NVLAP Lab Code 500089-0

Report Number:	PL16735-001A
Model:	CDR4-B-ALS-9ACK-10V5-xx-UNV (4000K)
Date:	03/21/2022

Cree Racine Engineering Services Testing Laboratory (RESTL) Photometric Testing and Evaluation Report

Prepared For:

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Cree Lighting

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Prepared By:

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Approved By:

Jonathan Vollers, Technical Manager

This report contains data that are not covered by the NVLAP accreditation.

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Product Information	
Manufacturer	Cree Lighting
Model Number (SKU)	CDR4-B-ALS-9ACK-10V5-xx-UNV (4000K)
Serial Number	16735
LED Type	Smalite SL-ID2835FTA-31KAG

Product Description
CDR 4" Downlight luminare, white painted reflector, selectable CCT at full power and 4000K CCT

Driver Information (Where Applicable)
Integral

Length	Width	Height
5.875”	5.875”	3.5”

Sample

The following sample was submitted for evaluation

CREE LIGHTING
A COMPANY OF IDEAL INDUSTRIES, INC.

NVLAP TESTING
NVLAP Lab Code 500089-0

Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	1098.6	1112	lm
Efficacy	90.90	94.56	lm/W
Correlated Color Temperature (CCT)	4030	K	
Color Rendering Index (CRI)	94		
R_9	69		
Duv	0.0022		
S/P Ratio**	1.82		
CIE Type	Direct		

	Sphere		Goniophotometer		
Electrical Measurements	**120V**	**277V**	**120V**	**277V**	
Input Wattage	12.09	-	11.76	11.60	W
Input Current	0.102	-	0.100	0.045	A
Input Voltage	120.03	-	120.14	277.56	V
Power Factor	0.983	-	0.982	0.919	
Off-State Power	0	-	0	0	W
Total Harmonic Distortion (Voltage)	0.05	-	0.12	0.19	%
Total Harmonic Distortion (Amperage)	8.85	-	9.17	19.20	%

Note: All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	52	30	min
Total Operating Time (Stabilization + Test)	62	50	min
Ambient Temperature	25.06	24.5	˚C

Spacing Criteria

Spacing Criterion (0 - 180)	1.12
Spacing Criterion (90 - 270)	1.12
Spacing Criterion (Diagonal)	1.18

