





# INTRODUCTION

DRIVERS ON OUR NATION'S HIGHWAYS AND WORKERS AT PORTS AND RAILWAYS MUST BE AS SAFE AT NIGHT AS THEY ARE DURING THE DAY. IN RECENT YEARS, SECURITY HAS ALSO BECOME A PRIORITY. FACILITIES MUST HAVE ENOUGH LIGHT TO THWART VANDALISM, TERRORISM AND THEFT. OWNERS ALSO SEEK TO DECREASE THE COST OF OWNERSHIP BY MINIMIZING ENERGY CONSUMPTION AND MAINTENANCE.





Holophane and American Electric Lighting bring over 160 years of combined leadership to the transportation industry, offering lighting solutions for a range of infrastructure applications.

Holophane’s innovative High Mast Systems are easy to maintain, minimize the number of poles needed and ensure high levels of visibility. Mongoose luminaires facilitate wider spacing between poles, increase vertical illumination and provide excellent lighting uniformity.

Safety through effective lighting is one key concern when purchasing roadway lighting. American Electric Lighting offers a wide range of high speed roadway products including the 325 cobra head luminaire that provides reliable roadway lighting meeting any design criteria.

By combining efforts, Holophane and AEL present a thorough product selection and can provide a clear resolution to any lighting application. Contact your local Holophane/American Electric Lighting factory sales representative or visit our websites at [www.holophane.com](http://www.holophane.com). or [www.americanelectricleighting.com](http://www.americanelectricleighting.com)

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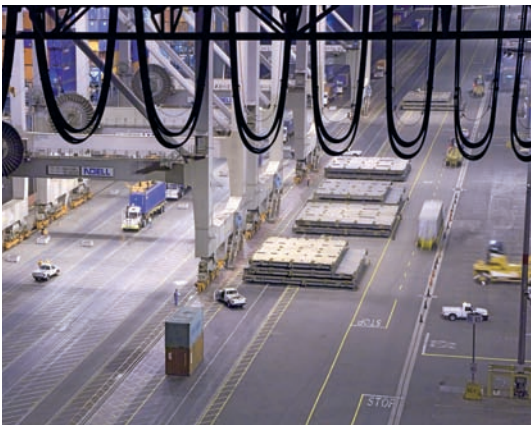
# LIGHTING CONSIDERATIONS

- Uniformity
- Vertical and Horizontal Lighting
- Glare Control
- Light Trespass
- Environmental Issues





**State Route 54; Osage Beach, Missouri** Mongoose® luminaires effectively illuminate the 60 - foot wide roadway from one side of the highway and created a safer environment for both travelers and local residents.



**Port of LA; San Pedro, California** High Mast System boosted both vertical and horizontal illumination and uniformity that enables a safe working environment.



## UNIFORMITY

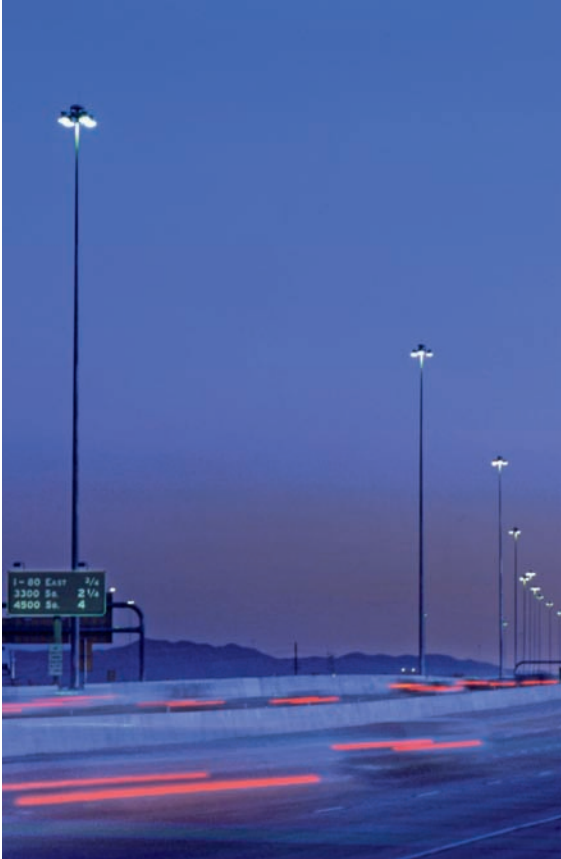
Most transportation environments are 24-hour operations where occupants must have sufficient illumination to make decisions and perform a variety of tasks. This requires an evenly illuminated space that is comfortable and highly visual, without dark areas and glare.

