

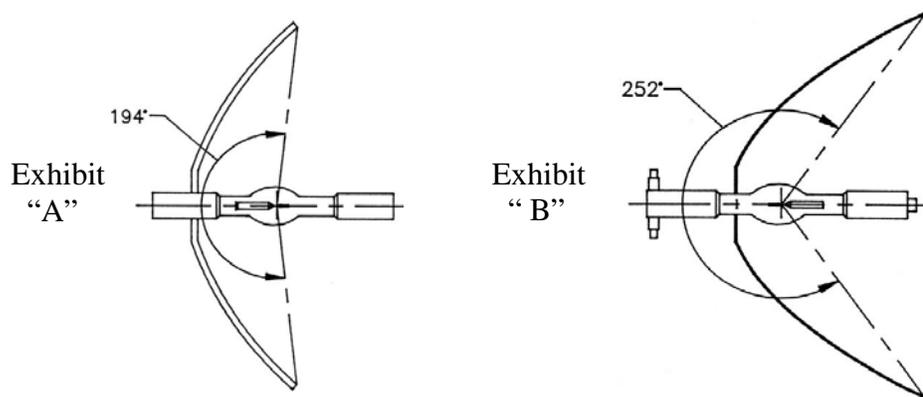
Candlepower vs. Wattage...

“The writing of a Searchlight Specification”

A specification should be written to provide enough light output to satisfy the application, as well as include any other important features necessary for that application, such as anti-icing heater circuitry for cold climates, remote electric focus, etc. The Candlepower is the “intensity rating” of the searchlight. Candlepower, measured in units of Candela, is the ability of the searchlight to produce light... the greater the Candlepower, the greater the distance. The actual light intensity at any specific distance is measured in Footcandles or Lux (metric). See sample lighting calculations on back side of this sheet.

The factors which determine the Candlepower of the Searchlight are: Wattage (amount of Light Energy available), Light Source Efficiency (Lumens per Watt) and the Optical Efficiency (the Angle of light collection combined with the Precision of Searchlight Focus). Surprisingly, Wattage is one of the least important. Even if there is a significant amount of light energy (Wattage), if the optic system of the searchlight does not efficiently collect the light, and if it does not have precise focus, the candlepower will be minimal. Assuming that there is enough wattage to satisfy the application, the Optical Efficiency is the most important factor contributing to the Candlepower.

As seen in the diagram below, the Angle of Light Collection is critical in order to maximize the Candlepower. If two Searchlights have the same wattage lamp, and one searchlight (Exhibit “B”) is able to collect more light, then the Candlepower will be greater. And if that same searchlight is able to focus the beam more accurately, because of a more precise parabolic reflector, the Candlepower will also increase because there will be “fewer out of focus light rays”, resulting in a more concentrated, brighter Beam.



In conclusion, **you should specify Candlepower rather than Wattage.** The advantage for the customer is that while he will still receive a product with the required Brightness, in addition, he may now achieve a reduction in the size, weight, and power consumption... and most importantly, the price may be lower also!



Searchlight Ranges and Light Intensity Calculations

The candlepower requirements to illuminate objects over specific distances are shown below and are copied from information in the IES Lighting Handbook, (published by the U.S. Illumination Engineering Society) for a target on a clear night. As the IES handbook points out, searchlight ranges can be reduced by haze, smoke, fog or any additional poor weather conditions.

CANDLEPOWERS REQUIRED TO PRODUCE DISTANCES.

Miles Range	Required Candlepower	Meters Range	Miles Range	Required Candlepower	Meters Range	Miles Range	Required Candlepower	Meters Range
¼	270,000	402	1-1/4	1,600,000	2011	3	20,000,000	4827
½	420,000	805	1-1/2	2,500,000	2414	4	35,000,000	6436
¾	630,000	1207	2	5,500,000	3218	5	70,000,000	8045
1	1,000,000	1609	2-1/2	11,000,000	4023	6	150,000,000	9654

Candlepower is the “Capacity to Produce Light” and does not change over distance. However the actual light intensity (measured in Foot-Candles or Lux) does change over distance, and can be mathematically computed at any specified distance if the Candlepower Rating of the searchlight is known. . Also, The Carlisle & Finch Beam Candlepower (Bcp) figures listed below are determined by the Internationally accepted procedure of measuring directly the light output in Foot-candles (Fc), at a known Distance (D) in feet, between the searchlight and the target. Beam Candlepower is then computed by the formula $Bcp = (Fc) \times (D)^2$. The units of measure for Beam Candlepower (Bcp) are Candela, Distance (D) in Feet, and Intensity (Fc) in Foot-candles. For applications which require the Beam Intensity displayed in metric (Lux values at distances in Meters), simply use the same formula and convert Feet into Meters and Foot-candles into Lux. See sample calculations below.

Sample #1: Calculating Light Intensity at a specified distance(if Candlepower is known)

Example: If a searchlight has a 4.3 Million Candlepower rating, what will be the Light Intensity at a distance of 250 meters, in Lux and Footcandles?

Using formula: $Bcp = Fc \times (D)^2 \dots$ where $Fc = Bcp/(D)^2$
 $Fc = 4,300,000/(250 \text{ meters} \times 3.281 \text{ feet per meter})^2 = \mathbf{6.39 \text{ Foot-candles}}$
 Since 1 Lux = .0929 Foot-candles, then $6.39 \times 1/.0929 = \mathbf{68.78 \text{ Lux}}$

Sample #2: Calculating Candlepower(if Light Intensity at a Specified Distance is known)

Example: If a searchlight beam measures 1 Lux at 2km, what will be the Beam Candlepower of the searchlight in units of Candela?

Using formula: $Bcp = Fc \times (D)^2$
 $Bcp = (.0929 \text{ Foot-candles per 1 Lux}) \times (2000 \text{ meters} \times 3.281 \text{ feet/meter})^2$
 $Bcp = \mathbf{4,000,260 \text{ Candela}}$