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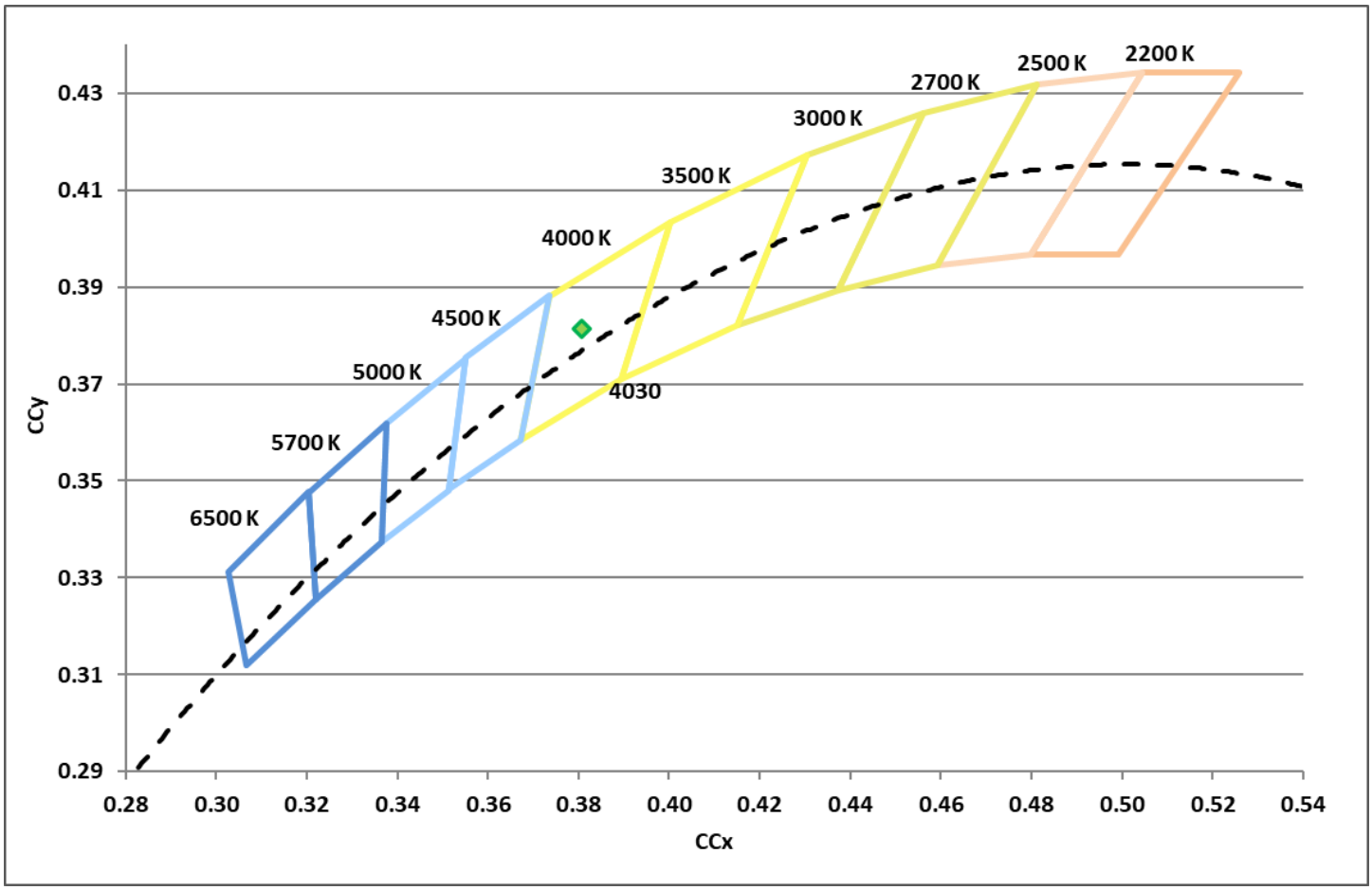
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3806	0.3815	0.2233	0.3358	0.2233	0.5037	0.0022

Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
94	94	98	99	91	92	95	93	87	69	93	92	69	95	99

Chromaticity Diagram



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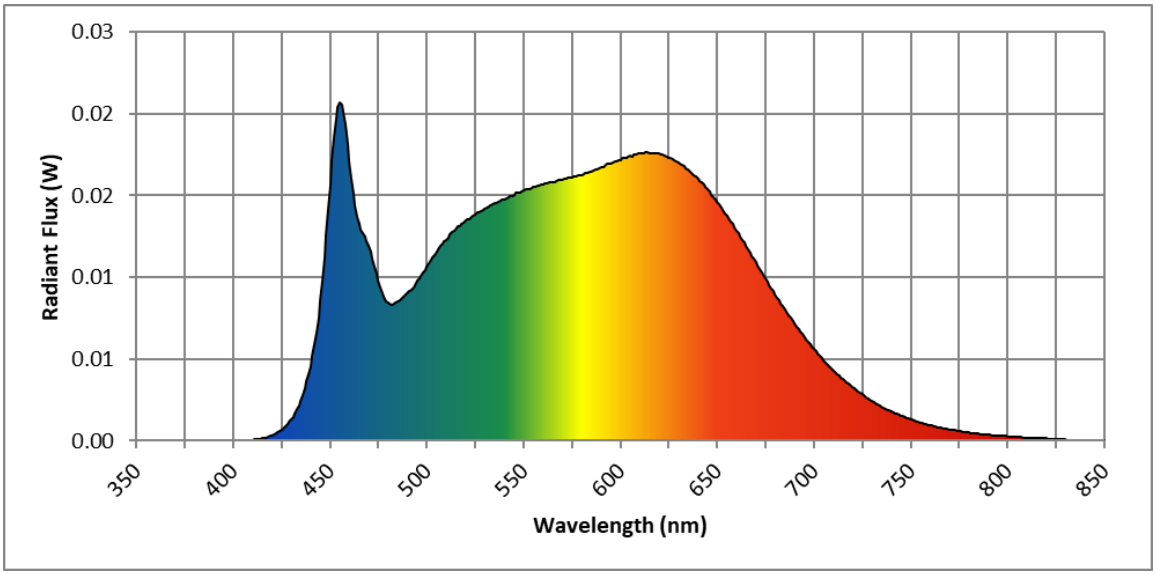
Spectral Distribution

