: Zonal Lumen

Illuminance Plots- Goniophotometer Method

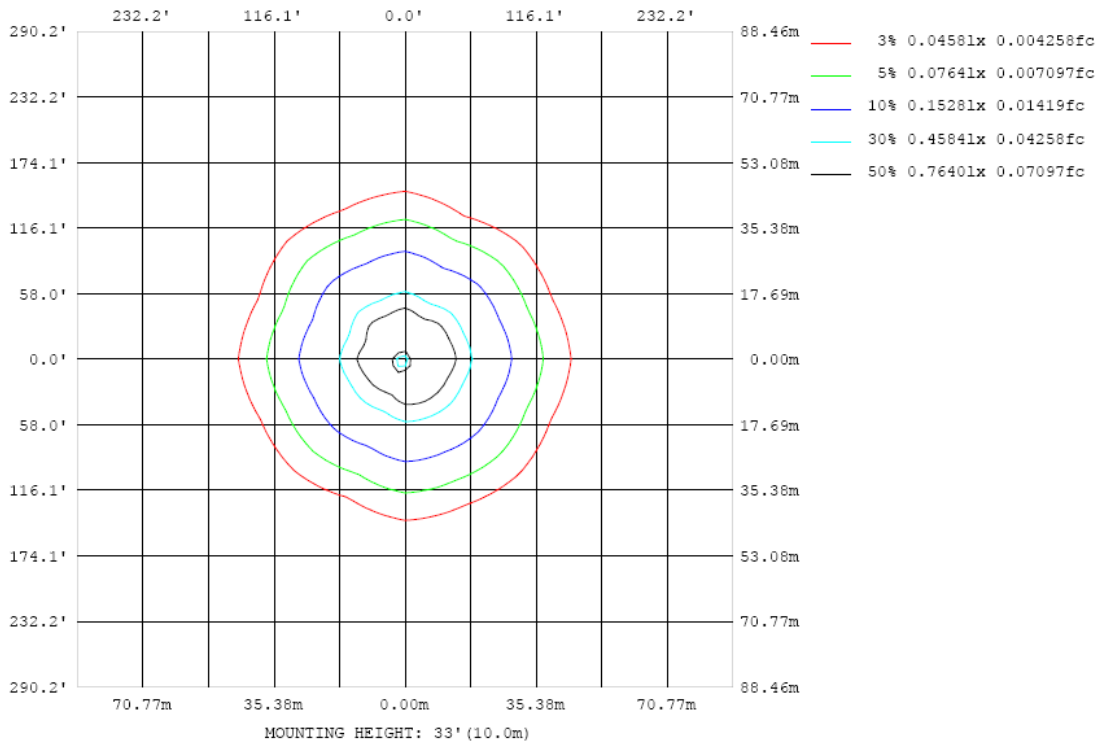


Chart 13: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

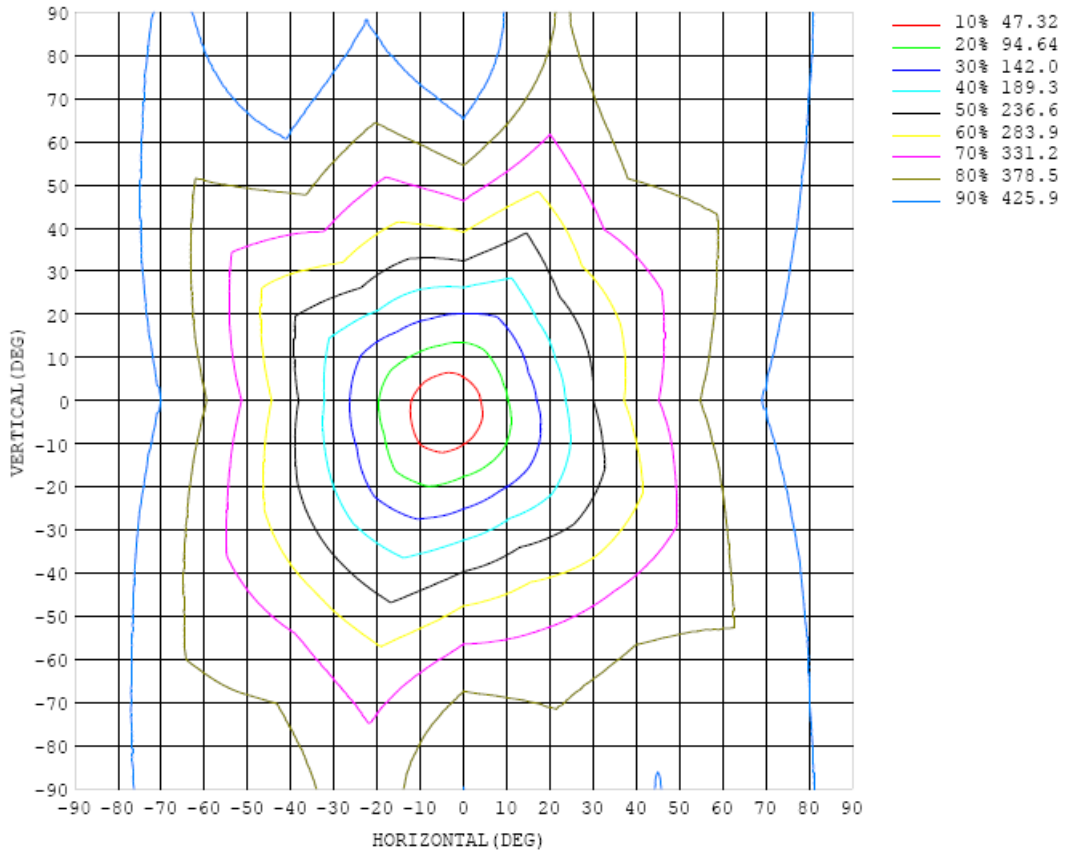


Chart 14 Isocandela Plot

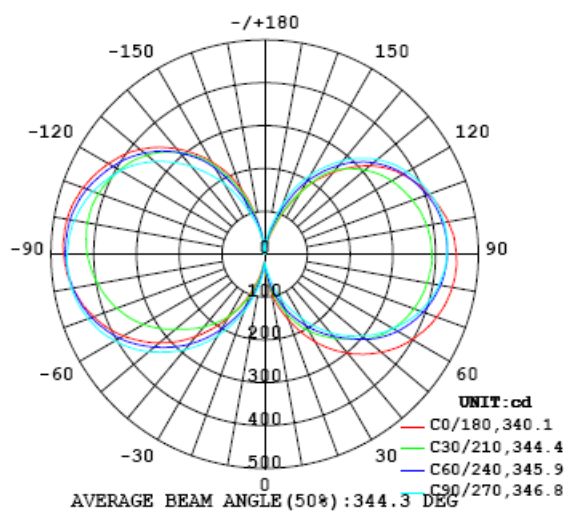


Chart 15: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) \ γ (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5			
0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0			
5	55.5	49.4	42.3	34.9	25.0	17.3	15.9	16.0	17.8	21.5	29.3	37.8	45.8	50.3	54.3	56.0			
10	92.4	81.7	71.0	58.1	46.4	32.6	26.7	27.9	35.9	45.9	58.6	66.7	72.6	80.6	89.1	95.1			
15	129	113	100	89.5	76.9	58.6	51.5	59.6	64.0	76.1	92.6	104	105	108	122	133			
20	163	146	131	124	110	86.4	79.8	95.2	97.1	105	128	140	141	138	155	168			
25	200	178	162	159	141	116	110	130	132	137	163	173	180	164	190	201			
30	236	207	192	195	173	145	142	161	171	167	201	206	219	188	223	231			
35	270	232	221	229	207	171	173	193	211	195	239	237	256	210	253	259			
40	302	256	250	260	239	195	204	223	250	222	274	265	291	232	281	285			
45	330	280	279	287	269	219	234	251	288	247	307	291	324	255	308	307			
50	356	308	309	311	297	241	263	278	322	272	337	314	353	280	334	327			
55	379	330	336	330	324	265	291	301	353	302	367	335	382	302	358	344			
60	398	347	359	348	347	287	318	322	382	328	392	356	405	320	376	360			
65	415	361	378	362	369	304	341	342	406	350	413	374	425	336	393	372			
70	428	371	395	374	387	317	360	358	425	369	432	391	440	348	406	382			
75	439	380	408	382	403	329	377	373	443	384	446	404	451	359	415	388			
80	445	386	418	387	414	338	390	384	456	397	455	414	458	366	421	393			
85	449	391	424	389	422	344	399	392	465	407	463	422	462	371	424	393			