Holophane optical systems provide the light control needed for portal to portal illumination providing excellent uniformity and wider spacing between poles critical in applications with heavy equipment and high volumes of traffic.

## VERTICAL AND HORIZONTAL LIGHTING

Vertical and horizontal illumination creates an enhanced visual field to promote greater nighttime security. Drivers, equipment operators and others can quickly read signage and identify vital equipment. They can see between buildings, rail cars and containers.

Holophane area lighting systems ensure high levels of vertical and horizontal illumination, helping individuals discern the details of approaching objects. Occupants within the space feel safe because they have enough fill light to discern details.



**I-15; Salt Lake City, Utah** The High Mast System utilizes a prismatic reflector that reduces glare and minimizes light trespass in the residential areas on the surrounding mountainside.



**Southwest Harbor, Seattle, Washington** The High Mast System has a symmetric and asymmetric distribution to minimize light trespass and glare into the neighboring community without sacrificing visibility which is of particular importance to longshoremen while moving containers.



## GLARE CONTROL

An environment with glare is uncomfortable, unsafe and unproductive. Holophane luminaires feature high performance optical systems that minimize the veiling luminance—or glare—that can distract drivers and hinder workers.

Prismatic reflectors and refractors and shields reduce both discomfort glare and disabling glare. Fixtures may be installed at various mounting heights and with a range of lamp wattages to control glare and create a more usable environment.

## LIGHT TRESPASS

With many ports, railroads and highways located near residential, tourist and conservation areas, facilities must be able to install lighting systems that avoid unwanted illumination onto adjacent properties. Holophane engineered optical systems include prisms that control light and distribute it on the task at hand to limit light trespass.

Luminaires are available with asymmetric and symmetric distribution and shields to control light at the property line. This allows facilities to install luminaires and poles where they are needed for maximum effectiveness.



**Port of Oakland; Oakland, California**  
 The High Mast luminaires have an external shield to eliminate light trespass and meet all Illuminating Engineering Society (IES) full cutoff requirements and the port instituted a restricted uplight policy.

## NIGHTTIME FRIENDLY

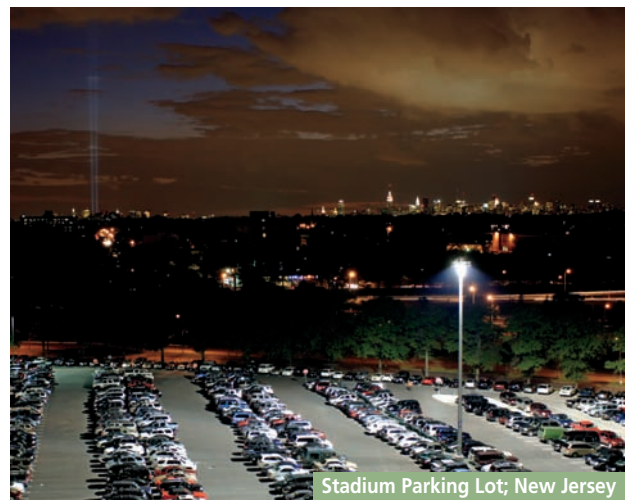
Lighting fixtures must prevent the haze or glow common to many populated areas that hampers views of the nighttime sky. Light enters the sky either as indirect illumination reflected off surfaces by outdoor lighting systems or as light directed above the horizontal plane.



NIGHTTIME FRIENDLY

Consistent with LEED® goals & Green Globes™ criteria for light pollution reduction

Holophane lighting systems are designed to meet most lighting ordinances that restrict the amount of illumination that emits into the night sky. If an application requires the high visibility provided by full cutoff luminaires, restricted uplight luminaires are available to prevent sky glow.



