GENERAC®
MOBILE

WHITE PAPER

LED vs. Metal Halide

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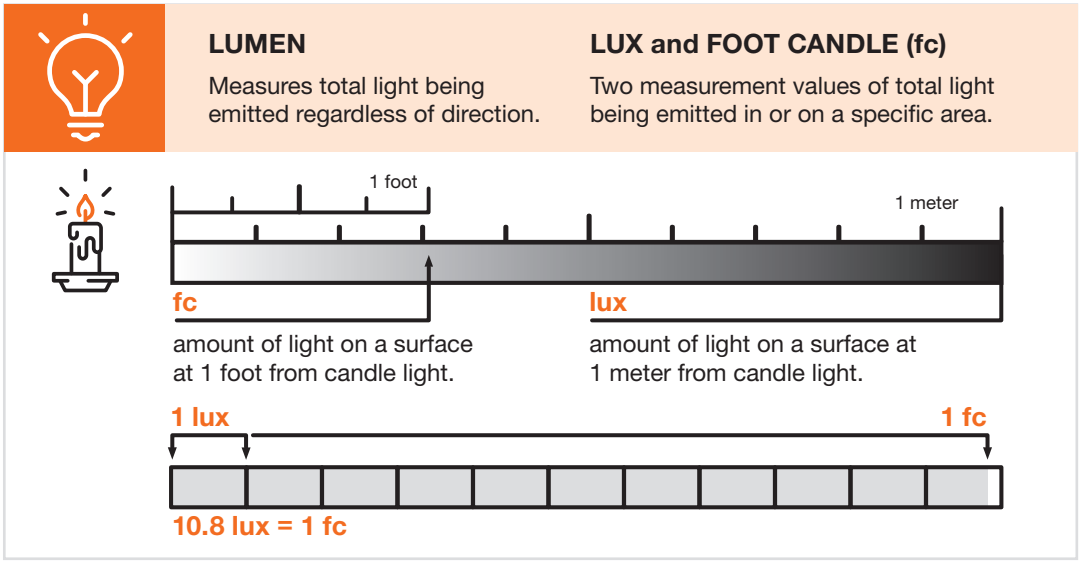
INTRODUCTION

For decades, metal halide lights were the preferred lighting method for the jobsite due to their high lumen output and ability to cover large areas. However, the latest LED technology has provided energy-efficient, reliable and high-performance lighting that is taking over the market. These improvements have increased demand for LED light towers, and in the not too distant future, metal halide light towers will be a thing of the past. This white paper will explore what you need to know when choosing a light tower in today's market.

LIGHT MEASUREMENT

Proper lighting is a critical component to worksite safety. It improves nighttime visibility, allowing for around the clock-work to complete jobs in less time. OSHA standard 29 CFR 1926.56 for construction areas sets minimum illumination requirements, measured in foot-candles that will allow workers to safely navigate and avoid hazards to complete the specific type of work indicated.

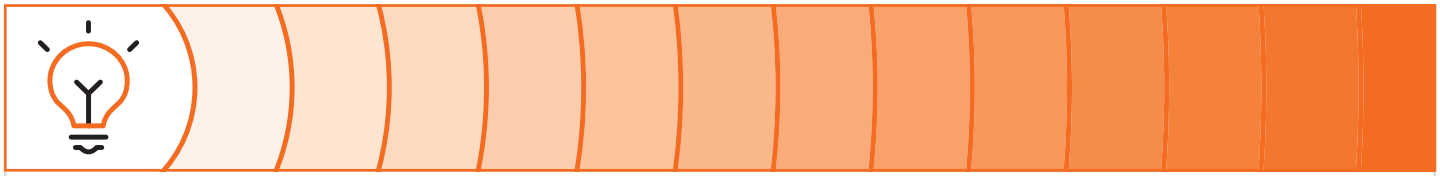
A foot-candle is a unit of measure of light emitted from one candle falling on a one-square-foot area one foot away. Light is typically measured as a lumen or lux using a light meter. Basically, one foot-candle can be equated to one lumen per square foot.



