DesignLights Consortium Test Report

Refference Standards

UL1598-2008
ANSI C82.77-10-2014
IES LM-79-2008

Prepared For

Espen Technology Inc

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Test Laboratory:
UL-CCIC Company Limited
Test Laboratory Address:

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Catalog Number
VEKT2X4(25W/30W/34W)

Project Number
4790446284
Report Number
4790446284_4

Test Date
2020-05-27~2021-09-01
Issue Date
2022-06-23
Revision Date
N/A

Prepared By	**Approved By**
Zhao, Elaine	Wu, Elvis

Test Summary

DLC Technical Requirements V5.1- issued 2020-02-14

Requirement Category	Test Method	Requirements	Tolerance	Test Result
Minimum Light Output (lm)-Luminaires	**IES LM-79-2008**	≥1500	-10%	3381.25
Minimum Luminaire Efficacy (lm/W)-Luminaires	**IES LM-79-2008**	≥110	-3%	128.23
Spacing Criteria (0-180°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.24
Spacing Criteria (90-270°)	**IES LM-79-2008**	1.0-2.0	±0.1	1.28
Zonal Lumen Requirement 1(0°-60°)	**IES LM-79-2008**	≥75%	-3%	74.40%
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3468
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3473
Allowable CCT (3500K)	**IES LM-79-2008/ANSI C78.377-2015**	3465±245	N/A	3477
Allowable CCT (4000K)	**IES LM-79-2008/ANSI C78.377-2015**	3985±275	N/A	4135
Allowable CCT (5000K)	**IES LM-79-2008/ANSI C78.377-2015**	5029±283	N/A	4997
Minimum CRI	**IES LM-79-2008/CIE 13.3-1995**	≥80	-1	81
Minimum R9	**IES LM-79-2008**	≥0	-1	5.0
Minimum Rg	**IES LM-79-2008**	≥89	-1	95
Minimum Rf	**IES LM-79-2008**	≥70	-1	83
Rcs,h1	**IES LM-79-2008**	-12%-23%	-1%	-13%
L70 Lumen maintenance (Hours)	**N/A**	≥50000	N/A	≥50000
L90 Lumen maintenance (Hours)	**N/A**	≥36000	N/A	≥36000
Power Factor	**ANSI C82.77-10-2014**	≥0.9	-0.03	0.9280
Total Harmonic Distortion (A%)	**ANSI C82.77-10-2014**	≤20%	5%	13.88%
In-Situ Temperature Measurement Test for LED 1 (°C)	**UL1598-2008**	≤105	N/A	44.8
In-Situ Temperature Measurement Test for Driver 1 (°C)	**UL1598-2008**	≤90	N/A	41.8
Max Chromaticity Shift (1000-6000h)	**N/A**	≤0.004	0.0004	0.0024
Minimum Luminaire Warranty (Years)	**N/A**	≥5	N/A	≥5

Test List

Sample Received Date: 2020-04-28

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2020-05-28	VEKT2X4(25W/30W/34W)25W	Yang, Gavin X
Integrating Sphere Test	2020-05-29	VEKT2X4(25W/30W/34W)30W	Yang, Gavin X
Integrating Sphere Test	2020-05-28	VEKT2X4(25W/30W/34W) 34W	Yang, Gavin X
Integrating Sphere Test	2020-06-08	VEKT2X4(25W/30W/34W)34W	Yang, Gavin X
Integrating Sphere Test	2020-05-29	VEKT2X4(25W/30W/34W) 34W	Yang, Gavin X
Goniophotometer Test	2020-05-27	VEKT2X4(25W/30W/34W) 34W	Yang, Gavin X
Goniophotometer Test	2020-05-27	VEKT2X4(25W/30W/34W)34W	Yang, Gavin X
THD and PF Test	2020-05-27	VEKT2X4(25W/30W/34W) 25W	Yang, Gavin X
THD and PF Test	2020-05-27	VEKT2X4(25W/30W/34W)30W	Yang, Gavin X
THD and PF Test	2020-05-27	VEKT2X4(25W/30W/34W)34W	Yang, Gavin X
THD and PF Test	2021-09-01	VEKT2X4(25W/30W/34W) 34W	Yang, Gavin X
THD and PF Test	2021-09-01	VEKT2X4(25W/30W/34W) 34W	Yang, Gavin X
In-Situ Temperature Measurement Test	2020-06-02	VEKT2X4(25W/30W/34W)34W	Yang, Gavin X

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
2. The accuracy method decision rule is applied when the compliance or verdict is made to the results of this report.
3. This report replace 4789466438_7R01, the report 4789466438_7R01 is terminated. Update driver photo and there is no change in TC position.
4 This Report is a copy report of Test Report 4790087535_2 issued on 2021-09-03

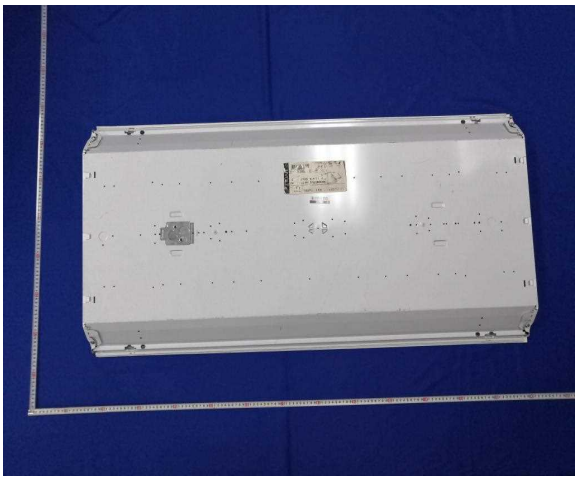
Product Description

Lamp/Luminaire Description: Integrated Retrofit Kits for 2x4 Luminaires
Model Number: VEKT2X4(25W/30W/34W)
Electrical Parameter: 120-277V, 50/60Hz
LED Package: STW8A2PD-XX
Dimming Information: continuous dimming capability
Remark: Housing Model: Lithonia 2GT8 4 32 A12 MVOLT GEB10IS

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
VEKT2X4(25W/30W/34W)	3500k	4250	34	125
VEKT2X4(25W/30W/34W)	4000k	4284	34	126
VEKT2X4(25W/30W/34W)	5000k	4318	34	127

Photos of Products Characteristics



Integrating Sphere Test

Model No.	VEKT2X4(25W/30W/34W)25W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

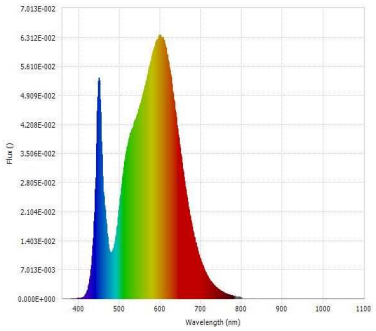
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

