STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS

SUMMARY

NCHRP Project 17-10 was conducted for the main purpose of revamping the 1994 edition of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* (hereafter referred to as the *Supports Specifications*). The project addressed specific technical topics; provided major updates based on current codes and standards; presented new wind maps and wind loading criteria; and introduced new sections on fiber-reinforced composites, wood structures, and fatigue design. Project 17-10 resulted in a totally revised *Supports Specifications* that was submitted to the AASHTO Highway Subcommittee on Bridges and Structures (HSCOBS), adopted in 1999, and published in 2001.

In spite of the extensive research efforts performed under NCHRP Project 17-10, a number of technical issues still needed further investigation or refinement. The project panel identified and prioritized a number of technical topics for study in NCHRP Project 17-10(2). The main objective of NCHRP Project 17-10(2) was to enhance the *Supports Specifications* developed under Project 17-10 and to provide a strategic plan for future development of the specifications. Specific technical topics addressed by Project 17-10(2) included the following:

- **Wind load analysis.** A report for consideration by the AASHTO HSCOBS was prepared to address the basis for the differences in the wind speed maps, the differences in design loads resulting from wind speed maps, and the treatment of gusts in the 1994 and 2001 *Supports Specifications*. Approximate gust effect factors for wind-sensitive structures were also developed.
- **Fatigue and vibration in noncantilevered support structures.** Fatigue and vibration in noncantilevered support structures were studied, and a set of fatigue loads was recommended. Additionally, connection details to minimize fatigue effects, effectiveness of gussets in reducing fatigue problems, and vibration-mitigation measures were evaluated and documented. The material is presented in a format that is suitable for consideration for inclusion in the specifications.
- **Foundations and anchor bolts.** Selection criteria and design guidance for support structure foundations were provided, and a simplified design method for anchor

bolt design was proposed based on state-of-the-art information on anchorage to concrete.

- **Drag coefficient transitions for multisided to round shapes.** A drag coefficient transition equation was developed for tapered poles that transition from multisided shapes to round shapes.
- **Connection plate and base plate flatness tolerances.** Current practice and state DOT specifications were reviewed to identify the need for structure-specific connection plate and base plate flatness tolerances for erection. Tolerances based on the findings were recommended.
- **Bending about the diagonal for rectangular steel sections.** Strength and failure criteria for bending about the diagonal axis of rectangular steel sections were established. Design guidelines were developed and proposed for bending about the diagonal for rectangular steel sections.
- **Fiber-reinforced composites.** A performance specification, including acceptance testing procedures, was developed for fiber-reinforced composite support structures.
- **Design examples.** Sixteen design examples that represent good design practice for various types of support structures while illustrating key features of the specifications were developed.
- **Retrofit and rehabilitation of fatigue-damaged support structures.** A report that addresses for retrofitting and rehabilitating fatigue-damaged support structures was prepared. Guidance on repair and replacement decisions was also provided as part of this report.

Furthermore, a strategic plan for future enhancement of the *Supports Specifications* was developed, including a plan for conversion of the specifications to load and resistance factor design (LRFD) philosophy and format. The importance of converting to an LRFD approach was emphasized, and the necessary analytical work to achieve this conversion was reviewed.

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