In OSHA standard 1926.56(a), the minimum foot-candles for each area of operation are outlined as follows:

Foot Candles (FC)	Area of Operation
5	General construction area lighting
3	Concrete placement, excavation and waste areas, access ways, active storage areas, loading platforms, refueling, and field maintenance
5	Indoors: warehouses, corridors, hallways, and exit ways
5	Tunnels, shafts, and general underground work areas. Exceptions apply: for shaft and tunnel heading, ten foot-candles is the requirement for mucking, drilling and scaling. Bureau of Mines-approved cap lights are also acceptable
10	In general shops or construction plants such as screening plants, batch plants, carpenter shops, mechanical and electrical equipment rooms, rigging lofts, active storerooms, mess halls, and indoor toilets and workrooms
30	First aid stations, infirmaries, and offices

For industrial areas not covered by the OSHA standards, construction managers can refer to the American National Standard A11. 1-2965, R1970. This includes industrial lighting for warehouses, shipyards, loading docks, and other work areas. The following chart is a guide for the amount of illumination required in each environment:



Illuminance (in foot-candles)

50 45 40 35 30 25 20 15 10 05 0.5 0.25

00 - 05 fc	Rail Yards, Parking Lots, Airports, Haul Roads
05 - 10 fc	Quarries, Open Mining, Industrial Yards
10 - 15 fc	General Construction, Rec Areas
15 - 20 fc	Marine Areas / Piers
20 - 30 fc	Loading / Unloading Areas
30 - 40 fc	Explosives Handling
40 - 50 fc	Sporting Events

MYTH

A light tower will cover 5 to 7 acres.

FACT

Know the requirement when lighting your job site or event.

UNDERSTANDING METAL HALIDES

Metal halides are compounds formed when metal and halogen elements combine. Metal halide lamps produce light by passing an electric current through a combination of mercury and metal halide gas. A study carried out by The Dark Sky Society showed that the initial lumens of a 400-watt metal halide lamp are 20,500 and its rated life expectancy is around 15,000 hours. However, while a metal halide bulb has a very high light output initially, it loses its lumens very quickly. When the bulb gets to half of its lifespan, around 10,000 hours, lumen depreciation may have gotten to 50%. Metal halides are also omnidirectional; they distribute light in every direction, meaning a lot of the light that is produced is wasted. They also have the longest warm-up period of any light on the market. Many metal halide lamps take 15-20 minutes to reach their normal operating temperature. They are also extremely susceptible to vibration and breakage, and most deployed in mobile light towers never reach their rated life expectancy, or even half of it.

THE EVOLUTION OF LED LIGHTS

Light-emitting diodes are tiny devices made from semiconductor materials that convert electrical energy into visible and near-UV wavelengths when they are assembled in a package and connected to an electrical circuit. Over the past decade, these tiny diodes have improved in color range, lumen output, color stability, lifespan and other areas allowing them to replace many other lighting technologies.

LED lights produce light that is directional and all the light is focused where it is needed. Another advantage of LED lighting is that it can be dimmed and then brought back to full brightness instantly as necessary. Metal halide lights do not switch on and off on demand, you have to wait for them to restrike, which can be costly due to lost production time and potentially very dangerous on a jobsite. Unlike traditional incandescent bulbs, LEDs don't have a filament that burns out and they don't generate as much heat. Early LEDs emitted very little light, but with technological advances, LED efficiency and light output have gone up dramatically.

COMPARING LED AND METAL HALIDE

There are several differences to consider when comparing LED to metal halide light fixtures. The two technologies use entirely different methods of producing light. Metal halide bulbs contain metals that are evaporated into inert gas within the glass casing, while LEDs utilize solid-state, semiconductor technology. While both technologies produce high quality light

output. LEDs tend to be more durable and last much longer, are more energy efficient and are a less maintenance intensive technology. Metal halides can have long strike and warm-up periods and a shorter lifespan, but produce a very high quality light especially when it comes to warm color temperatures. Whereas, LEDs can be instantly switched on and off, and the latest generations have improved to offer true daylight color temperatures. When looking to add a lighting solution to your jobsite, it is important to know the nuances of each light type, so you can determine what is best for your application.