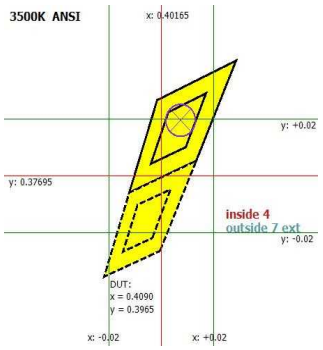
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120.11	60	0.2109	24.969	0.9859	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3468	81	5.0	0.0017	3381.25	135.42	N/A





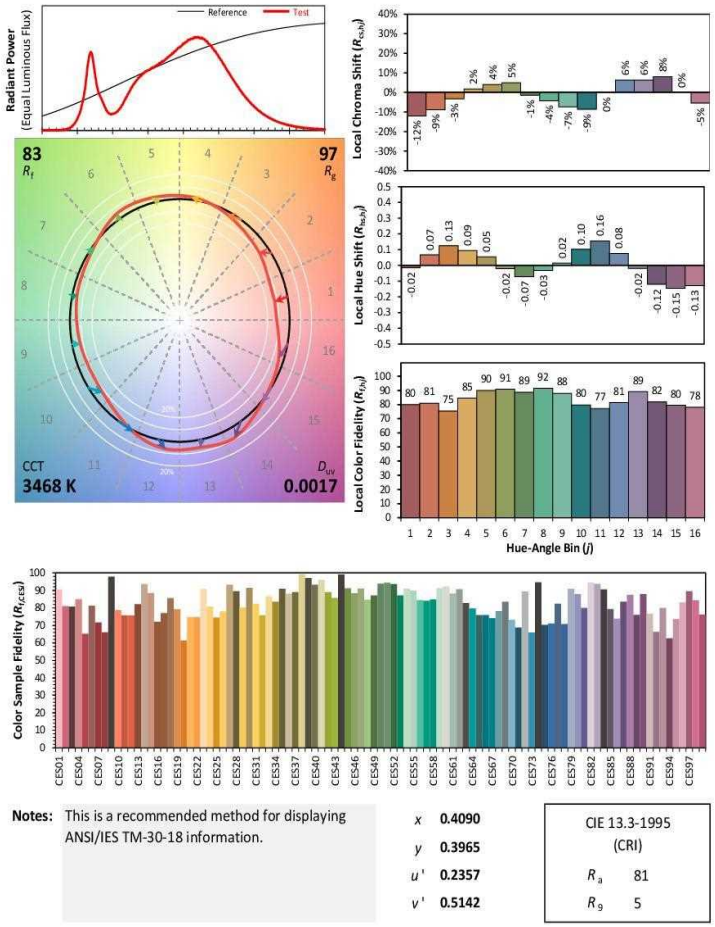
Luminous Flux (lm)	3381.25	Chrom x	0.4090
Chrom y	0.3965	Chrom u	0.2357
Chrom v	0.3428	Duv	0.0017
Chrom u’	0.2357	Chrom v’	0.5142
CCT (K)	3468	Luminous Efficacy (lm/W)	135.42
Ra	81	R1	79.5
R2	87.0	R3	93.7
R4	81.2	R5	79.2
R6	82.7	R7	85.4
R8	62.0	R9	5.0
R10	69.8	R11	80.1
R12	60.6	R13	81.0
R14	96.3	R15	72.8
Rf	83	Rg	97
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	STW8A2PD-XX	**Manufacturer:**	Espen Technology Inc.
Date:	5/28/2020	**Model:**	VEKT2X4(25W/30W/34W)25W



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4090
y	0.3965
u'	0.2357
v'	0.5142

CIE 13.3-1995 (CRI)

R_a	81
R_9	5

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

Integrating Sphere Test

Model No.	VEKT2X4(25W/30W/34W)30W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

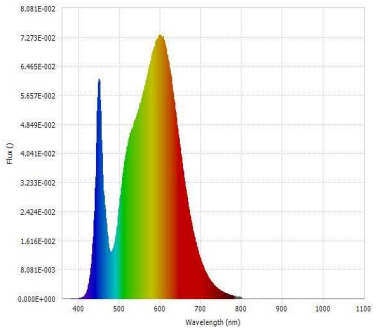
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

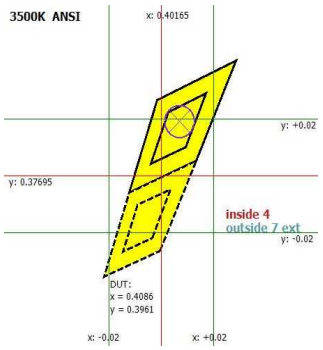
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120.1	60	0.2495	29.585	0.9872	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3473	81	5.0	0.0016	3901.83	131.89	N/A