90	448	391	427	388	426	349	406	397	471	416	467	427	463	374	424	392			
95	445	390	426	384	428	351	409	399	472	419	465	428	459	374	419	388			
100	436	385	422	378	426	350	410	399	469	421	463	427	453	370	410	383			
105	424	379	416	370	421	347	405	396	464	420	455	422	442	364	398	373			
110	410	368	405	358	413	340	396	389	453	414	443	413	428	354	384	361			
115	392	356	391	344	400	332	384	380	438	404	427	402	409	343	368	348			
120	372	343	375	329	384	321	370	369	423	392	410	388	391	331	349	331			
125	349	326	355	312	366	309	354	355	404	378	391	369	365	313	326	312			
130	320	305	332	292	343	294	334	338	380	359	367	347	337	292	300	288			
135	287	283	304	269	316	277	311	317	353	337	341	319	304	268	268	260			
140	250	255	271	243	286	255	284	291	322	310	309	287	267	238	235	230			
145	211	217	234	216	249	232	254	263	286	278	273	252	229	202	197	199			
150	167	165	195	188	212	201	219	233	249	241	231	216	191	162	153	162			
155	117	121	148	153	173	158	182	201	210	197	181	174	147	119	110	119			
160	73.7	80.9	102	114	123	118	138	158	162	150	133	125	104	82.8	72.0	75.7			
165	40.2	50.6	64.6	75.7	80.9	82.0	99.2	111	110	105	91.2	82.4	71.2	52.9	38.3	36.6			
170	3.71	14.9	29.4	43.1	48.5	55.0	57.8	53.9	30.5	62.4	54.9	48.0	34.3	10.8	2.88	1.88			
175	0.89	1.27	1.44	4.16	10.7	16.8	17.6	11.3	1.99	1.79	1.75	1.01	0.83	0.62	0.57	0.73			
180	0.24	0.24	0.25	0.26	0.26	0.27	0.27	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27	0.27			

Table 15: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Feb. 05, 2025	-
Digital Power Meter	PF2010A	HZTE028-01	Aug. 08, 2024	Aug. 07, 2025
AC Power Supply	DPS1060	HZTE001-06	Aug. 08, 2024	Aug. 07, 2025
DC Power Supply	WY12010	HZTE004-03	Aug. 08, 2024	Aug. 07, 2025