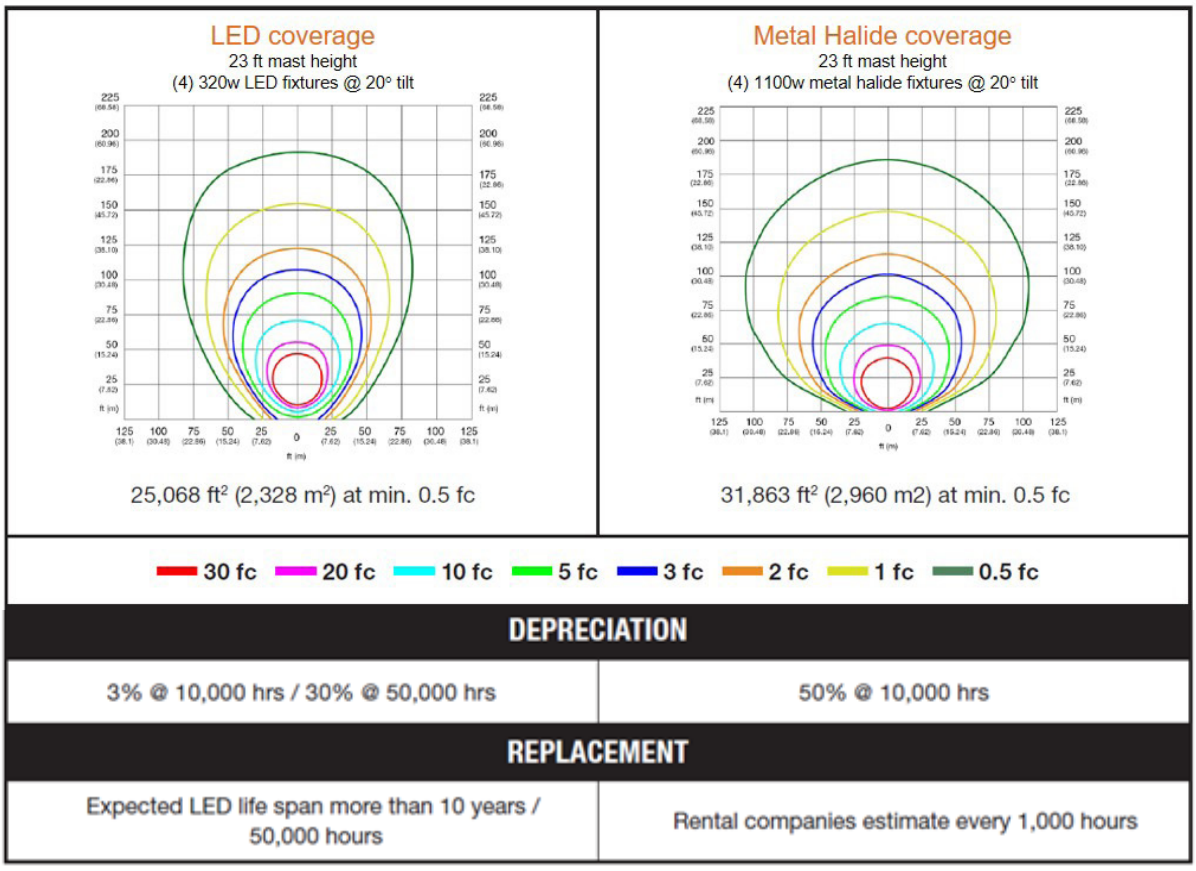
Lumens

The numbers in table 1 represent "fixture lumens", which is a more accurate, exact measure of actual usable light. Most light tower manufacturers only list "bare bulb lumens" for metal halide light towers, which is a rating of the maximum available lumens from a brand-new metal halide bulb. However, when the bulb is placed in a fixture, you can instantly lose up to 50% of bare bulb lumen output due to fixture inefficiencies.

