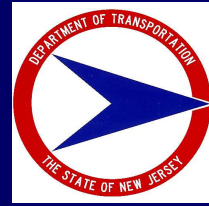


New Jersey Department of Transportation
Bureau of Research

Technical Brief



Tower Lighting

The “Tower Lighting” research report explores a range of potential benefits and drawbacks of replacing conventional highway lighting systems with high mast systems. Factors compared include the ease and cost of maintenance, lifecycle costs, the safety of maintenance personnel, impacts on the safety of the motoring public, and impacts on the environment and aesthetics.

Background

Proper highway lighting is critical to driver safety, particularly on interchange ramps and in urbanized areas. However, bulbs burn out, wiring issues cause strings of lights to go dark, and vehicle strikes destroy lighting standards and endanger drivers. As a result, the New Jersey Department of Transportation (NJDOT) devotes thousands of hours each year to the maintenance of its extensive highway lighting systems. Based on the observations of the Central Region Electrical Operations group, maintenance of conventional “cobra head” lighting can be resource intensive, time consuming, costly, and potentially endanger both maintenance workers and motorists. Electrical Operations identified high mast lighting—with multiple, descending luminaires per pole and typically located outside the clear zone or behind guide rails—as a potential solution to these problems.

Research Objectives and Approach

This study explores the potential benefits of replacing conventional highway lighting systems with high mast systems.

The process was rooted in a literature review, which examined regional and national warrants, standards, current and best practices, and challenges applicable to the use of high mast highway lighting. The review drew from the lighting design guidelines and specifications from 10 state DOTs. Five interviews were conducted with lighting maintenance personnel at four DOTs (Virginia, Maine, Florida, and Delaware) and NJDOT North Region—all agencies responsible for the maintenance of tower lighting.

The research team continued by comparing a hypothetical high mast system (designed specifically for the study interchange) with the hybrid system currently in place at the interchange of I-78 and I-287. The evaluation incorporated the factors explored in the previous literature review, namely the comparative lifecycle costs of the two systems, the ease and costs of maintenance, the safety of maintenance personnel, impacts on the safety of drivers, and impacts on the environment and aesthetics.

Findings

The research team found that high mast lighting may offer significant benefits over conventional lighting for major urban and semi-urban interchange projects, particularly in non-residential areas, but present a few challenges as well.

- **Lifecycle Costs:** Overall, high mast lighting could save approximately \$582,000 at the interchange of I-78 and I-287 over the 25-year life of the system, primarily due to reduced maintenance costs.
- **Safety of Maintenance Personnel:** By installing a high mast system instead of a conventional system, a significant reduction in incidents could reasonably be expected.
- **Safety of Motoring Public:** Motorist safety is likely to improve, with fewer opportunities for worker-driver incidents or pole strikes. Drivers may also experience better visibility.
- **Environment:** There is no significant difference in energy consumption between the high mast and existing systems, and thus no difference in emissions.
- **Aesthetics:** Light trespass and pollution are potential drawbacks, but in appropriate contexts high mast lighting can be made to minimize light spillage.

This study recommends that NJDOT:

- Enhance highway lighting selection factors to explicitly include the safety of maintenance personnel and motorists.
- Expand strategies for the control of light trespass, including curfews, to ensure that tower lighting is fairly considered as a design alternative.
- Investigate the application of energy efficiency technologies.
- Collect and analyze data on highway lighting and safety to better clarify the safety proposition of high mast lighting versus conventional highway lighting.

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A final report is available online at: <http://www.state.nj.us/transportation/refdata/research/>. If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

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NJDOT Research Report No: NJ-2010-002