

# lowbay revisited.

common industrial lamps.

## F96T12HO

the old 8-foot workhorse, commonly used in the industrial reflector fixtures found everywhere. still available in low-CRI, cool-white versions. 12,000 hours life.

## 400W Metal Halide

formerly the standard choice for highbay lighting. has a CRI in low 60's, and significant lumen depreciation over life.

## F96T8HO

an 8-foot T8 lamp intended to replace the T12HO. obstacles to adoption include lamp life less than the 4-foot T8 and a reputation for breakage.

## Pulse Start Metal Halide

design of pulse start shifts the starter to the ballast from the lamp, similar to HPS. although the CRI is the same as standard metal halide, lumen depreciation is improved as is output. also starts reliably at colder temperatures than standard metal halide.

## F54T5HO

a nominal 4-foot lamp that produces nearly double the lumens of standard 4-foot lamp. lamp brightness is so great that direct luminaires are not advised, except at the higher mounting heights common to lowbay and highbay lighting.

## Lamp Watts vs. system Watts

in the chart at the bottom of this page you may note that the lamp Watts are different than the system Watts. generally HID ballasts consume about 15 - 20% of the rated lamp watts. so do not make your payback calculations simply based on the lamp Watts - get the full fixture wattage values to do correct calculations. Note that electronic ballasts operating fluorescent lamps may have system watts equal to or less than lamp watts!



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Back in 1996 I wrote an article that said to stop using metal halide luminaires in warehouse-storage-industrial facilities. Fluorescent is more efficient! Then, I compared Metal Halide and T8 fluorescent and found the Fluorescent used 30% less energy to produce the same light levels in the 20 to 25 foot mounting height range.

Technology has improved in the last 6 years so it is time for an update. Adding to the original study of 400 MH and F96T8/HO I add Pulse Start MH and F54T5/HO. Also, I'm using mean lumens because they are a better representation of the light output of the lamps. Mean lumens are measured when the lamps has burned for 40% of its rated life.

From a mean lumen standpoint, a 4-lamp F96T8/HO/RE70 or 6-lamp F54T5/HO system would produce 20% more lumens using 20% less energy than the 400 MH, 26% more lumens using the same energy as the 320 MH, and 3% more lumens using 10% less energy than the 350 MH. Assuming that the light loss factors were equal for both systems and you used luminaires with comparable efficiencies (I know you can find super efficient HID luminaires, but I can find super efficient Fluorescent luminaires also) the fluorescent system would be the most energy efficient. The 350 Pulse Start Metal Halide would be a good second choice, but skip the 320 Pulse Start and the standard 400 watt Metal Halides.

The lamp life for the two systems is comparable: 18,000 to 20,000 hours for the Fluorescent and 20,000 hours for the Metal Halide. The lighting distribution (softer shadows) will be better with the fluorescent system due to 2 to 3 times the number of luminaires and/or their significantly larger size. The instant-on capabilities of the fluorescent eliminates the need, and cost, of the quartz restrike in the Metal Halide. Daylight control and scheduling scenarios will be cheaper and easier to implement with an instant-on fluorescent light source. Color rendering and color consistency of the fluorescent is significantly better than the Metal Halide.

On the negative side, there will be 4 to 6 times the number of Fluorescent lamps to maintain and possibly 2 to 3 times the number of Fluorescent luminaires to purchase and install. The added cost for installation and maintenance may be offset by the lower cost of the Fluorescent luminaires, lamps, and energy consumption. In unheated spaces the Fluorescent system may have difficulty starting or providing full light output in cold environments (there are 0 degree starting ballasts).

So what is the answer? There are many options, calculations show that the fluorescent system will be more efficient even at 35 foot mounting heights. But you must consider all the variables, number of luminaires, number of lamps, cost of equipment, type and quality of the luminaire, color quality of the light, light distribution, maintenance costs and energy costs.

Lamp	Watts	Mean Lumens	Mean Lumens/W	Lamp Life	Instant Restrike
400 watt MH	460	23,500	51	20,000	NO
350 watt Pulse Start MH	400	27,500	69	20,000	NO
320 watt Pulse Start MH	368	22,500	61	20,000	NO
4-lamp F96T8/HO/RE70*	<b>370</b>	28,400	77	18,000	YES
6-lamp F54T5/HO*	<b>360</b>	28,440	79	20,000	YES
* 1.0 ballast factor					