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The Jefferson Memorial

New lighting design improves look while reducing energy and maintenance costs.

In 1943, the Jefferson Memorial opened to the public on the National Mall in Washington, D.C. In the early 1970s, the initial incandescent lighting design was refreshed by incorporating incandescent and halogen technologies. At that time, these were the most advanced and appropriate technologies for this type of application. However, since the 1990s, significant advances in lighting technology and design have achieved impressive energy and cost savings for all types of lighting requirements, including historic sites such as the Jefferson Memorial.



Photo courtesy of Destination DC

An evening view of the Jefferson Memorial.

In 2001, the Mintz Lighting Group implemented a complete redesign of the Jefferson Memorial lighting system by installing metal halide lamps, induction lamps, and light-emitting diodes (LED). The improvements reduced the lighting load by 78 percent (about 98 kW) while reducing luminaires and increasing the lighting area by 30 percent.¹

Introduction

Monuments, memorials, and other prominent historic sites often fall under multiple local jurisdictions and government agencies with varying interests in design, lighting, and presentation. Balancing each organization's desires can be difficult. Monument and memorial design, including lighting needs, often require the approval and/or oversight by one or more responsible agencies. In the case of the Jefferson Memorial, both the National Park Service and the District of Columbia's Commission of Fine Arts expressed their preferences regarding the lighting redesign project. For example, the commission wanted to maintain the integrity of the original design and ensure that the new elements were visually consistent with the other memorials located in Washington, D.C.

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¹ Lighting of Thomas Jefferson Memorial Case Study. National Park Service.
http://www.nps.gov/partnerships/lighting_jefferson_memorial.htm - Accessed March 11, 2008



The Jefferson Memorial Lighting Design

Metal halide, induction, and LEDs were used to light the exterior of the Jefferson Memorial. Metal halide lamps, as a point light source, work well with reflectors to allow a variety of beam options when floodlighting. A 4,000 K color-corrected temperature (CCT) metal halide lamp was chosen because of its long life and because the color spectrum is well suited for white granite. The 400-watt metal halide floodlights, mounted on 45-foot poles, surround the Memorial and light both the façade and the dome. Over the years, trees have grown in front of the original floodlights that lit the exterior of the dome. The poles were moved in front of the trees so now the trees do not block the light; the columns act as towers preventing the visitors from experiencing the glare. The columns also block the light from entering the interior chamber.²

Variation in the brightness of the different elements is an important part of the Memorial’s lighting design. In 2001, dimming metal halide lamps was not an option, so neutral density filters, which are theatrical filters that reduce the amount of light without changing the spectrum of the light source, were used to balance brightness.

Induction lamp technology is similar to fluorescent; however, this technology significantly extends lamp life because it does not require electrodes. Induction lamps are installed in recessed downlights around the portico and columns, where the luminaire mounting height and location make the long life of this technology a distinct advantage for maintenance.



New lighting design for the Jefferson Memorial improved the visual performance while reducing energy and maintenance costs (original lighting shown in inset). (photos courtesy of Osram Sylvania)

	Before	After
Total system power	125.8 kW	27.9 kW
Operating hours	14 hours/day	14 hours/day
Energy consumed per year	643,042 kWh	142,533 kWh
Energy saved per year		500,509 kWh
CO ₂ reduced per year		343.2 tons

Because of previous limitations in luminaire technology, a band of text around the interior of the dome was never lighted. Now, with the small size and low profile of LED’s, this text is lighted for the first time since the Memorial’s opening.

The top portion of the dome (reached 129 feet high) is still slightly dark and, over the years, past designs have tried to address this issue (this has been a concern even among some former presidents).³ However, the only way to light the dome entirely is to have a luminaire either even with or higher than the dome, which would visually alter and degrade the presentation of the Memorial.

² A. L. Slingerland. “A Capital Idea: The Jefferson Memorial Gets a Glamorous Yet Energy-Efficient Facelift.” *Live Design*. May 2, 2002.

³ P. Kennicott. “Bathed in the Right Light.” *Washington Post*. August 26, 2007.

Lighting Operation and Maintenance

The Memorial's new lighting design implemented a unique strategy to monitor lamp failure and help automate the process of maintaining its lighted appearance — a control system was installed with a variety of capabilities, including monitoring power levels. When consumption on a given circuit drops below 20 percent of the predefined limit, an electronic message is automatically sent to maintenance personnel identifying the circuit, which powers up to five luminaires. While the system had a high initial investment, it reduced annual costs associated with nighttime manual monitoring of the Memorial, ensuring an effective presentation while providing a welcome return on investment.

When lamps are being replaced, it is not uncommon for the focus of the luminaire to be moved or changed. Since it is critical that the Memorial's focus and aiming of luminaires is maintained at all times as designed, the new system includes bolts inserted through the luminaires to fix the focus of each fixture to ensure that they cannot be moved.

Additional Items to Consider

Several additional items should be considered in any outdoor lighting project:

- *Minimize Skyglow.* Skyglow is the glowing effect of the night sky caused by reflected and refracted light. The Jefferson Memorial is located within the flight line of Reagan National Airport. Skyglow could cause problems for pilots; however, the Jefferson Memorial's new lighting design has received no complaints.⁴
- *Minimize Light Trespass.* Light trespass occurs when light extends beyond the immediate grounds and enters neighboring sites. The Jefferson Memorial is surrounded by the Potomac Park, which minimizes the opportunity for light trespass. However, with proper luminaire selection, light trespass is minimized by focusing the lighting on the Memorial.

- *Minimize Glare.* Glare is created when the ratio of foreground to background brightness is large. The Jefferson Memorial is lit using luminaires installed away from the structure aimed back toward the Memorial, which could have been a glare issue for visitors. Proper shielding, luminaire selection, and location minimize glare.

Conclusions

The current Jefferson Memorial lighting design has significantly improved the presentation of this historic structure. Areas that were previously not lighted because of technological limitations are now presented with the honor originally intended. With its new lighting design, the Memorial is now the showcase it was meant to be, standing in tribute to our founding fathers. In addition, the project achieved significant reductions in energy, operation, and maintenance costs. This facility is an example to others who strive to showcase national treasures. In addition, the new lighting system showcases the Federal Government's ability to be good stewards of our Nation's historic resources.

NPS Energy Program

The National Park Service (NPS) operates 391 individual park sites throughout the United States. Most sites have facilities which consume energy and water to operate and serve park visitors. The **NPS Green Energy Parks Program** supports the efforts of individual parks to improve the energy and water efficiency of our Nation's National Park system. To accomplish this, NPS is working with DOE's Federal Energy Management Program to provide individual park sites with technical and project financing assistance. For more information on NPS, go to www.nps.gov.

⁴ Phone call with David Mintz, Mintz Lighting Group, March 13, 2008.



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