Generac 320 Watt Gen4 LED	1100 Watt Metal Halide
43,050 lumens per fixture (x4 fixtures)	70,356 lumens per fixture (x4 fixtures)
188,000 total lumens per tower	281,424 total lumens per tower with new bulbs

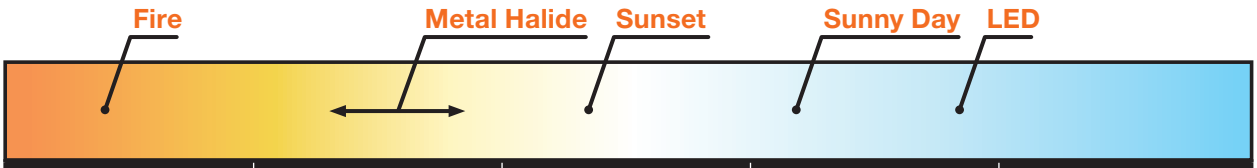
Coverage

Total lumen output doesn't give a true representation of the usable light cast over an area. Instead, we need look at the light coverage maps, which show the area covered at different foot-candle thresholds. When you compare our LED vs 1100 W metal halide towers, you can see that the light output from the LED tower is more focused and directional, with less light spillage to the sides. This had long been one of the drawbacks to earlier generations of LED light towers, they lacked the punch and spread of metal halide models. "Punch" is how far forward the light can be cast or "thrown", and "spread" is how wide the light is being cast out to the sides. The latest LED technology has all but eliminated that gap, and future generations of LEDs will continue to outpace the capabilities of metal halide.



Kelvin Color Temperature

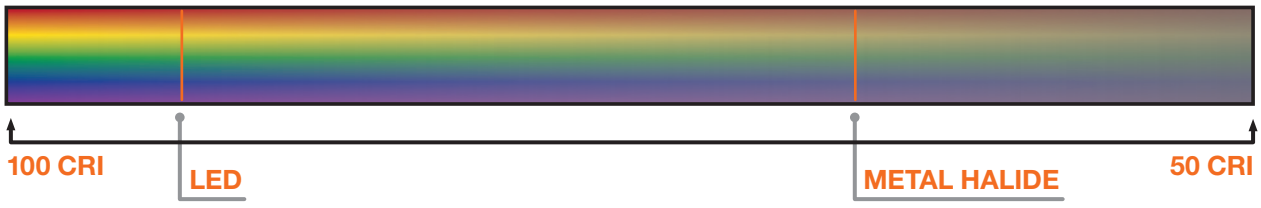
Metal halide bulbs change temperature with bulb degradation, so the color will not be consistent throughout the lifetime of the bulb. Generac's latest 4th generation of LEDs, however, provides better, more consistent light for jobsites in the 5,000 K range.



Extra Warm 2000 - 2500K	Warm White 2700 - 3000K	Mid-range 35000 - 4000K	Cool White 4000 - 5000K	Daylight White 5000K+
Bread / Meat Displays City Beautification Not for general lighting	Residential lighting Restaurants Hotel Lobbies	Retail Stores Supermarkets Showrooms	Offices Hospitals Manufacturing	Graphics Studios Winter Goods Shops Seasonal Affective Disorder

Task Color Rendering

The Color Rendering Index (CRI) is a measure of a light source's ability to show an object's true colors "realistically" or "naturally", as compared to a familiar reference source, generally either incandescent light or daylight. Color rendering is important in applications that have hazard or warming labels and signage present. Think of chemical or explosive storage areas, traffic-warning signs, or a bundle of colored wires, and the importance of needing to distinguish the difference between blue wire and green wire when connecting power to equipment.



CONCLUSION

LED technology has finally reached a point where serious consideration can be given to the obsolescence of metal halide lamps. The list of benefits gained by switching to LED is long and getting longer as the performance continues to evolve, improving overall TCO.

- Improved Fuel Efficiency, Longer Run Times and More Export Power Available
- Lightweight and Durable, Longer Life Expectancy and Maintains Lumen Output
- Instant ON/OFF, Cool to the Touch, Better Color Rendering and Temperature Output for Improved Site Safety
- Reduced Maintenance Costs with Virtually No Bulb Replacement or Related Service Calls
- 5 Year Warranty and Higher Residual Resale Value
- Generac Gen4 Fixture Specific - Even & Efficient Lumen Distribution, No Hotspots, Easily Converted to Diffuse