Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6864: Investigate the Air Quality Benefits of Nighttime Construction in Non-attainment Counties

Background

In urban areas in Texas and the United States, roadway work zone and construction activities are often conducted at night to reduce the disruptions to traffic and to prevent congestion caused by lane closures during peak hours. The reduced traffic delays due to nighttime construction have the potential to reduce traffic emissions. However, the emissions and air quality impacts associated with moving these activities from the daytime to the nighttime have not been studied in detail. This research project developed an understanding of emissions and air quality impacts of shifting work zone and construction activities to the nighttime. These findings were then discussed in the broader context of other factors that generally influence the decision to pursue nighttime construction.

What the Researchers Did

The research team conducted an extensive state-of-the-practice assessment to investigate the advantages and disadvantages of nighttime construction, technical methods to model and estimate emissions impacts, and relevant air quality issues. Researchers also conducted a survey of practitioners in Texas to gain an understanding of current practices. Following the state-of-practice review, the research team developed and implemented a case-study-based approach to assess the emissions impact of nighttime construction.

The case studies were designed to study the differences between daytime and nighttime construction in terms of two main components:

- The difference in emissions from construction activity and equipment.
- The difference in emissions from traffic.

Further, researchers also investigated the differences in emissions dispersion impacts during the daytime and nighttime, attributable to the differences in prevailing metrological factors.

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Project Completed:
7-31-2017

What They Found

In terms of emissions from construction activities and equipment, researchers found that the use of diesel-powered lighting equipment during nighttime construction is the major contributor to the differences between nighttime and daytime construction practices.

The research team developed a methodology using microsimulation models and emissions models to estimate the traffic operation and emissions impacts of nighttime versus daytime work zones. The methodology was applied to three case studies (two freeways and an arterial) in Texas. The analysis results suggested that nighttime work zones result in lower total emissions than daytime work zones, though part of the lower emissions is attributable to overall reduced traffic levels.

The assessment of the impact of metrological conditions on the dispersion of pollutants showed that for the same amount of emissions, the nighttime period could result in higher pollutant concentration levels. But since traffic congestion and overall traffic volumes are substantially lower at night, the findings do not imply that nighttime construction activities result in worse air quality in terms of pollutant concentrations.

Based on the findings from the case studies and state-of-practice assessment, a decision-support framework was developed. The framework identified criteria relevant to deciding on nighttime construction. A spreadsheet-based decision support tool was developed, which included a screening checklist along with a quantitative calculator. The quantitative calculator generates sketch-level assessments of the emissions impacts for a lane closure under nighttime and daytime construction scenarios.

What This Means

While air quality is not a primary consideration in the decision to pursue nighttime construction, researchers established the potential for emissions reduction (primarily from traffic emissions) when construction activities are moved to the nighttime in congested urban areas. Considering the air quality impacts of nighttime construction should be based on three major areas:

- Construction emissions impacts.
- Traffic emissions impacts.
- Potential impacts on dispersion of pollutants.

For More Information

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Keyword: Research