Stadium Parking Lot; New Jersey





# ECONOMICS OF LIGHTING

- Cost Effective - Wider Spacing,  
Less Poles/Fixtures
- Better Use of Space
- Ease of Maintenance

## COST EFFECTIVE

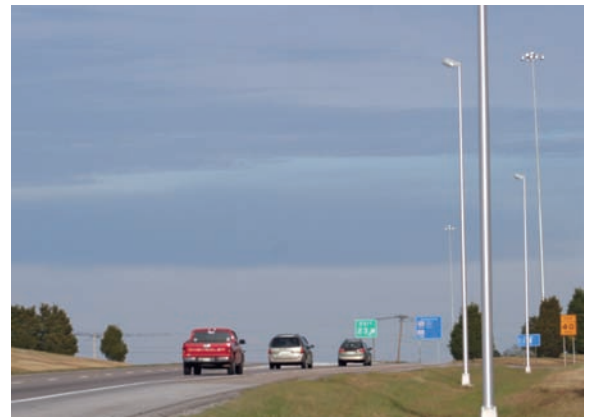
While safety and security are critical for infrastructure applications, budget limitations must be considered, too. Holophane systems are designed to minimize operating costs, with highly efficient optical systems that allow DOTs, ports and railway facilities to use fewer poles and luminaires while obtaining the same—or better—results.

Cost savings are passed down the line with fewer poles and foundations, reduced energy consumption and less maintenance. DOTs and facility owners benefit from improved performance and the lowest cost of ownership.





**Union Pacific Railroad** used two High Mast Systems with 12 luminaires per pole to replace up to 30 wooden poles, which significantly reduced maintenance costs and virtually eliminated downtime. High Mast Systems were used for general lighting, HMSC® luminaires with cutoff optics for areas where light trespass was a concern.



## USE OF SPACE

Land is at a premium these days, with many ports and railway yards sandwiched between residential and commercial areas that limit expansion. Because Holophane systems meet—and exceed—lighting requirements with fewer poles and luminaires, facilities can maximize work spaces within existing facilities.

Minimal poles translate into more room for storage and fewer obstacles to inhibit truck and auto traffic and equipment operators. Spaces also appear cleaner and less congested overall.

## EASE OF MAINTENANCE

Maintaining light fixtures can be expensive and even dangerous. It is costly to close highway lanes or shut off areas within a busy port or railway yard. Maintenance crews are at risk any time they must service luminaires along busy roadways or make repairs at dangerous heights.

Holophane High Mast System lowering devices allow maintenance workers to bring luminaires to the ground for servicing, eliminating the down time associated with repairs. Optical systems on luminaires such as the Mongoose are efficient and allow poles to be installed a distance from the roadway to ensure worker safety.



# APPLICATIONS

- Department of Transportation
  - Interchanges
  - High Speed Roadways
  - Tunnels, Underpasses, Bridges
  - Sign Lighting
  
- Ports
  
- Railways



## DEPARTMENT OF TRANSPORTATION



## CHALLENGES

- Departments of Transportation face challenges specific to highways and tunnels.
- Lighting must meet AASHTO, FHWA and IESNA design criteria
- Drivers require sufficient illumination to travel high speed roadways, interchanges, tunnels and underpasses
- Lighting must be dependable and require minimal energy, maintenance
- Lighting needs to turn on and off automatically
- DOTs constantly strive to be good stewards of a declining tax base





## MONGOOSE ILLUMINATES RICHMOND EXPRESSWAY

The Richmond Expressway in Richmond, Virginia takes drivers from the heart of the historical city to the outlying suburbs. Good lighting is essential for this stretch of highway because of the volume of traffic and so toll booth workers can read license plate numbers.

Pole arms on the existing cobra-head fixtures had become cracked or otherwise damaged. When planning for the system retrofit, the Virginia Department of Transportation advised against cobra head units because they require a lane closure for maintenance.

Richmond Metropolitan Authority, which owns the expressway, replaced cobra head units with Holophane Mongoose® luminaires, mounted on existing poles. Luminaires with 150-watt high pressure sodium lamps and semi-cutoff optics were installed along ramps, with 250-watt HPS lamps and semi-cutoff optics used along the main line. Fixtures at the toll plazas have 400-watt metal halide lamps and cutoff optics.



“MAINTENANCE CREWS ARE ABLE TO SERVICE FIXTURES ON THE ROADWAY SHOULDER WITHOUT THE EXPENSE AND INCONVENIENCE OF CLOSING LANES.”

“With a tilt angle of 0 degrees, fixtures at every location illuminate the entire roadway with almost no glare,” said Antonio Altamar, lighting design section manager, HNTB Corporation.

