UTC RESEARCH PROJECT DESCRIPTION

PROJECT NUMBER
04219

PROJECT TITLE
New Design Criteria for Traffic Signal Support Structures

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PROJECT OBJECTIVE:
The main objective of this study is to evaluate the safety and economy of traffic signal supports in the state of Alabama that are designed in accordance with the new wind load and fatigue provisions published in 2001 by AASHTO (and 2003 interim specifications). Another objective of the study is to transfer the knowledge gained from this research to the engineers and designers of Alabama DOT through a half-day workshop.

PROJECT ABSTRACT:
AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals has been revised in its entirety through a major research project conducted under the auspices of the National Cooperative Highway Research Program (NCHRP 17-10). The new document was published by AASHTO in 2001. A major part of the revisions includes updated provisions and criteria for extreme wind loads and new provisions and criteria on fatigue design. These provisions differ considerably from those in previous editions of the specifications. The impact of the revised wind load provisions and new fatigue design criteria on the design of traffic signal structures from the standpoint of safety and economy has not been studied and is the main goal of this proposed work. A secondary objective of the project is to disseminate the information gained from this research to the engineers and designers of Alabama DOT.
PROJECT TASK DESCRIPTIONS:
Task 1 - Determine impact of new wind provisions and fatigue provisions on the design of traffic signal and sign supports.
Task 2 - Determine impact of the new fatigue criteria on the design of cantilevered mast arm traffic signal mast arm supports.
Task 3 - Prepare report summarizing Tasks 1 and 2.
Task 4 - Organize a workshop to present the results of the study to Alabama DOT engineers and designers.

MILESTONES AND DATES:
Task 1: Jan. 1 to Apr. 30
Task 2: May 1 to Sept. 30
Task 3: Oct. 1 to Dec. 31
Task 4: Dec. 1 to Dec. 31

TOTAL BUDGET:
One-year project: other (HHP) $43,720; total budget $87,347.

STUDENT INVOLVEMENT:
The Co-PI is a graduate student working on her Ph.D. degree at UAB. Additionally, undergraduate students (the names of whom will be identified later) will be heavily involved on this project.

RELATIONSHIP TO OTHER RESEARCH PROJECTS:
UTCA Project 00218 studied the effects of new wind loading criteria and wind map on the design of structural supports. The study focused on the comparing the 2001 and 1994 specifications for a large number of cities across the state of Alabama in an effort to ascertain the effect of the new wind provisions on the design of structural supports in the state. The project specifically addressed the impact of the new wind load provisions on the design of a high mast lighting pole, a street lighting pole and a road side sign structure.

UTCA Project 02216 studied the effects of new wind loading and fatigue provisions on the design of a cantilevered overhead sign support structure. The study focused on comparing the 2001 and 1994 specifications for a large number of cities across the state of Alabama.

This follow-up project addresses concerns and safety-related design considerations for traffic signal structures that are specific to the state of Alabama. Although research under NCHRP Projects 17-10 and 17-10(2) is in the same subject area, there is no overlap in work activities and all work produced under this project will be original. However, the ongoing and past NCHRP research activities will provide significant background material and information that is vital for the success of this project. This project will supplement results summarized in UTCA Reports 00218 and 02216 (Project #00218 and # 02216), which provided comparisons of wind pressures and structural designs for a number of
support structures, but did not consider traffic signal support structures or the effect of fatigue on the design of such structures.

TECHNOLOGY TRANSFER ACTIVITIES:
As part of this research study, a 4-hour workshop will be planned after completion of the work to present to ALDOT the results of the study and the impact of the revised wind provisions and new fatigue criteria on the design of traffic signal support structures in Alabama.

SIGNIFICANCE AND BENEFITS
The new wind and fatigue provisions of AASHTO 2001 have not been evaluated by most state departments of transportation, and as such no information is available on the design of traffic signal structures using this national specification. Both design criteria will have a direct bearing on the safety and economy of highway support structures. As indicated earlier, the wind loads on support structures could increase or decrease drastically depending on the location of the structure in the state, hence resulting in significant increase in member sizes. The fatigue criteria, particularly as it applies to the traffic signal mast arm structure, may also result in significantly heavier and more costly designs. AASHTO Committee T-12 is very interested in understanding the impact of implementing the new fatigue provisions, as well as the new wind criteria, on the design of support structures. This work will establish ALDOT as a lead DOT in the U.S. regarding knowledge of AASHTO 2001 and the impact of the new wind provisions and fatigue criteria on the design of structural supports.

TRB KEYWORDS:
extreme wind loads, fatigue loads, highway signs, traffic signal structures, structural supports