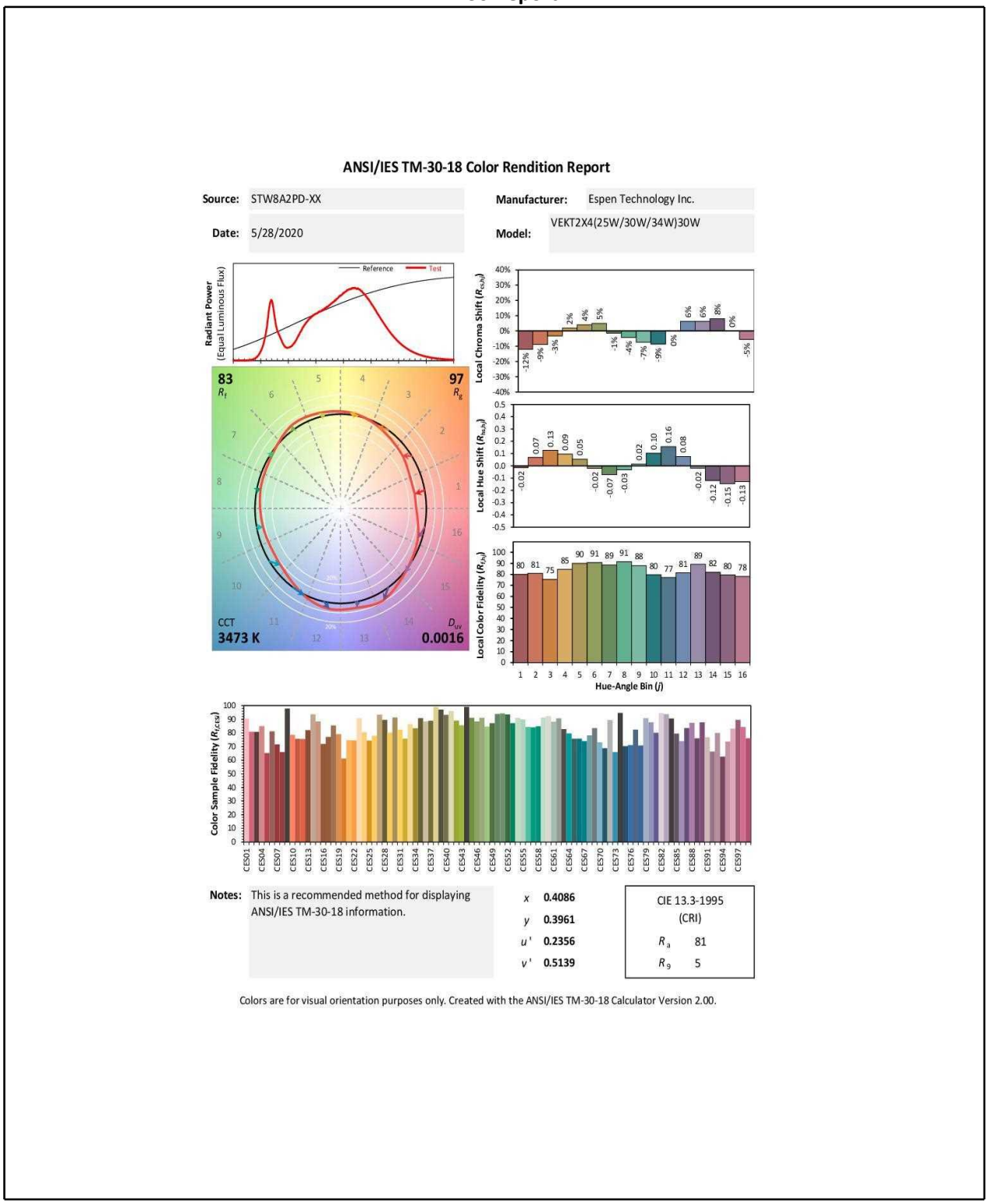




Luminous Flux (lm)	3901.83	Chrom x	0.4086
Chrom y	0.3961	Chrom u	0.2356
Chrom v	0.3426	Duv	0.0016
Chrom u’	0.2356	Chrom v’	0.5139
CCT (K)	3473	Luminous Efficacy (lm/W)	131.89
Ra	81	R1	79.5
R2	87.0	R3	93.7
R4	81.1	R5	79.2
R6	82.7	R7	85.3
R8	61.9	R9	5.0
R10	69.7	R11	80.0
R12	60.7	R13	81.0
R14	96.3	R15	72.8
Rf	83	Rg	97
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report



Integrating Sphere Test

Model No.	VEKT2X4(25W/30W/34W) 34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

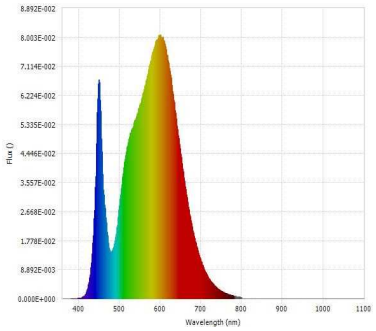
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

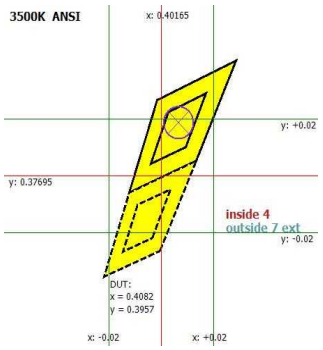
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120.06	60	0.2802	33.192	0.9865	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3477	81	5.0	0.0015	4333.62	130.56	N/A





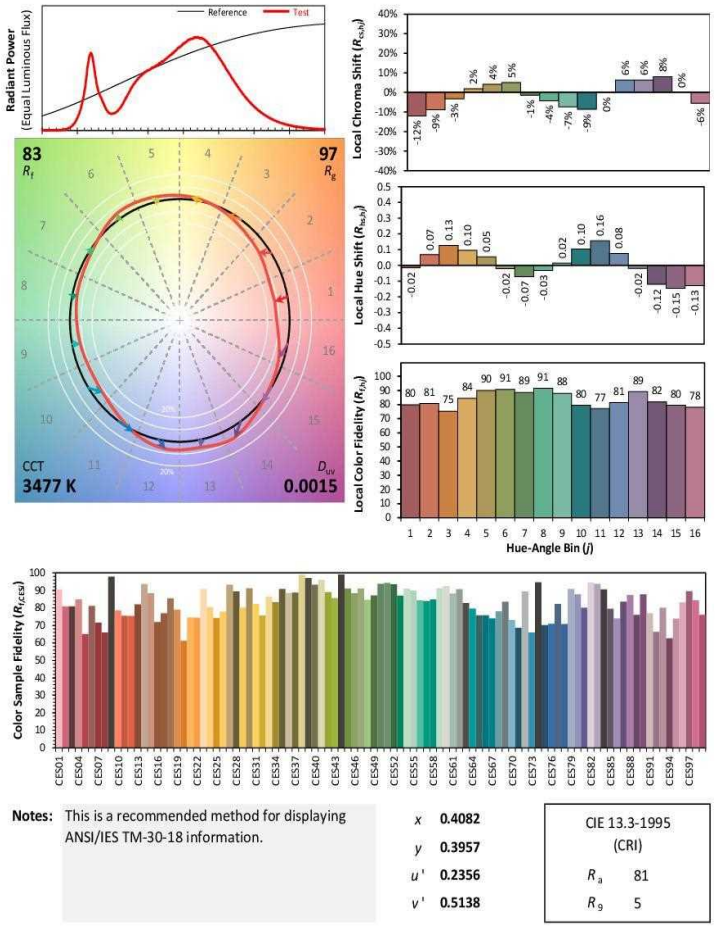
Luminous Flux (lm)	4333.62	Chrom x	0.4082
Chrom y	0.3957	Chrom u	0.2356
Chrom v	0.3425	Duv	0.0015
Chrom u’	0.2356	Chrom v’	0.5138
CCT (K)	3477	Luminous Efficacy (lm/W)	130.56
Ra	81	R1	79.5
R2	87.0	R3	93.7
R4	81.0	R5	79.2
R6	82.7	R7	85.3
R8	61.9	R9	5.0
R10	69.7	R11	79.9
R12	60.7	R13	80.9
R14	96.3	R15	72.8
Rf	83	Rg	97
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	STW8A2PD-XX	**Manufacturer:**	Espen Technology Inc.
Date:	5/28/2020	**Model:**	VEKT2X4(25W/30W/34W)34W