“Maintenance crews are able to service fixtures on the roadway shoulder without the expense and inconvenience of closing lanes.”

Illumination levels exceed the minimum .2 footcandles AASHTO recommends for interstate highways.

## HOLOPHANE ADVANTAGES

- Holophane systems meet IESNA, AASHTO and FHWA design criteria
- Precisely engineered optical systems control light for excellent uniformity
- Fixture distribution designed to reduce sky glow, light trespass
- Durable glass reflectors and refractors minimize maintenance
- Vertical illumination allows drivers to read signage
- High mast devices lower to the ground for servicing
- Fewer poles and luminaires result in lower cost of ownership
- Luminaires may be used with photocells for automatic control



Vermont DOT; Richmond, VA



## LIGHTING MAKES VEGAS TUNNEL SAFE



Quality lighting was essential for the 2,740-foot, six-lane vehicle tunnel at McCarran Airport in Las Vegas, where external brightness measures as high as 10,000 footcandles in the summer. Designers were concerned with avoiding the “black hole” effect that drivers can experience when moving from a bright exterior to a darker interior.

Holophane ProBeam® tunnel luminaires with 400-, 250-, 150- and 100-watt high pressure sodium lamps were installed within the tunnel at 18 feet. The lighting system includes daytime, nighttime and energy-saving intermediate levels, with the latter used at twilight or when skies are overcast.

A sunshade was also installed at the tunnel entrance to lower outdoor brightness to approximately 1,000 footcandles. Luminaires were aimed away from oncoming traffic, with longitudinal spacing varying from eight feet at the entrance to 24 feet in the transition zones and 48 feet in the interior.



“THE WALLS AND OTHER VEHICLES ARE WELL LIT, WHICH INCREASES SAFETY BECAUSE MOTORISTS FEEL COMFORTABLE.”

“Drivers experience no glare when they enter and drive through the tunnel,” said Ernie Gomes, Electrical Layout Supervisor for Bechtel Corporation. “The walls and other vehicles are well lit, which increases safety because motorists feel comfortable.”

ProBeam fixtures use three different light levels determined by the amount of external ambient light.

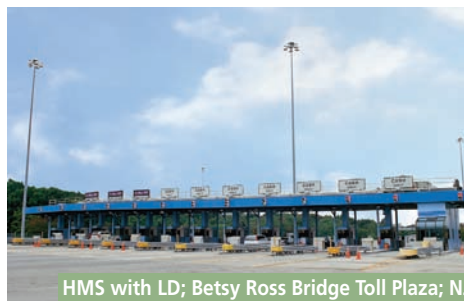
## SIGNS, TUNNELS, UNDERPASSES AND BRIDGES



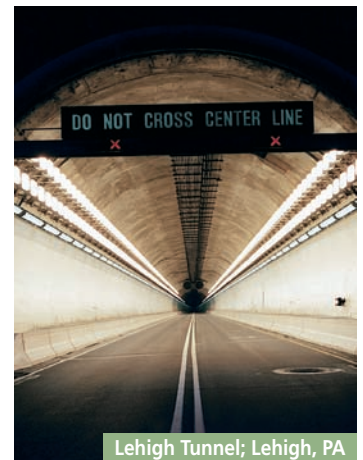
Gateway Bridge; Nashville, TN



Sign-Vue II; Redlands, CA



HMS with LD; Betsy Ross Bridge Toll Plaza; NJ



Lehigh Tunnel; Lehigh, PA

# PORTS



## CHALLENGES

- Land is scarce and expensive
- Cranes, trucks and other vehicles need room to maneuver
- Drivers must be able to identify obstacles and other vehicles
- Lighting must be maintainable without interrupting 24/7 operations
- Local ordinances prohibit sky glow, light trespass
- Lighting must turn on and off automatically
- Prevention of theft and vandalism



Subaru Port; Columbia Gateway, Vancouver



## HIGH MAST SAVES SPACE AT HOUSTON PORT



When light fixtures were installed at Terminal No. 5 at Barbours Cut Marine Terminal along the Houston Ship Channel, fixtures were restricted to property edges to facilitate movement of the port's mobile cranes. Terminal No. 5 is 1,000 feet wide and 2,500 feet deep and stores modular containers for shipping.

