



# LUMINAIRE TESTING LABORATORY, INC.

SUSTAINING  
MEMBER  
of the  
IESNA

905 Harrison Street · Allentown, PA 18103 · 610-770-1044 · Fax 610-770-8912 · www.LuminaireTesting.com

LTL NUMBER: 17559 DATE: 12-09-2009  
 PREPARED FOR: ADAM METAL PRODUCTS  
 CATALOG NUMBER: 6 LAMP 54W T5HO HIGH BAY CONCEPT 3  
 LUMINAIRE: FORMED WHITE ENAMEL STEEL HOUSING, FORMED SPECULAR ALUMINUM REFLECTORS, NO ENCLOSURE.  
 LAMP: SIX 54 WATT HIGH OUTPUT T5 LINEAR FLUORESCENT LAMPS RATED AT 4400 LUMENS EACH.  
 LAMP CATALOG NUMBER: PHILIPS F54T5/841/HO/ALTO  
 BALLAST: TWO UNIVERSAL LIGHTING TECHNOLOGIES B454IUNV-E  
 MOUNTING: PENDANT  
 ELECTRICAL VALUES: 120.0VAC, 2.9063A, 347.4W

### Candela Distribution

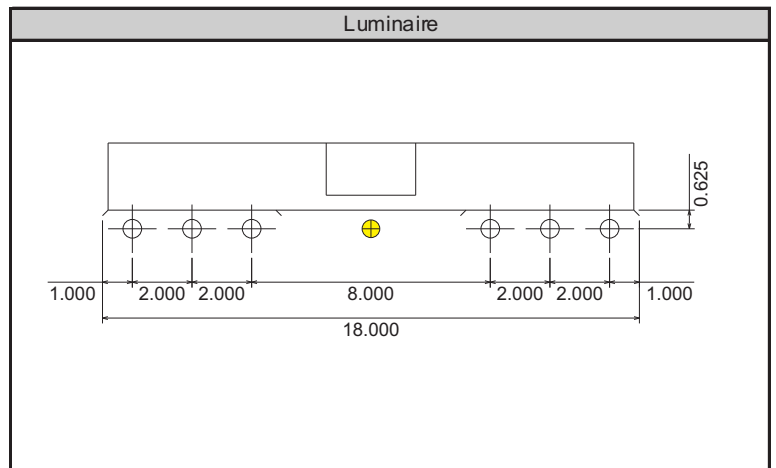
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Flux
0	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	
5	5192	5158	5177	5209	5233	5209	5177	5158	5192	5158	5177	5209	5233	5209	5177	5158	500.6
15	4912	5132	5525	5801	5913	5801	5525	5132	4912	5132	5525	5801	5913	5801	5525	5132	1553.0
25	4534	5014	5717	6186	6404	6186	5717	5014	4534	5014	5717	6186	6404	6186	5717	5014	2595.2
35	3987	4782	5790	6819	7136	6819	5790	4782	3987	4782	5790	6819	7136	6819	5790	4782	3596.7
45	3296	4316	5949	7050	7437	7050	5949	4316	3296	4316	5949	7050	7437	7050	5949	4316	4373.7
55	2490	3846	5718	6723	7033	6723	5718	3846	2490	3846	5718	6723	7033	6723	5718	3846	4691.2
65	1625	3314	4891	5547	5752	5547	4891	3314	1625	3314	4891	5547	5752	5547	4891	3314	4304.1
75	783	2453	3376	3844	4010	3844	3376	2453	783	2453	3376	3844	4010	3844	3376	2453	3170.6
85	131	1046	1552	1888	1998	1888	1552	1046	131	1046	1552	1888	1998	1888	1552	1046	1461.8
90	0	244	442	579	634	579	442	244	0	244	442	579	634	579	442	244	
95	0	108	526	845	939	845	526	108	0	108	526	845	939	845	526	108	459.7
105	0	0	124	276	337	276	124	0	0	0	124	276	337	276	124	0	164.2
115	0	0	0	78	122	78	0	0	0	0	0	78	122	78	0	0	38.1
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

### Zonal Lumen Summary

Zone	Lumens	% of Lamp	% of Luminaire
0-30	4648.8	17.6%	17.3%
0-40	8245.5	31.2%	30.6%
0-60	17310.3	65.6%	64.3%
0-90	26246.8	99.4%	97.5%
90-180	662.8	2.5%	2.5%
0-180	26909.6	101.9%	100.0%

Total luminaire efficiency: 101.9%

CIE Type: Direct  
 Spacing Criterion: 0 deg: 1.23 90 deg: 2.03  
 180 deg: 1.23 270 deg: 2.03



Approved By: \_\_\_\_\_

**THIS REPORT BASED ON LM-41 AND OTHER PERTINENT IESNA PROCEDURES.**



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Candela Tabulation (5 degree Vertical Increments)