λ(nm)	W/nm	λ(nm)	W/nm	λ(nm)	W/nm
360	0.000022	530	0.014181	700	0.005605
370	0.000010	540	0.014778	710	0.004295
380	0.000006	550	0.015308	720	0.003277
390	0.000008	560	0.015666	730	0.002434
400	0.000006	570	0.015974	740	0.001785
410	0.000056	580	0.016246	750	0.001306
420	0.000315	590	0.016729	760	0.000948
430	0.001298	600	0.017179	770	0.000686
440	0.004574	610	0.017559	780	0.000499
450	0.015668	620	0.017542	790	0.000357
460	0.017100	630	0.016999	800	0.000261
470	0.011884	640	0.016005	810	0.000183
480	0.008428	650	0.014602	820	0.000133
490	0.009035	660	0.012857	830	0.000090
500	0.010610	670	0.010907		
510	0.012296	680	0.008949		
520	0.013446	690	0.007159		

Dominant Wavelength	577	nm
Peak Wavelength	455	nm

Spectral Power Distribution (W/nm)



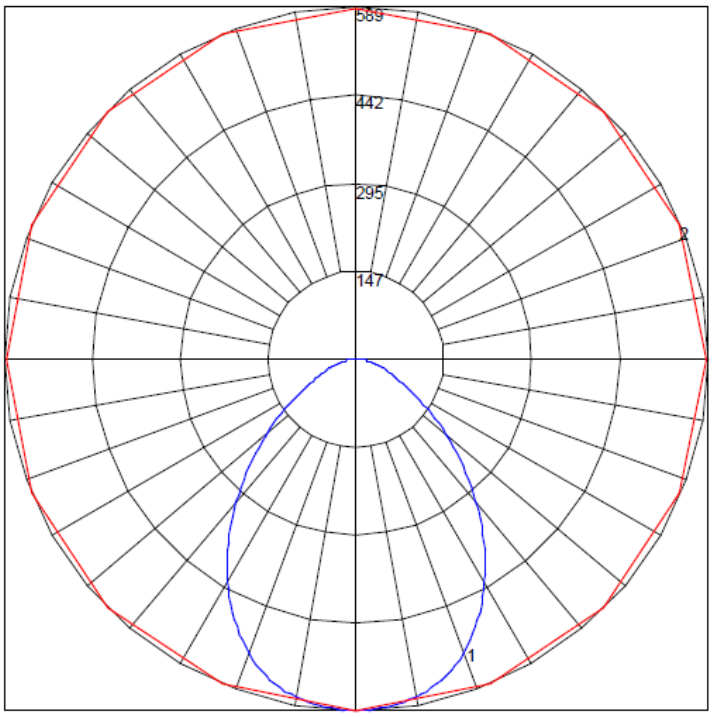
Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	211.59	19	0-10	55.46
0-30	432.14	38.9	10-20	156.13
0-40	664.16	59.7	20-30	220.55
0-60	990.81	89.1	30-40	232.01
0-80	1102.34	99.1	40-50	195.28
0-90	1112.07	100	50-60	131.38
10-90	1056.61	95	60-70	72.57
20-40	452.56	40.7	70-80	38.96
20-50	647.84	58.3	80-90	9.73
40-70	399.23	35.9	90-100	0.0
60-80	111.52	10.0	100-110	0.0
70-80	38.96	3.5	110-120	0.0
80-90	9.73	0.9	120-130	0.0
90-110	0.0	0.0	130-140	0.0
90-120	0.0	0.0	140-150	0.0
90-130	0.0	0.0	150-160	0.0
90-150	0.0	0.0	160-170	0.0
90-180	0.0	0.0	170-180	0.0
110-180	0.0	0.0		
Total	**1112.1**	**100**		

Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	39272	39496	39867
55	27955	28076	28235
65	18413	18450	18526
75	15584	15648	15702
85	10497	10172	9806

Candela Plots



Maximum Candela = 589.208 Located At Horizontal Angle = 67.5, Vertical Angle = 1
1 - Vertical Plane Through Horizontal Angles (67.5 - 247.5) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (1) (Through Max. Cd.)

Coefficients of Utilization

RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	111	107	103	100	108	104	101	98	100	98	95	96	94	92	93	91	90	88
2	102	95	90	85	100	93	88	84	90	86	82	87	83	80	84	81	78	76
3	95	85	78	73	92	84	77	72	81	76	71	78	74	70	76	72	69	67
4	88	77	69	64	85	76	69	63	73	67	62	71	66	62	69	65	61	59
5	81	70	62	56	79	69	61	56	67	60	55	65	59	55	63	58	54	52
6	76	64	56	50	74	63	55	50	61	54	49	60	54	49	58	53	49	47
7	71	58	51	45	69	58	50	45	56	49	45	55	49	44	54	48	44	42
8	66	54	46	41	65	53	46	41	52	45	40	51	45	40	50	44	40	38
9	62	50	42	37	61	49	42	37	48	42	37	47	41	37	46	41	37	35
10	58	46	39	34	57	46	39	34	45	38	34	44	38	34	43	38	34	32

Candela Tabulations

	0	22.5	45	67.5	90
0	588.6	588.6	588.6	588.6	588.6
1	586.8	587.9	588.0	589.2	588.6
2	586.4	586.7	588.2	588.7	589.0
3	584.6	586.4	586.8	587.7	587.8
4	584.6	584.7	585.9	586.4	587.1
5	582.5	583.9	584.6	586.0	585.1
6	581.7	582.2	582.8	583.3	584.2
7	579.1	580.6	581.6	582.1	582.3
8	577.5	578.1	578.8	579.7	579.6
9	575.0	575.7	576.9	577.9	577.8
10	572.6	574.0	574.2	574.8	575.3
11	569.6	570.8	570.9	572.3	572.6
12	566.7	567.9	568.4	569.5	568.8
13	563.4	564.9	565.2	565.4	565.7
14	558.9	559.9	560.4	561.6	561.4
15	554.3	555.8	555.4	556.2	556.7
16	548.9	550.2	550.7	551.9	551.8
17	542.8	543.8	545.1	544.9	545.8
18	536.5	537.8	538.2	539.1	538.7
19	529.8	530.8	531.2	532.1	532.4
20	522.4	523.7	524.6	524.6	524.6
21	514.5	515.3	515.7	516.5	516.2
22	505.9	507.0	507.5	507.9	508.3
23	497.6	498.4	498.8	500.4	499.4
24	488.0	489.4	490.0	490.6	491.0
25	478.8	480.1	480.4	481.7	480.9
26	469.8	471.0	471.1	472.1	472.5
27	459.7	461.2	461.9	462.3	461.2
28	449.6	450.8	451.3	451.8	451.0
29	438.6	440.6	441.0	441.0	440.2
30	428.0	429.6	430.5	430.7	429.7
31	416.9	418.5	419.5	419.7	417.9
32	406.0	406.9	407.9	408.5	406.4
33	394.5	395.7	396.3	396.7	394.1
34	383.2	383.7	385.0	385.4	383.1
35	371.1	372.5	372.7	373.4	370.8
36	359.2	360.0	360.4	360.9	358.5