Holophane LD 25 High Mast Systems were installed on 75-foot poles mounted on five-foot pedestals. Poles were spaced 200 feet by 1,000 feet, with 16 1,000-watt HPS Prismbeam luminaires mounted on each pole. Existing port facilities use fixed poles with horizontal arms supporting 18 lamps per pole.

"We selected the High Mast System because we have so much heavy equipment and need as few poles as possible placed in out-of-the-way locations," said John Paterson, chief electrical engineer, Port of Houston Authority.



"THE LIGHT IS WELL DIRECTED AND LIGHTING UNIFORMITY IS GREATLY IMPROVED."

"The Holophane High Mast System allowed us to increase footcandle levels about two times, with two fewer fixtures per pole compared to other facilities. The light is well directed and lighting uniformity is greatly improved."

Prismatic glass optics stand up to the salt air and prevent the light depreciation common with metal reflectors. The high mast units include a lowering device that brings the fixtures to the ground for servicing. All electrical connections are accessible for easy maintenance.

## HOLOPHANE ADVANTAGES

- Engineered optics provide excellent uniformity and high levels of horizontal and vertical illumination without glare
- Fixture distributions designed to reduce sky glow, light trespass
- Durable prismatic glass reflectors and refractors reduce maintenance
- Fewer poles results in more usable space
- High Mast Systems lower to the ground for servicing
- Luminaires may be used with photocells for automatic control
- Surveillance camera systems available with high mast lighting systems



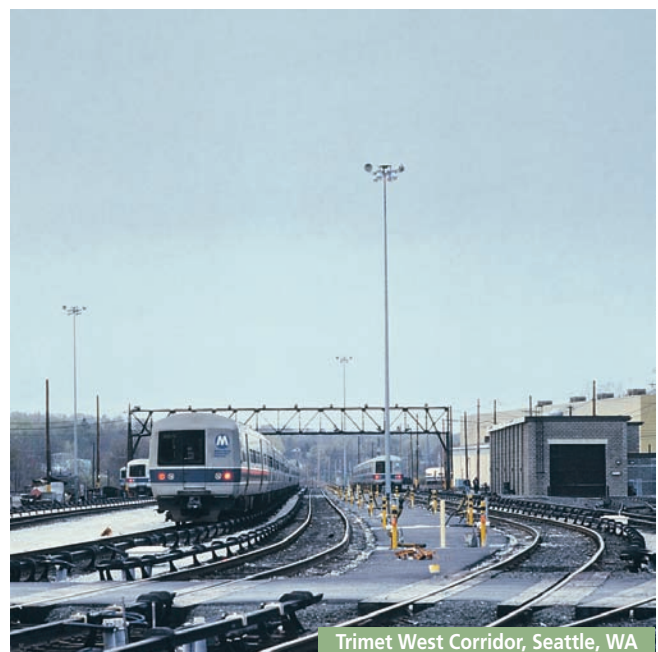
Port of Savannah; Savannah, GA

# RAILWAYS



## CHALLENGES

- Facilities require high light levels for safety, security
- Light fixtures must be out of the way to facilitate train movement
- Ordinances restricting sky glow and light trespass
- Lighting must be maintained without disrupting operations
- Luminaires must turn on and off automatically
- Prevention of theft and vandalism



Trimet West Corridor, Seattle, WA





## HIGH MAST REDUCES DOWNTIME FOR UNION PACIFIC

A smaller maintenance crew prompted Union Pacific Railroad to consider various options to light new intermodal and auto unloading facilities. Existing yards were lit by a virtual forest of wooden poles supporting one or two fixtures. Maintenance crews were constantly changing lamps or fixing downed wires, which required closing one or more tracks due to poles' inaccessibility.

Union Pacific began designing all new facilities with Holophane high mast lighting systems mounted on 100-foot poles. Existing facilities were changed over, using two high mast systems with 12 luminaires per pole to replace up to 30 wooden poles.

Union Pacific used Holophane HMS systems for general lighting, HMS luminaires with cutoff optics for areas requiring less brightness, and in areas where light trespass was a concern.



"WE SIGNIFICANTLY REDUCED MAINTENANCE COSTS AND VIRTUALLY ELIMINATED DOWNTIME."

"The High Mast System provide tremendous flexibility," said John Thornton, manager, electrical maintenance, Union Pacific Railroad Company. "We significantly reduced maintenance costs and virtually eliminated downtime. Yards look clean and vehicles can move around more freely because there are fewer obstacles."

