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UNDERSTANDING DUAL ARC-TUBE LAMPS AND THE EFFECT ON LUMINAIRE OPTICS

Venture Lighting International, a leading manufacturer of metal halide lighting systems, has expanded their family to include Super Pulse Start Long Life (SPL) lamps that have two independent arc tubes. While only one arc-tube operates at a time, cycling of the lamp randomizes which arc-tube ignites providing enhanced lumen maintenance and 40,000 hour rated life.

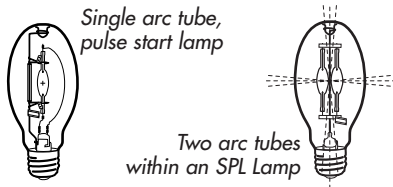
The effect of the second arc tube of the SPL lamp to fixture photometric performance has been determined to be minimal. The function and the aesthetics of light distribution are not significantly affected.

The arc tubes are positioned very close together, allowing the SPL lamp to work effectively within point-source optical systems. The effect of the second arc tube of the SPL lamp to fixture photometrics has been determined to be minimal. The function and the aesthetics of light distribution are not significantly affected.

garage model: a 360'x180'x10' garage with 20/20/20 percent ceiling/wall/floor reflectance and fixtures, (72) reflector-type luminaires, in a two-row configuration, 30' x 30' spacing 8' MH. The results showed the enclosed rated clear, dual arc-tube lamp is the recommended choice. The SPL lamp exceeds IES and NPA recommendations in minimum footcandles. In fact, the minimum footcandles of the SPL lamp deviated less than 6.5% from a single arc-tube lamp of similar wattage. The test results were favorable, because the reflector facets captured and reflected the images of both arc-tubes.

Parking Garage Comparison	150W single arc-tube PSMH	150W SPL
Rated Life Hours	15,000	40,000
24/7 Life in Years*	1.8	4.8
Lumens	14,000	14,000
Test #	ITL48439	ITL66767
Avg. Maintained Footcandles	8.7	8.0
Maximum	16.9	18.0
Minimum	4.7	4.4
Uniformity Avg : Min (NPA 3:1)	1.9 : 1	1.8 : 1
Max : Min	3.6 : 1	4.0 : 1

NOTE: * "24/7" is based on 8,400 hours per year.



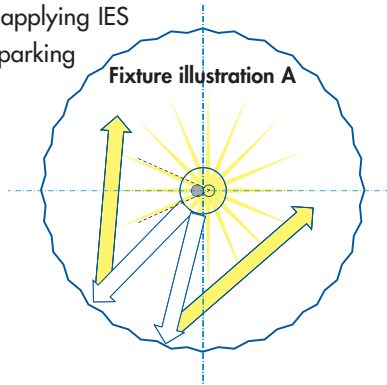
To further explain, we chose three common applications and used ITL files to study and compare the applications.

Parking Garage Lighting Example



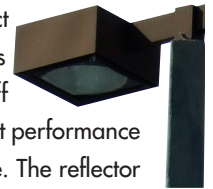
The typical parking garage fixture accepts a lamp with a base-up (BU) operating position. They are designed for symmetric distribution. Orientation of the arc-tube will always be in the vertical position (see illustration A) and the vertical facets of the fixture will reflect light adequately through and around the arc-tube that is not ignited. By applying IES

formatted data to a typical parking

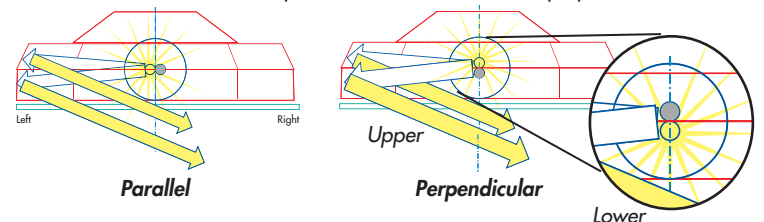






Parking Lot Lighting Example

A typical parking lot fixture installed today has a 400-watt metal halide lamp operating in the horizontal position. The lower edge of a reflector or lower row of facets project the most candlepower in between poles. SPL lamps were independently tested within a typical cut-off luminaire to determine if there were any significant performance changes by the various placements of the arc-tube. The reflector facets see a direct image of an energized arc-tube or a slightly obscured image passing through the clear quartz of the arc-tube that is not in use. Lamps were tested with the arc-tubes positioned parallel and perpendicular to the lens (see illustration B). In addition, for the perpendicular orientation we tested upper and lower arc-tube operation. See comparison table on next page.



