

Design guide for Warehouse – 400w Metal Halide

The Problem

Provide high quality lighting that illuminates the warehouse shelves to IESNA recommended light levels while beating ASHRAE/IESNA 90.1-2004 Standard for Warehouse Lighting of 0.8W/ft².

The Solution

This guide shows a base 400 watt lighting system that may be found in many existing facilities. **This guide is not intended to be “what to do” for a new facility.** See Energy Saving Options section below for retrofit options.



Room Characteristics

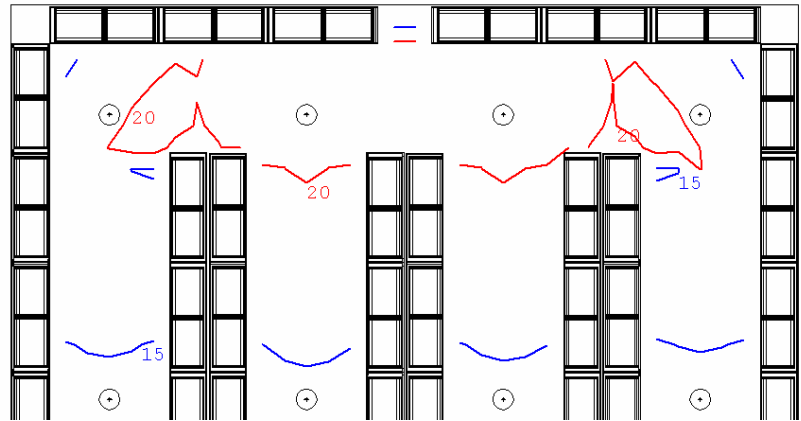
Dimensions

Length	Width	Height
72'	150'	28'

- open ceiling

Surfaces/Reflectivity

- Ceiling: White (0.80)
- Walls: Paint – Gray (0.30)
- Floor: Concrete (0.20)
- Displays: Product (0.30)



Product Specification

- Description: Pendant mounted industrial Metal Halide
- Lens: clear
- Watts: 460
- Number of lamps: 1
- Lamp: 400MH
- Lumens per lamp: 36,000
- Ballast Factor: 1.0
- Lamp Lumen Depreciation: 0.67
- Dirt Depreciation Factor: 0.84

Product Installation

- Number of luminaires: 24
- Mounting: 24 feet AFF
- Luminaire spacing: Center of rows 26' O.C.
- Footcandles (stack area):
Horizontal = 15.5 (0' aff)
Vertical = 13.0
- Watts/ft²: 1.02

Affordability: This is a low first cost option compared to other energy efficient lighting designs.

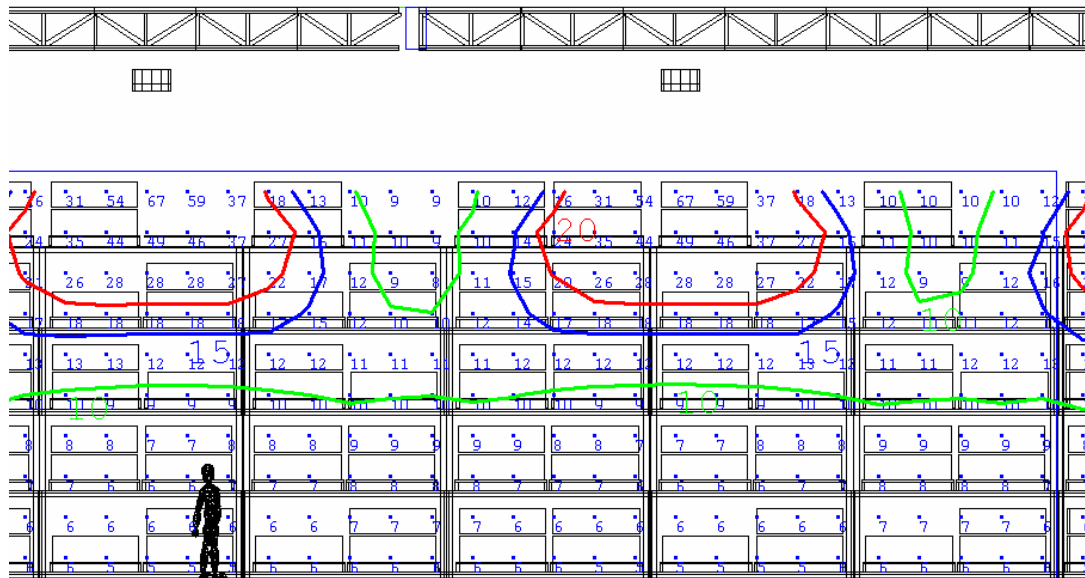
Design Implications

The shelving/luminaire layout along with the mounting height of the fixture is the most important consideration because vertical product lighting is critical. Improper location or mounting height can create shadows and low light levels on the racks.

Energy Saving Options	Watts per luminaire	Energy Savings from Base Design	Light level from Base Design
320 watt retrofit	364	20% (0.81 W/sf)	90%(h and v)
6-lamp T5HO wide distribution	360	20% (0.8 W/sf)	114%(h), 106%(v)
4-lamp T5HO narrow distribution	240	48% (0.53W/sf)	78%(h), 72%(v)

- Washington code allows 0.5W/sf (1.15W/sf using rack allowance – footnote 11)
- Oregon code allows 0.8W/sf
- Idaho code allows 0.8W/sf
- Montana code allows 0.8W/sf





Lighting Calculations

The above image shows the vertical footcandles provided on the face of the stacks. Vertical footcandles are much more important than the typical horizontal footcandles, because the task is the vertical stacks. Light loss factors (lamp lumen depreciation and luminaire dirt depreciation) along with the ballasts factor have been factored into the calculated numbers.

Design Issues

The quality of rendering is not indicative of how the human eye will perceive this space lighted. The eye will see the surfaces as having a more graduated illumination and more light in the workspaces. While the product is normally a low reflectance the space will actually feel darker when the shelves are not full.

Lensed Luminaire

Use lensed luminaires to keep the fixture clean and for protection from lamp failures. There may be a high glare potential when looking up to the top racks from the fixtures. Use a high reflectance ceiling and luminaires with some uplight to make the space feel bright and open and reduce glare potential.

Luminaire Selection

Not all luminaires are created equally. Just because two luminaires look alike does not mean they perform the same. If you are unsure of a luminaire's performance do not hesitate to ask distributors and representatives for calculations using their product. Make sure ballast information, light loss factors, and reflectance's are the same for each calculation.

Stacks

Stacks have a large impact on the illumination of a space. The vertical surfaces absorb and block light as well as create shadows if positioned off-center from a direct fixture. The stack layout must correspond to the lighting layout to minimize the shadows.

Affordability

Affordability is based on fixture and lamp costs only. Variables of cost include ease of installation, contractor knowledge of product and the time it takes for installation. In retrofit situations, costs are variable depending on existing wiring layouts.

Controls

Occupancy sensors or building energy management systems should be incorporated to turn the lights down but not off when the occupants are away or after hours. One of the most cost effective solutions is to have the fixtures come from the factory with integral occupancy sensors and multi-level ballasts to minimize wiring labor costs.

Daylight harvesting controls should be used on all luminaires within the daylight zone (typically 70% of the ceiling height in all directions from the edge of a skylight). Provide about 6% of the roof area in skylights to achieve 50% annual lighting energy savings.

Metal Halide lights are not an instant on source so using a control system that turns the lights off is not recommended. Use dimming or multi-level ballasts that reduce the light output.