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4082
y	0.3957
u'	0.2356
v'	0.5138

CIE 13.3-1995 (CRI)

R_a	81
R_9	5

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

Integrating Sphere Test

Model No.	VEKT2X4(25W/30W/34W)34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

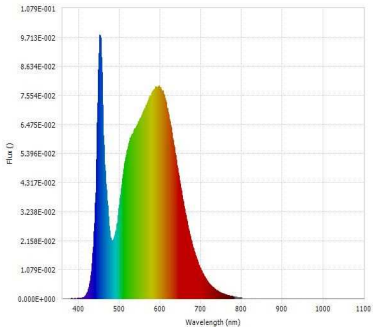
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

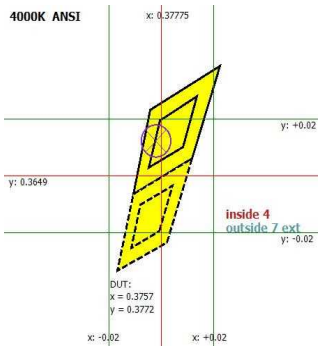
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120.07	60	0.2734	32.353	0.9857	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4135	83	10.0	0.0017	4601.19	142.22	N/A





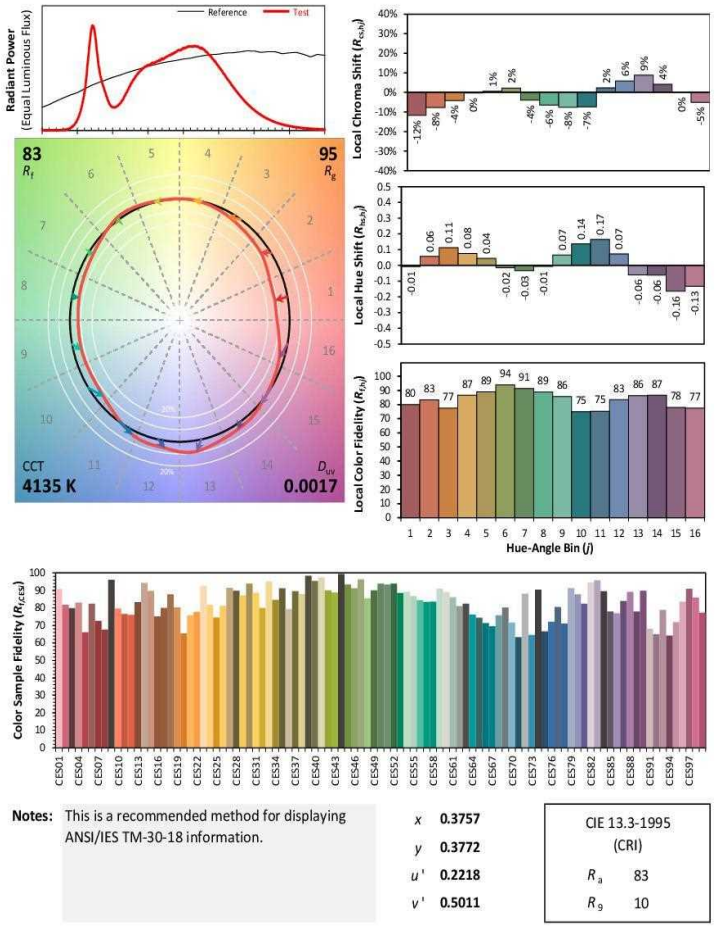
Luminous Flux (lm)	4601.19	Chrom x	0.3757
Chrom y	0.3772	Chrom u	0.2218
Chrom v	0.3341	Duv	0.0017
Chrom u’	0.2218	Chrom v’	0.5011
CCT (K)	4135	Luminous Efficacy (lm/W)	142.22
Ra	83	R1	81.0
R2	88.1	R3	93.1
R4	81.8	R5	80.5
R6	83.0	R7	87.2
R8	66.0	R9	10.0
R10	71.1	R11	80.3
R12	56.2	R13	82.7
R14	96.2	R15	75.4
Rf	83	Rg	95
Rcs,h1	-12%		

Integrating Sphere Test (Cont'd)

TM-30 Report

ANSI/IES TM-30-18 Color Rendition Report

Source:	STW8A2PD-XX	**Manufacturer:**	Espen Technology Inc.
Date:	5/28/2020	**Model:**	VEKT2X4(25W/30W/34W)34W



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3757
y	0.3772
u'	0.2218
v'	0.5011

CIE 13.3-1995 (CRI)

R_a	83
R_9	10

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

Integrating Sphere Test

Model No.	VEKT2X4(25W/30W/34W) 34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

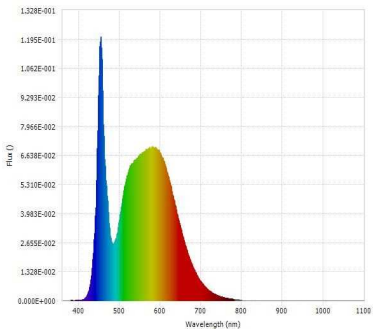
1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 °C ± 1 °C. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

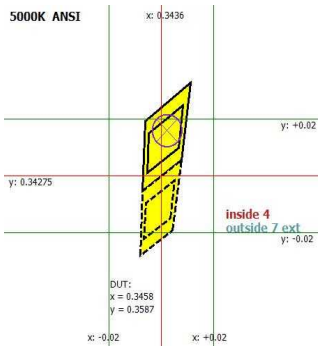
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.8	120.07	60	0.2807	33.249	0.9865	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4997	82	7.0	0.0033	4379.47	131.72	N/A