Fixture illustration B
Parking lot fixture, with the arc-tubes oriented parallel to fixture lens versus perpendicular



Parking Lot Comparison				
	320W PSMH	320W SPL	320W SPL	320W SPL
Rated Life Hours	20,000	40,000	40,000	40,000
Arc-Tube Orientation	Centered	Parallel to Lens	Perp. to Lens Lower	Perp. to Lens Upper
				
Test #	ITL67943	ITL67944	ITL67945	ITL67946
Avg. Maintained Footcandles	2.8	2.7	2.6	2.5
	Range of Average Footcandles			
Maximum	6.6	7.9	7.1	6.1
Minimum	0.8	0.7	0.9	0.5
Uniformity Avg. : Min	3.6 : 1	3.9 : 1	3.0 : 1	4.8 : 1
Max : Min	8.6 : 1	11.5 : 1	8.2 : 1	11.8 : 1

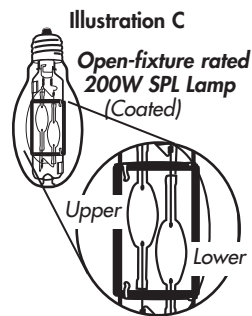
The test results showed that the lower facets of the fixture reflector effectively captured the image of each arc-tube. On average, 320-watt SPL clear lamps produced an average maintained light level of 2.6 footcandles with levels deviating only $\pm 4\%$ as a result of random arc-tube orientation.

Retail/Warehouse Lighting Example



A typical prismatic reflector high-bay is one of the most popular fixture types used for retail and warehouse lighting. These fixtures usually are open without a lens and have the lamp in a base-up operating position. Venture's 200-watt SPL open-fixture rated lamp has the arc-tubes nested within a protected shroud and is only available with a coated outer-jacket version.

Extensive independent lab testing revealed that a coated SPL lamp keeps the lighting distribution most consistent as the arc-tube location changes randomly from top to bottom. In an



application that is a 100'x100'x20' interior space with 50/50/20 percent room reflectances, high-bays are suspended on 20' x 20' centers at a mounting height of 18-feet requiring a spacing criterion of 1.3.



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Many retail and warehouse applications require 20 to 30 average maintained footcandles for general lighting. An open-fixture rated 200-watt SPL lamp in a High-Bay fixture delivers a range of 28.2 to 30.0 average maintained footcandles, with an average light level of 29.1 footcandles. As the arc-tube position changes, light levels vary by only $\pm 3\%$ which is imperceptible.

Retail & Warehouse Comparison			
	200W PSMH	200W SPL	200W SPL
Rated Life Hours	20,000	40,000	40,000
Arc-Tube Position (See illus. C)	Centered	Upper	Lower
Test #	ITL67991	ITL67993	ITL67995
Spacing Criterion	1.3	1.3	1.5
Avg. Maintained Footcandles	30.3	30.0	28.2
	29.1 Average fc		
Maximum	35.3	36.4	32.1
Minimum	22.2	21.7	19.3
Uniformity Avg. : Min	1.4 : 1	1.4 : 1	1.5 : 1
Max : Min	1.6 : 1	1.7 : 1	1.7 : 1

The results of the tests show the average footcandles of the SPL lamp deviate <4% from a single arc tube lamp of the same wattage.

In Conclusion

In Venture's Super Pulse Start Long Life (SPL) series, the effect of the second arc tube in the lamp to fixture photometric performance has been determined to be minimal. The function and the aesthetics of light distribution are not significantly affected.

For more information about SPL lamps, visit:
VentureLighting.com/SPL