	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	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157	5157
5	5192	5158	5177	5209	5233	5209	5177	5158	5192	5158	5177	5209	5233	5209	5177	5158
10	5086	5217	5345	5477	5565	5477	5345	5217	5086	5217	5345	5477	5565	5477	5345	5217
15	4912	5132	5525	5801	5913	5801	5525	5132	4912	5132	5525	5801	5913	5801	5525	5132
20	4744	5108	5651	6017	6153	6017	5651	5108	4744	5108	5651	6017	6153	6017	5651	5108
25	4534	5014	5717	6186	6404	6186	5717	5014	4534	5014	5717	6186	6404	6186	5717	5014
30	4280	4932	5728	6482	6817	6482	5728	4932	4280	4932	5728	6482	6817	6482	5728	4932
35	3987	4782	5790	6819	7136	6819	5790	4782	3987	4782	5790	6819	7136	6819	5790	4782
40	3658	4574	5920	6948	7308	6948	5920	4574	3658	4574	5920	6948	7308	6948	5920	4574
45	3296	4316	5949	7050	7437	7050	5949	4316	3296	4316	5949	7050	7437	7050	5949	4316
50	2903	4057	5861	6973	7306	6973	5861	4057	2903	4057	5861	6973	7306	6973	5861	4057
55	2490	3846	5718	6723	7033	6723	5718	3846	2490	3846	5718	6723	7033	6723	5718	3846
60	2062	3628	5370	6244	6484	6244	5370	3628	2062	3628	5370	6244	6484	6244	5370	3628
65	1625	3314	4891	5547	5752	5547	4891	3314	1625	3314	4891	5547	5752	5547	4891	3314
70	1193	2949	4180	4746	4909	4746	4180	2949	1193	2949	4180	4746	4909	4746	4180	2949
75	783	2453	3376	3844	4010	3844	3376	2453	783	2453	3376	3844	4010	3844	3376	2453
80	418	1790	2492	2894	3021	2894	2492	1790	418	1790	2492	2894	3021	2894	2492	1790
85	131	1046	1552	1888	1998	1888	1552	1046	131	1046	1552	1888	1998	1888	1552	1046
90	0	244	442	579	634	579	442	244	0	244	442	579	634	579	442	244
95	0	108	526	845	939	845	526	108	0	108	526	845	939	845	526	108
100	0	19	218	580	764	580	218	19	0	19	218	580	764	580	218	19
105	0	0	124	276	337	276	124	0	0	0	124	276	337	276	124	0
110	0	0	44	172	224	172	44	0	0	0	44	172	224	172	44	0
115	0	0	0	78	122	78	0	0	0	0	0	78	122	78	0	0
120	0	0	0	9	35	9	0	0	0	0	0	9	35	9	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Zonal Lumen Tabulation (5 degree zones)

Zone	Lumens	Zone	Lumens	Zone	Lumens	Zone	Lumens
0-5	123.7	45-50	2259.8	90-95	230.2	135-140	0.0
5-10	376.9	50-55	2342.2	95-100	229.5	140-145	0.0
10-15	642.3	55-60	2349.0	100-105	105.9	145-150	0.0
15-20	910.8	60-65	2250.6	105-110	58.3	150-155	0.0
20-25	1169.4	65-70	2053.5	110-115	28.7	155-160	0.0
25-30	1425.8	70-75	1765.3	115-120	9.5	160-165	0.0
30-35	1681.9	75-80	1405.3	120-125	0.8	165-170	0.0
35-40	1914.8	80-85	980.0	125-130	0.0	170-175	0.0
40-45	2113.9	85-90	481.8	130-135	0.0	175-180	0.0



Coefficients of Utilization - Zonal Cavity Method												
Effective Floor Cavity Reflectance 20%												
Ceiling Cavity Reflectance	90				80				70			
Wall Reflectance	70	50	30	10	70	50	30	10	70	50	30	10
Room Cavity Ratio (RCR)												
0	1.24	1.24	1.24	1.24	1.207	1.207	1.207	1.207	1.176	1.176	1.176	1.176
1	1.107	1.039	0.979	0.925	1.073	1.012	0.957	0.907	1.041	0.985	0.935	0.89
2	0.991	0.881	0.79	0.715	0.958	0.857	0.774	0.704	0.927	0.835	0.758	0.693
3	0.893	0.756	0.652	0.57	0.861	0.736	0.639	0.562	0.832	0.717	0.628	0.555
4	0.809	0.658	0.548	0.466	0.78	0.641	0.539	0.461	0.753	0.625	0.53	0.456
5	0.738	0.579	0.469	0.39	0.711	0.564	0.462	0.386	0.686	0.551	0.454	0.382
6	0.677	0.514	0.407	0.332	0.653	0.502	0.401	0.329	0.63	0.491	0.395	0.326
7	0.623	0.461	0.358	0.287	0.602	0.451	0.353	0.284	0.581	0.441	0.348	0.282
8	0.577	0.417	0.318	0.251	0.558	0.408	0.314	0.249	0.539	0.399	0.31	0.247
9	0.537	0.379	0.285	0.222	0.519	0.372	0.281	0.221	0.502	0.364	0.278	0.219
10	0.501	0.347	0.257	0.198	0.485	0.341	0.255	0.197	0.47	0.334	0.252	0.196