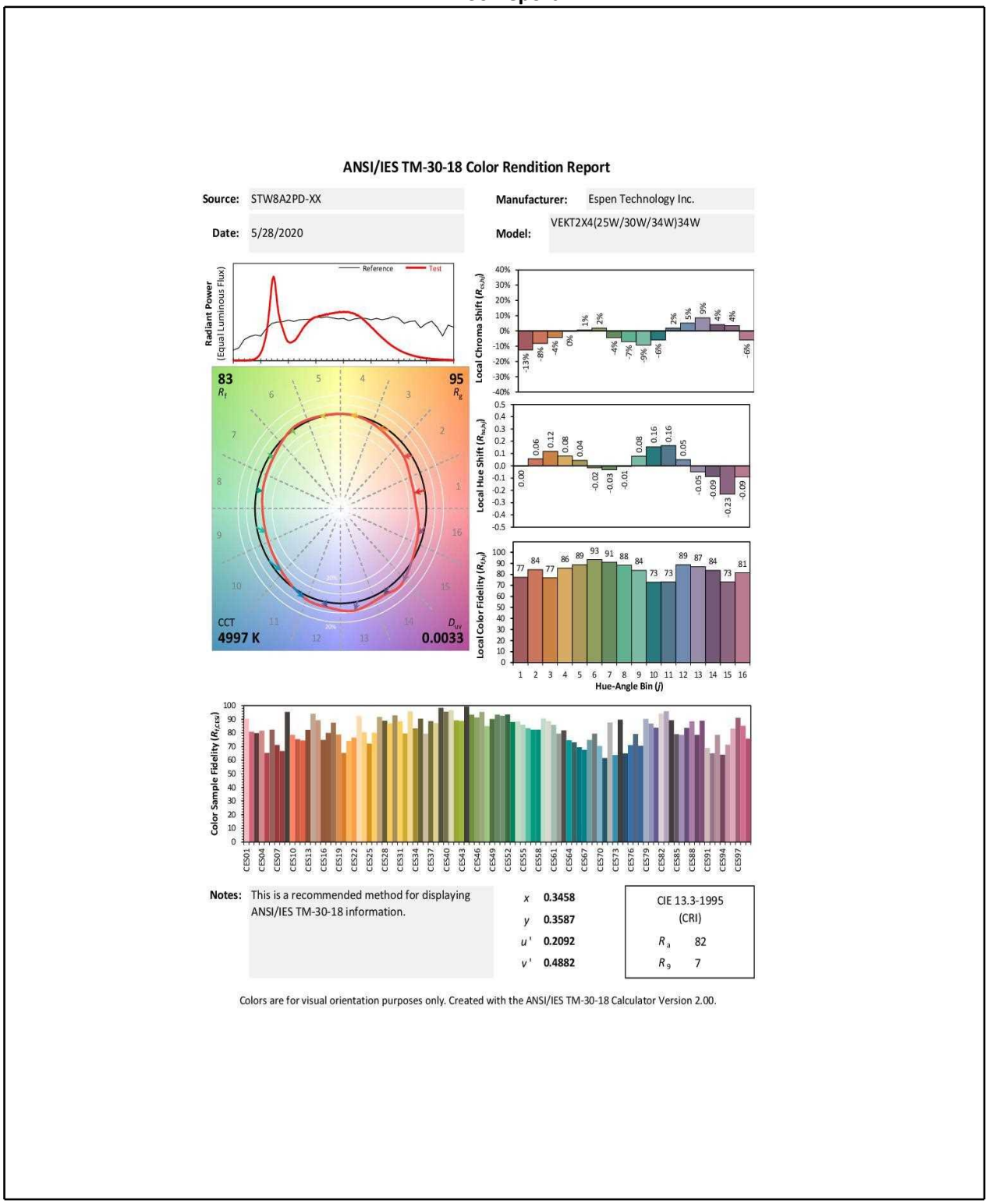




Luminous Flux (lm)	4379.47	Chrom x	0.3458
Chrom y	0.3587	Chrom u	0.2092
Chrom v	0.3255	Duv	0.0033
Chrom u’	0.2092	Chrom v’	0.4882
CCT (K)	4997	Luminous Efficacy (lm/W)	131.72
Ra	82	R1	80.2
R2	87.8	R3	92.3
R4	80.3	R5	79.5
R6	81.7	R7	88.0
R8	67.2	R9	7.0
R10	69.8	R11	78.3
R12	51.2	R13	82.3
R14	95.9	R15	75.0
Rf	83	Rg	95
Rcs,h1	-13%		

Integrating Sphere Test (Cont'd)

TM-30 Report



Goniophotometer Test

Model No.	VEKT2X4(25W/30W/34W) 34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using a type C goniophotometer and software.
3.The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	119.97	60	0.2792	33.15	0.9894	12.51%	Horizontal

Test Results

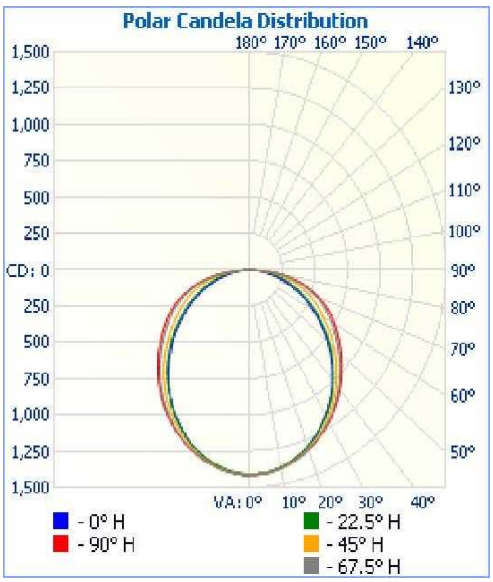
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0°-60°	N/A	Horizontal Spread	Vertical Spread	
4250.7	74.40%	N/A	125.3	106.9	128.23

Backlight	Uplight	Glare
N/A	N/A	N/A

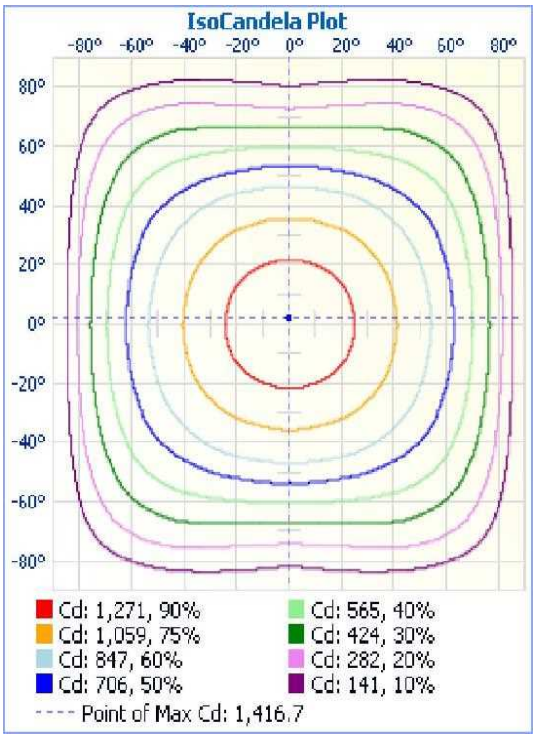
UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
18.9	21.6	1.24	1.28