High Mast System are installed on elevated concrete bases to prevent vehicles from hitting the poles. Light levels are 2 to 3 footcandles in automobile unloading areas and as high as five footcandles in areas where locomotives are fueled. Levels are as low as 1 footcandle at switch points.

## HOLOPHANE ADVANTAGES

- Lighting uniformity and high levels of visibility promote safety, security
- Horizontal and vertical illumination help workers identify approaching vehicles, see between objects
- Fixture distributions designed to reduce sky glow, light trespass
- Durable prismatic glass reflectors and refractors reduce maintenance
- Fewer poles results in fewer obstacles for trains and other vehicles
- Luminaires may be used with photocells for automatic control
- Surveillance camera systems available with high mast lighting systems



Trimet West Corridor, Seattle, WA

**Weathertight Design** for UL wet location listed.

**Ballast Assembly** is provided with quick disconnects for fast installation or removal. UL listing for 40°C ambients provides extended ballast and capacitor life.

**Terminal Block** provides for positive lead connection and is pre-wired to the quick disconnect.

**Sealed Optical System** consists of spun on aluminum cover with high temperature silicone sealant at top and bottom. Hermetically seals reflecting prisms from all contaminants

**Weather Shield** permits air passage for reflector self-cleaning. It also prevents snow, ice or wind driven rain from entering the lamp/optical chamber

**Reflective Specular Panels** improve luminaire efficiency

**Reflector/Refractor** prismatic borosilicate glass refractor and reflector combinations provide a variety of light distributions



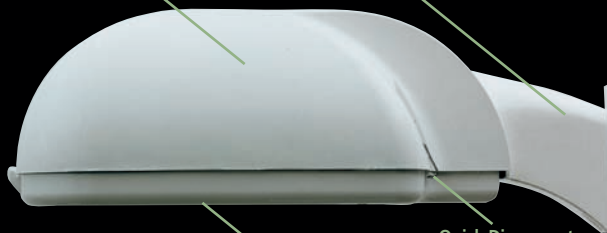
**HOLOPHANE LUMINAIRES**





Heavy Duty Die Cast Ballast provides ease of maintenance and energy savings

A Variety of Mounting Options offers versatile design choices



A Variety of Glass and Tilt Options offers 14 optical light distributions

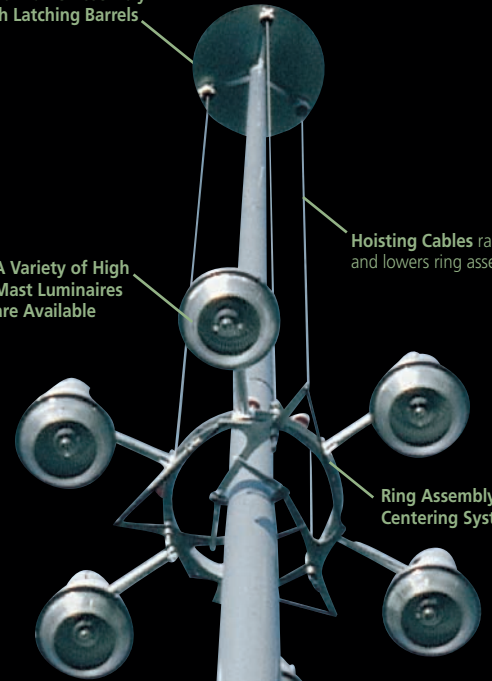
Quick Disconnect provides ease of maintenance

Variety of Pole Choices fit any site architecture

Head Frame Assembly with Latching Barrels

A Variety of High Mast Luminares are Available

Hoisting Cables raises and lowers ring assembly



Ring Assembly with Centering System

## LOWERING DEVICES



LMS - Lowering Device Systems



High Mast Lowering Device Systems

## AEL LUMINAIRES



115



Corvus



413



325 (flat glass)



DuraStar™



Interstate II (725)



125 (Cutoff)

## REMOTE OPERATIONS ASSET MANAGEMENT



Wireless node for monitoring and control of street lights



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**lighting's**  
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*10.59 lbs waterborne waste not created*

*1,557 gallons wastewater flow saved*

*172 lbs solid waste not generated*

*339 lbs net greenhouse gases prevented*

*2,596,580 BTUs energy not consumed*