Temperature recorder	JM624U	HZTE018-08	Aug. 08, 2024	Aug. 07, 2025
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 08, 2024	Aug. 07, 2025
Standard source	D908	HZTE012-01	Aug. 14, 2018	-
Integrate Sphere system	3M	HZTE015-04	Dec. 10, 2024	-
Digital Power Meter	WT210	HZTE008-01	Aug. 08, 2024	Aug. 07, 2025
AC Power Supply	PCR 500L	HZTE001-07	Aug. 08, 2024	Aug. 07, 2025
DC Power Supply	IT6154	HZTE004-04	Aug. 08, 2024	Aug. 07, 2025
Standard source	SCL-1400	HZTE012-06	Nov. 04, 2021	-
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 08, 2024	Aug. 07, 2025
Temperature Meter	TES1310	HZTE017-01	Aug. 08, 2024	Aug. 07, 2025

Table 13: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and 3 Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π . Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

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.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 20 min, taken 10 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer. The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expanded uncertainty is 2.1% with a coverage factor $k=2$.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.

Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 20 min, taken 10 minutes apart, is less than 0.5 %. Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.

Some graphics were created with Photometric Plus software.

The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

The uncertainty of goniophotometer system reported in this document is expanded uncertainty is 2.3% with a coverage factor $k=2$.

Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

*** End of Report ***

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