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1089.7	25.60%
0-40	1782.3	41.90%
0-60	3173.8	74.70%
60-90	1068.3	25.10%
70-100	514.2	12.10%
90-120	3.6	0.10%
0-90	4242.1	99.80%
90-180	8.6	0.20%
0-180	4250.7	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	33.7	0.80%	90-95	1.0	0.00%
5-10	99.8	2.30%	95-100	0.8	0.00%
10-15	162.2	3.80%	100-105	0.6	0.00%
15-20	218.8	5.10%	105-110	0.4	0.00%
20-25	267.7	6.30%	110-115	0.4	0.00%
25-30	307.5	7.20%	115-120	0.4	0.00%
30-35	337.0	7.90%	120-125	0.5	0.00%
35-40	355.6	8.40%	125-130	0.5	0.00%
40-45	362.8	8.50%	130-135	0.5	0.00%
45-50	359.2	8.40%	135-140	0.6	0.00%
50-55	345.7	8.10%	140-145	0.6	0.00%
55-60	323.8	7.60%	145-150	0.5	0.00%
60-65	295.7	7.00%	150-155	0.5	0.00%
65-70	260.2	6.10%	155-160	0.4	0.00%
70-75	216.3	5.10%	160-165	0.4	0.00%
75-80	165.0	3.90%	165-170	0.3	0.00%
80-85	103.0	2.40%	170-175	0.2	0.00%
85-90	28.1	0.70%	175-180	0.1	0.00%

Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C																	
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410
1	1414	1407	1415	1412	1410	1410	1412	1408	1417	1408	1412	1410	1410	1412	1415	1407	1414
2	1414	1409	1413	1411	1411	1413	1414	1406	1414	1406	1414	1413	1411	1411	1413	1409	1414
3	1410	1404	1411	1409	1405	1411	1410	1404	1409	1404	1410	1411	1405	1409	1411	1404	1410
4	1410	1405	1409	1409	1408	1410	1410	1401	1408	1401	1410	1410	1408	1409	1409	1405	1410
5	1409	1404	1406	1408	1404	1405	1406	1398	1405	1398	1406	1405	1404	1408	1406	1404	1409
6	1406	1399	1404	1404	1400	1405	1402	1394	1402	1394	1402	1405	1400	1404	1404	1399	1406
7	1401	1397	1404	1401	1401	1401	1400	1390	1399	1390	1400	1401	1401	1401	1404	1397	1401
8	1391	1390	1398	1394	1397	1397	1396	1386	1394	1386	1396	1397	1397	1394	1398	1390	1391
9	1392	1387	1395	1391	1390	1396	1389	1380	1390	1380	1389	1396	1390	1391	1395	1387	1392
10	1387	1382	1388	1390	1387	1390	1387	1372	1382	1372	1387	1390	1387	1390	1388	1382	1387
11	1382	1373	1379	1383	1382	1382	1377	1366	1373	1366	1377	1382	1382	1383	1379	1373	1382
12	1371	1368	1380	1377	1374	1377	1373	1361	1367	1361	1373	1377	1374	1377	1380	1368	1371
13	1365	1360	1370	1373	1370	1370	1364	1353	1359	1353	1364	1370	1370	1373	1370	1360	1365
14	1354	1354	1363	1362	1364	1366	1356	1345	1351	1345	1356	1366	1364	1362	1363	1354	1354
15	1347	1345	1355	1356	1359	1358	1351	1335	1345	1335	1351	1358	1359	1356	1355	1345	1347
16	1338	1337	1348	1349	1351	1349	1342	1327	1331	1327	1342	1349	1351	1349	1348	1337	1338
17	1329	1326	1337	1344	1341	1341	1334	1317	1323	1317	1334	1341	1341	1344	1337	1326	1329
18	1320	1317	1330	1335	1337	1332	1322	1308	1309	1308	1322	1332	1337	1335	1330	1317	1320
19	1306	1307	1322	1326	1327	1325	1314	1296	1301	1296	1314	1325	1327	1326	1322	1307	1306
20	1299	1298	1311	1316	1319	1316	1305	1287	1288	1287	1305	1316	1319	1316	1311	1298	1299
25	1233	1235	1256	1266	1269	1264	1244	1224	1225	1224	1244	1264	1269	1266	1256	1235	1233
30	1162	1164	1187	1204	1212	1202	1178	1152	1148	1152	1178	1202	1212	1204	1187	1164	1162
35	1076	1083	1112	1135	1146	1134	1106	1069	1066	1069	1106	1134	1146	1135	1112	1083	1076
40	984	994	1031	1060	1074	1057	1019	984	973	984	1019	1057	1074	1060	1031	994	984
45	884	899	940	978	993	976	935	890	878	890	935	976	993	978	940	899	884
50	780	798	844	891	915	891	838	792	775	792	838	891	915	891	844	798	780
55	675	693	748	807	832	805	744	689	670	689	744	805	832	807	748	693	675
60	564	588	650	724	752	722	652	586	563	586	652	722	752	724	650	588	564
65	459	484	561	639	664	638	566	486	458	486	566	638	664	639	561	484	459
70	350	383	473	541	564	541	474	388	356	388	474	541	564	541	473	383	350
75	248	289	372	429	453	430	374	296	258	296	374	430	453	429	372	289	248
80	153	200	261	305	320	306	266	208	164	208	266	306	320	305	261	200	153
85	65	101	129	139	142	142	136	111	78	111	136	142	142	139	129	101	65
90	2	2	2	3	3	3	2	4	4	4	2	3	3	3	2	2	2
95	1	1	2	2	2	2	2	1	1	1	2	2	2	2	2	1	1
100	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1
105	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1
115	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
125	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
130	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
135	1	1	1	1	2	1	2	2	1	2	2	1	2	1	1	1	1
140	1	1	2	2	2	2	2	1	2	1	2	2	2	2	2	1	1
145	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
150	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
155	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
160	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
165	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2
170	3	3	3	3	3	3	2	2	3	2	2	3	3	3	3	3	3
175	3	3	3	4	4	3	3	3	3	3	3	3	4	4	3	3	3
180	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Goniophotometer Test

Model No.	VEKT2X4(25W/30W/34W)34W	Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
2.Photometric parameters were measured using a type C goniophotometer and software.
3.The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.8	120.06	60	0.2792	33.18	0.9895	12.47%	Horizontal

Test Results

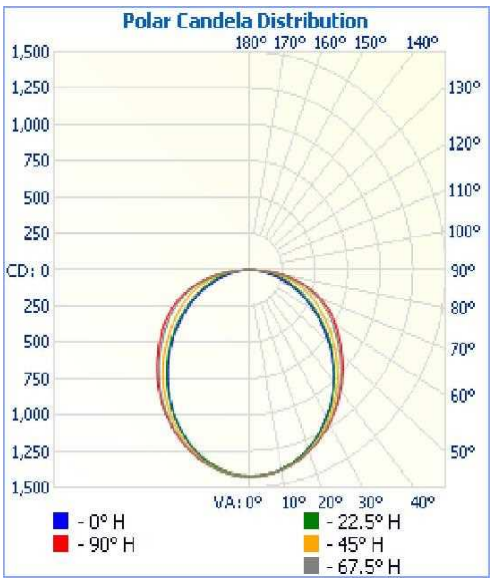
Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0°-60°	N/A	Horizontal Spread	Vertical Spread	
4295.5	74.50%	N/A	125.4	106.8	129.46