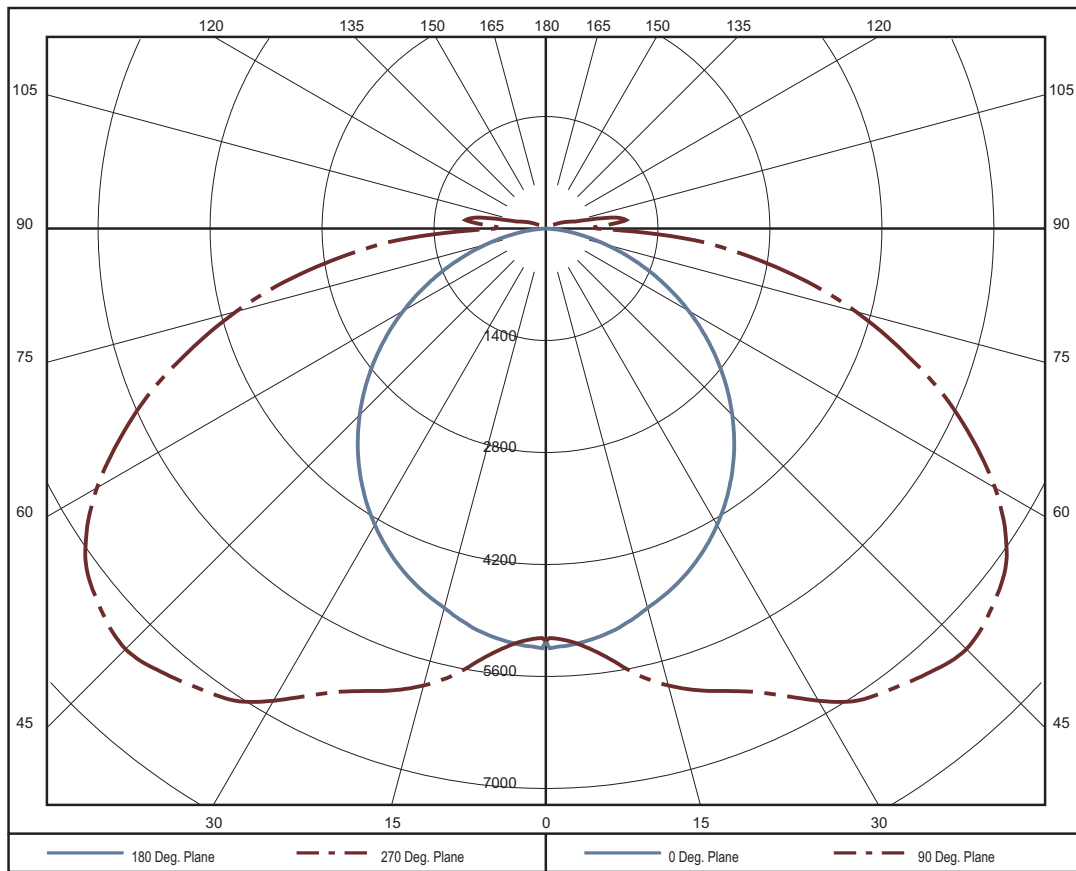
  

Ceiling Cavity Reflectance	50				30			10			0
Wall Reflectance	70	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio (RCR)											
0	1.119	1.119	1.119	1.119	1.066	1.066	1.066	1.017	1.017	1.017	0.994
1	0.982	0.936	0.895	0.857	0.891	0.857	0.825	0.849	0.822	0.796	0.771
2	0.869	0.793	0.728	0.673	0.755	0.7	0.653	0.719	0.674	0.634	0.608
3	0.777	0.682	0.605	0.542	0.649	0.583	0.528	0.618	0.563	0.515	0.489
4	0.703	0.595	0.512	0.446	0.567	0.495	0.437	0.541	0.479	0.428	0.402
5	0.641	0.525	0.44	0.375	0.501	0.427	0.368	0.479	0.414	0.362	0.337
6	0.588	0.469	0.384	0.321	0.448	0.373	0.315	0.429	0.362	0.31	0.287
7	0.544	0.422	0.339	0.278	0.404	0.33	0.274	0.388	0.321	0.27	0.247
8	0.505	0.383	0.302	0.244	0.368	0.294	0.241	0.353	0.287	0.237	0.216
9	0.471	0.35	0.271	0.216	0.337	0.265	0.214	0.324	0.259	0.211	0.191
10	0.442	0.322	0.246	0.194	0.31	0.241	0.191	0.299	0.235	0.189	0.17