Candela Tabulations (Continued)

	0	22.5	45	67.5	90
37	346.9	348.2	348.4	349.2	347.2
38	335.2	336.4	336.7	337.1	335.0
39	323.2	324.0	323.8	324.5	321.6
40	310.9	311.9	312.1	312.3	309.7
41	297.9	300.3	300.3	300.6	296.7
42	287.3	288.1	288.6	288.8	287.6
43	274.7	276.4	276.3	276.5	277.2
44	262.3	264.4	265.1	265.2	266.4
45	252.2	253.2	253.6	253.8	256.0
46	241.1	241.4	242.2	242.3	243.8
47	229.4	230.2	230.5	230.7	231.7
48	218.6	219.5	220.1	220.0	220.4
49	208.6	208.2	208.7	208.9	208.2
50	197.0	197.4	197.4	197.6	196.6
51	186.3	186.6	186.5	187.2	186.0
52	176.0	176.4	176.4	176.7	175.6
53	165.8	165.9	165.6	166.2	165.4
54	154.7	155.8	155.7	155.7	156.0
55	145.6	146.1	146.2	146.4	147.1
56	136.1	136.6	136.8	136.6	137.3
57	126.8	127.0	127.6	127.5	127.8
58	117.8	118.7	119.2	118.8	119.2
59	110.3	110.2	110.8	110.7	110.7
60	102.3	102.1	102.6	102.7	102.3
61	94.8	94.9	95.3	95.3	95.0
62	88.1	88.1	88.4	88.6	88.3
63	81.8	81.7	81.8	82.0	82.0
64	75.6	75.7	75.6	75.8	76.0
65	70.7	70.9	70.8	70.9	71.1
66	66.5	66.4	66.5	66.7	66.7
67	62.8	62.8	62.9	63.0	63.0
68	59.3	59.5	59.5	59.6	59.6
69	55.9	56.0	56.1	56.1	56.0
70	52.5	52.5	52.6	52.6	52.5
71	49.2	49.1	49.4	49.4	49.3
72	45.9	46.0	46.1	46.2	46.2
73	42.8	42.8	42.8	42.9	43.0

Candela Tabulations (Continued)

	0	22.5	45	67.5	90
74	39.8	39.7	39.7	39.8	39.9
75	36.6	36.7	36.8	36.8	36.9
76	33.7	33.7	33.7	33.8	33.8
77	30.7	30.7	30.8	30.9	30.8
78	27.8	27.9	27.9	28.0	27.9
79	24.9	25.0	25.0	25.0	24.9
80	22.1	22.0	22.1	22.0	21.9
81	19.2	19.2	19.3	19.1	19.1
82	16.5	16.4	16.3	16.2	16.2
83	13.7	13.6	13.5	13.3	13.2
84	11.1	10.9	10.7	10.6	10.5
85	8.3	8.3	8.1	7.9	7.8
86	5.9	5.8	5.5	5.3	5.1
87	3.5	3.4	3.3	3.1	3.0
88	1.6	1.6	1.5	1.3	1.3
89	0.5	0.5	0.5	0.3	0.4
90	0.0	0.0	0.0	0.0	0.0

Integrating Sphere Equipment List

Description	Manufacturer	Model	Serial Number
2M Sphere	Labsphere	ILLUMIA PLUS 3020-300 4PI	1109184535
CCD Array Spectrometer	Labsphere	MC-9801:3683L	98011077
Programmable AC Source	Chroma	61602	616020003699
Power Analyzer	Xitron	XT2640	264AD2006001

Goniophotometer Equipment List

Description	Manufacturer	Model	Serial Number
AC Power Source	Chroma	61602	616020002300
Type C Goniophotometer	LSI / UL	6440T	6440PN2028
Spectroradiometer	Gooch & Housego	770VIS/NIR	12415189
Spectrometer	Inphora, Inc	PDET 31	130627
Power Meter	Xitron	XT2640	M20140823