Backlight	Uplight	Glare
N/A	N/A	N/A

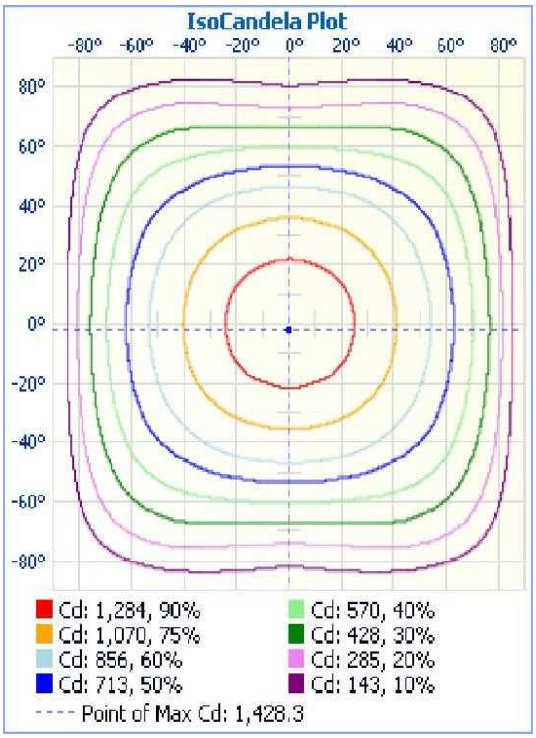
UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
18.9	21.6	1.24	1.28

Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot



Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1100.0	25.60%
0-40	1799.6	41.90%
0-60	3206.2	74.60%
60-90	1080.7	25.20%
70-100	520.2	12.10%
90-120	3.6	0.10%
0-90	4286.9	99.80%
90-180	8.6	0.20%
0-180	4295.5	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	34.0	0.80%	90-95	1.0	0.00%
5-10	100.7	2.30%	95-100	0.8	0.00%
10-15	163.7	3.80%	100-105	0.6	0.00%
15-20	220.9	5.10%	105-110	0.4	0.00%
20-25	270.3	6.30%	110-115	0.4	0.00%
25-30	310.5	7.20%	115-120	0.4	0.00%
30-35	340.4	7.90%	120-125	0.5	0.00%
35-40	359.2	8.40%	125-130	0.5	0.00%
40-45	366.6	8.50%	130-135	0.5	0.00%
45-50	363.1	8.50%	135-140	0.6	0.00%
50-55	349.4	8.10%	140-145	0.6	0.00%
55-60	327.5	7.60%	145-150	0.5	0.00%
60-65	299.1	7.00%	150-155	0.5	0.00%
65-70	263.2	6.10%	155-160	0.4	0.00%
70-75	218.8	5.10%	160-165	0.4	0.00%
75-80	167.1	3.90%	165-170	0.3	0.00%
80-85	104.4	2.40%	170-175	0.2	0.00%
85-90	28.1	0.70%	175-180	0.1	0.00%

Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424	1424
1	1426	1421	1428	1425	1421	1425	1426	1418	1428	1418	1426	1425	1421	1425	1428	1421	1426
2	1426	1419	1427	1426	1422	1424	1426	1419	1424	1419	1426	1424	1422	1426	1427	1419	1426
3	1426	1419	1426	1424	1421	1424	1423	1416	1428	1416	1423	1424	1421	1424	1426	1419	1426
4	1423	1417	1424	1422	1419	1419	1421	1414	1420	1414	1421	1419	1419	1422	1424	1417	1423
5	1419	1416	1422	1422	1418	1420	1419	1412	1420	1412	1419	1420	1418	1422	1422	1416	1419
6	1415	1414	1418	1416	1412	1418	1416	1408	1414	1408	1416	1418	1412	1416	1418	1414	1415
7	1414	1408	1413	1412	1413	1413	1411	1403	1410	1403	1411	1413	1413	1412	1413	1408	1414
8	1408	1406	1410	1410	1409	1409	1407	1398	1408	1398	1407	1409	1409	1410	1410	1406	1408
9	1402	1403	1408	1407	1406	1404	1402	1393	1399	1393	1402	1404	1406	1407	1408	1403	1402
10	1398	1394	1400	1401	1401	1399	1397	1386	1392	1386	1397	1399	1401	1401	1400	1394	1398
11	1389	1388	1397	1397	1393	1396	1392	1379	1387	1379	1392	1396	1393	1397	1397	1388	1389
12	1385	1380	1390	1390	1389	1390	1382	1370	1378	1370	1382	1390	1389	1390	1390	1380	1385
13	1375	1374	1386	1386	1382	1385	1380	1365	1372	1365	1380	1385	1382	1386	1386	1374	1375
14	1372	1367	1377	1378	1379	1376	1370	1355	1360	1355	1370	1376	1379	1378	1377	1367	1372
15	1360	1359	1369	1373	1371	1371	1363	1347	1352	1347	1363	1371	1371	1373	1369	1359	1360
16	1352	1348	1361	1364	1363	1363	1354	1340	1343	1340	1354	1363	1363	1364	1361	1348	1352
17	1342	1341	1352	1354	1358	1354	1345	1329	1334	1329	1345	1354	1358	1354	1352	1341	1342
18	1332	1330	1342	1346	1349	1347	1334	1319	1323	1319	1334	1347	1349	1346	1342	1330	1332
19	1322	1322	1334	1338	1339	1336	1323	1308	1312	1308	1323	1336	1339	1338	1334	1322	1322
20	1310	1308	1323	1328	1333	1328	1315	1296	1299	1296	1315	1328	1333	1328	1323	1308	1310
25	1245	1250	1269	1277	1282	1276	1257	1235	1232	1235	1257	1276	1282	1277	1269	1250	1245
30	1171	1176	1200	1215	1223	1214	1189	1160	1158	1160	1189	1214	1223	1215	1200	1176	1171
35	1088	1096	1125	1149	1157	1146	1113	1080	1072	1080	1113	1146	1157	1149	1125	1096	1088
40	996	1004	1043	1071	1083	1069	1031	992	980	992	1031	1069	1083	1071	1043	1004	996
45	893	910	949	988	1005	985	942	898	883	898	942	985	1005	988	949	910	893
50	793	806	857	903	921	899	848	798	780	798	848	899	921	903	857	806	793
55	682	701	758	814	839	811	752	694	674	694	752	811	839	814	758	701	682
60	571	594	662	731	761	731	658	593	565	593	658	731	761	731	662	594	571
65	463	490	567	646	675	645	570	491	460	491	570	645	675	646	567	490	463
70	354	389	479	547	573	547	479	391	358	391	479	547	573	547	479	389	354
75	252	292	377	436	459	434	380	298	258	298	380	434	459	436	377	292	252
80	155	203	265	310	324	311	270	210	164	210	270	311	324	310	265	203	155
85	66	102	131	140	143	145	139	112	76	112	139	145	143	140	131	102	66
90	2	2	2	3	3	3	2	3	3	3	2	3	3	3	2	2	2
95	1	1	2	2	2	2	2	1	1	1	2	2	2	2	2	1	1
100	1	1	1	1	1	2	2	1	1	1	2	2	1	1	1	1	1
105	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
115	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
120	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
125	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
130	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1
135	1	1	1	2	1	2	2	1	1	1	2	2	1	2	1	1	1
140	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
145	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
150	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
155	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
160	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
165	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2
170	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
175	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
180	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