Average Luminance Table (cd/m<sup>2</sup>)

	0	45	90
0	9842	9842	9842
45	8734	15338	19157
55	8067	17819	21894
65	7050	20034	23530
75	5386	21110	25033
85	2342	21931	28125

THIS TEST WAS CONDUCTED USING RELATIVE PHOTOMETRY TECHNIQUES ACCORDING TO STANDARD IESNA PROCEDURES. THE USER MUST THEREFORE USE CAUTION IN THE FOLLOWING SITUATIONS: 1) THIS TEST WAS PERFORMED USING A SPECIFIC BALLAST/LAMP COMBINATION. EXTRAPOLATION OF THESE DATA FOR OTHER BALLAST/LAMP COMBINATIONS MAY PRODUCE ERRONEOUS RESULTS. 2) ACCORDING TO IESNA PROCEDURES, THE BALLAST(S) AND LAMP(S) ARE PRESUMED TO PRODUCE 100% OF RATED OUTPUT. AN APPROPRIATE BALLAST FACTOR MUST BE APPLIED TO THE LUMEN OUTPUT RATINGS AND LUMINOUS INTENSITY VALUES GIVEN. 3) THIS TEST WAS CONDUCTED IN A CONTROLLED LABORATORY ENVIRONMENT WHERE THE AMBIENT TEMPERATURE WAS HELD AT 25 °C ±1°C. FIELD PERFORMANCE MAY DIFFER PARTICULARLY IN REGARDS TO CHANGE IN LUMINOUS OUTPUT AS A RESULT OF DIFFERENCE IN AMBIENT TEMPERATURE AND METHOD OF MOUNTING THE LUMINAIRE.





## A Notice About Extremely High Efficiencies and Efficiencies Exceeding 100%

### Preface

All fluorescent lamps exhibit some change in lumen output as a function of ambient temperature. Highly loaded lamps such as T5 high output, twin tube fluorescent, and high-wattage compact fluorescent lamps typically exhibit the most dramatic light output versus temperature curves. These curves are non-linear functions that have a peak light output at a temperature near the middle of the lamp's usable temperature range. See Figure 1 for the temperature response of a typical T5 high output lamp. The specific temperature where the peak lumen output occurs is dependent on many variables within the lamp manufacturing process as well as the lamp orientation within the luminaire (base up, base down, horizontal).

In the case of T5 high output lamps, the peak lumen output temperature falls near the 35°C(95°F) temperature.

### What does this have to do with testing?

You might be wondering, "Since IESNA standards on fluorescent testing are based on relative photometry, what effect does this have on my photometric test?" Although the relative photometry method of testing luminaires is designed to normalize as many variables as possible, the efficiency that is calculated from the results of a relative photometric test is not a pure "optical efficiency". Consider the following:

- When the "bare lamps" are tested, they are tested in the ambient atmosphere of the lab 25°C(77°F).
- When the luminaire is tested, it is tested in the ambient atmosphere of the lab 25°C(77°F). The ambient temperature within the luminaire is guaranteed to be warmer than 25°C(77°F).

As it was stated earlier, the lumen output of the lamps will vary as a function of the ambient temperature. This means that the lumen output of the lamps when operated inside of the luminaire will be different from the lumen output of the lamps when they are tested for bare lamp output. The efficiency that is reported on a photometric test report is the ratio of the total luminous output of the luminaire to the total luminous output of the bare lamps. The only way that a test report can show the true "optical efficiency" of a luminaire is if the lamps produce the same amount of lumens in the luminaire as they did in the bare lamp test.

### The point of this notice

Because the lumen output of the lamps operating within the luminaire can be different from the lumen output of the lamps operating outside of the luminaire, the luminaire efficiency can be increased/decreased beyond the "optical efficiency" of the luminaire. As an example, this situation could occur in a two lamp pendant T5 high output luminaire where mutual heating of the lamps, reflected radiant heat, contained heat, etc. can bring the temperature of the lamp close to the temperature that the lamp would operate at if it were in a 35°C(95°F) ambient temperature. Since T5 high output lamps have a peak lumen output near 35°C(95°F) ambient temperature, there is a possibility that an already high efficiency could be increased above 100%.

### A Word of Caution

Although the efficiency shown in a relative photometric test report is not a pure "optical efficiency", this does not mean that there is a problem with the test procedure. It means that there is a temperature factor included into the test report based on an ambient temperature of 25°C(77°F). If you are using the test results in a situation where you know the ambient temperature will be significantly different from the 25°C(77°F) laboratory conditions, make sure that you use an appropriate temperature correction factor.