Test Methods Used:

Title	Description
ANSI C82.77:2002	Harmonic Emission Limits- Related Power Quality Reqt's for Lighting Equipment
CIE Pub. 13.3:1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. 15:2004	Colorimetry
IES LM-58:1994	Spectroradiometric Measurements
IES LM-79:2008	Electrical and Photometric Measurements of Solid-State Lighting Products

Reference Standard Used:

Equipment	Description
3m Sphere	Tungsten Halogen Omni-Directional 35W Calibration Lamp, Serial Number E4
Type C Goniophotometer and Spectrometer	Tungsten Halogen Omni-Directional 500W Calibration Lamp, Serial Numbers 16C293. 16C294, 16C295. For color calibration of spectrometer, 13C074.

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In the event that the recorded temperature is outside of 25 ± 1˚C, this is considered a non-standard condition.

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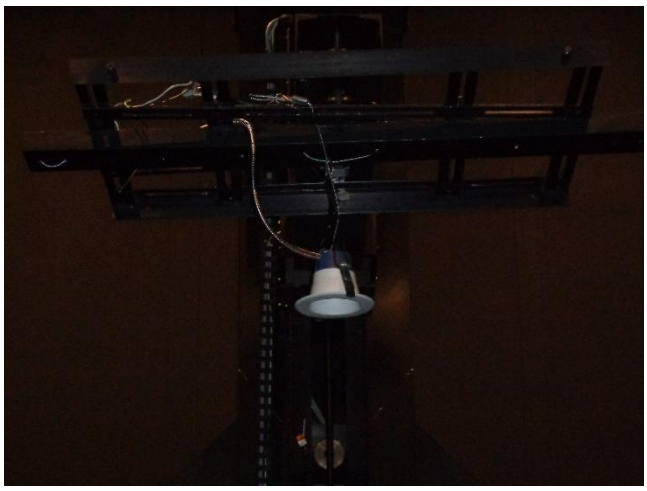
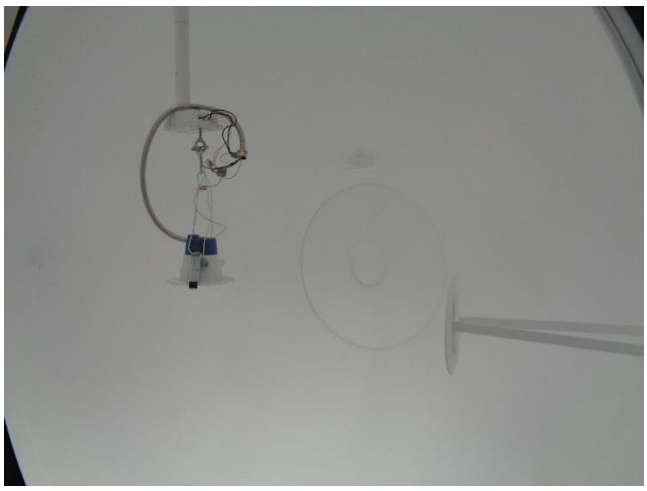
In the event that testing is subcontracted, or subcontracted equipment was used, test results in this report marked with the symbol *, or noted as “Sphere” or “Integrating Sphere” or “Goniophotometer,” were performed by the subcontracted laboratory identified in the equipment list of this report.

Additional Comments:

The photos below are intended to show the orientation and fixturing/set-up of the units under test. These are critical to understanding the results of the test given the sensitivity of many products and measurement systems to orientation and set-up considerations, and also for reproducing the conditions of the test.

Goniophotometer	Integrating Sphere
	

Document Revision History:

Each subsequent revision of this report replaces the preceding report.

Date	Rev	DCN #	Change at the time of this test	By	Approval
03/21/2022	A	DMS	Origination	M. Hubbard	J. Vollers