THD and PF Test

Model No.	VEKT2X4(25W/30W/34W) 25W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.04	60	0.2079	24.80	0.9933	10.54%	Horizontal
24.7	276.94	60	0.0974	25.03	0.9280	13.34%	Horizontal

THD and PF Test

Model No.	VEKT2X4(25W/30W/34W)30W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	119.99	60	0.2472	29.45	0.9925	11.23%	Horizontal
24.7	276.91	60	0.1126	29.61	0.9497	13.59%	Horizontal

THD and PF Test

Model No.	VEKT2X4(25W/30W/34W)34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	119.97	60	0.2792	33.15	0.9894	12.51%	Horizontal
24.7	276.90	60	0.1246	33.19	0.9624	13.64%	Horizontal

THD and PF Test

Model No.	VEKT2X4(25W/30W/34W) 34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.01	60	0.2763	32.45	0.9787	13.01%	Horizontal
24.7	277.07	60	0.1222	32.55	0.9613	13.88%	Horizontal

THD and PF Test

Model No.	VEKT2X4(25W/30W/34W) 34W		Sample ID.	3033622
Operate time (Min.)	90	Stabilization time (Min.)		45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.7	120.06	60	0.2809	33.20	0.9845	12.54%	Horizontal
24.7	277.07	60	0.1244	33.28	0.9654	13.55%	Horizontal

In-Situ Temperature Measurement Test

Model No.	VEKT2X4(25W/30W/34W)34W	Sample ID.	3033622

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL 1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of 25 °C ± 5 °C. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. Thermocouples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 7.5 hours.
3.The data and photos in LM-80 test report is provided by the customer/ The data and photos in driver specification is provided by the customer.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	119.97	60	0.2792	33.15	0.9894	12.51%	Horizontal

Test Results (LEDs)

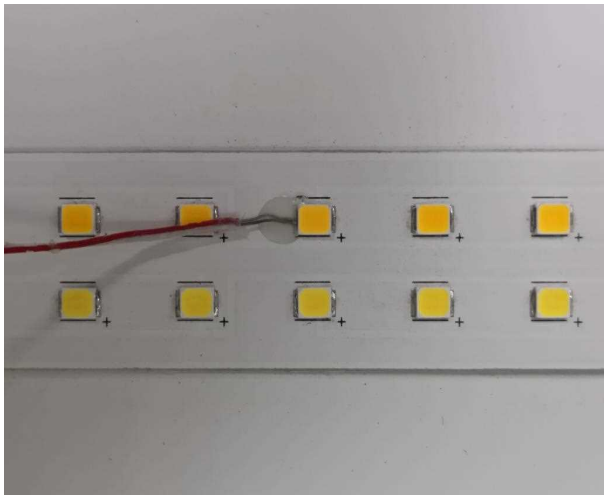
Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source (°C)		Max Chromaticity Shift （1000-6000h)	LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp (°C)
		Test Result	Test Result (Correct to 25 °C)				
Ambient TEMP	N/A	24.1	25.0				
TMP of Location 1	110	43.9	44.8	0.0024	STW8A2PD-XX	200	105

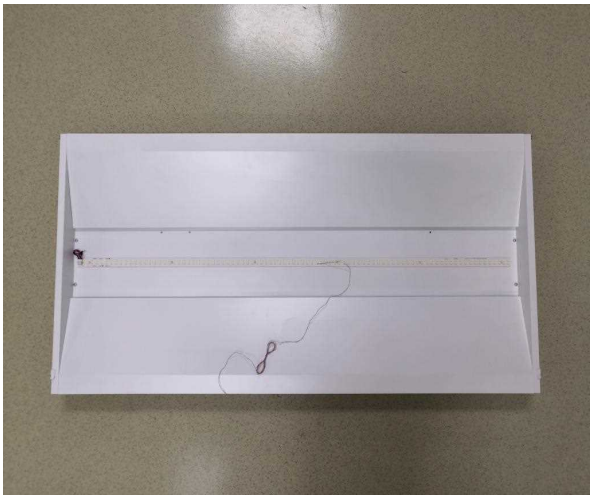
Test Results (Drivers)

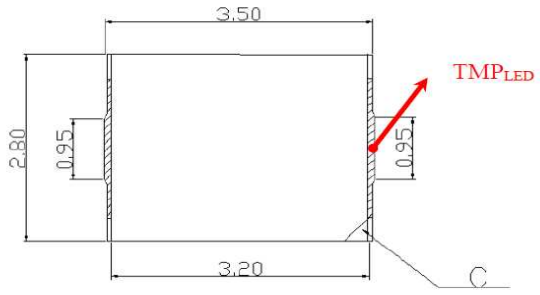
Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test Result	Test Result (Correct to 25 °C)		
Ambient TEMP	24.1	25.0		
TMP of Location 1	40.9	41.8	VEL46100MVHDA-MD-99	90

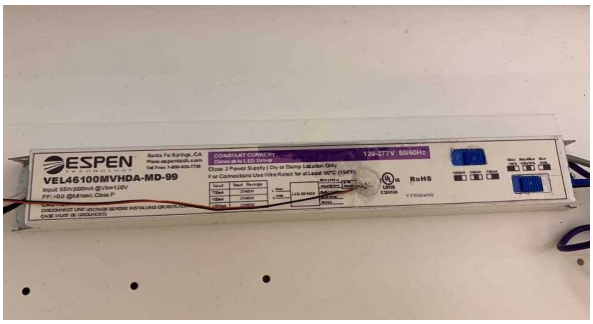
In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of Light Sources & Tc Point of Drivers









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