

FY 07/08 Research Initial Scope of Work

I. Project Title: S045

Development of a Comprehensive Inspection Plan for SRMD Devices

II. Background:

Information about the vulnerabilities of seismic response modification devices (SRMDs) installed on Caltrans bridges are embedded in technical reports focused on the device performance. This knowledge should be organized in guidelines to direct the periodic activity of the bridge maintenance personnel. Innovative non-destructive evaluation (NDE) techniques are needed to accomplish detailed inspections of these devices.

III. Project Problem Statement:

The results of several years of testing at the Caltrans SRMD Facility have created a large database of possible damage scenarios for each type of device tested. Although the response data are published in technical reports, the results were never organized and combined in terms of detailed instructions for maintenance/inspection personnel. Findings from the completed experimental programs on devices and innovative non-destructive evaluation (NDE) techniques can also be merged to provide strategic guidelines for bridge inspectors. Inspection guidelines are needed for the seismic response modification devices installed on Caltrans bridges.

IV. Objective:

The objective of this research is to develop guidelines for detailed inspection of existing seismic response modification devices.

V. Description of Work and Expected Deliverables:

Available damage detection methods will be adapted to inspect both outer and inner components of SRMDs. This will include the use of ultrasonic waves to penetrate, for instance, the lead core of lead-rubber bearing in order to provide indication of the structural integrity of the core itself and the core-to-elastomer interface. Infrared thermography will also be considered as a damage detection method, for both inspection of the core and of the outer elastomer layers as well as for analyses of sliding surfaces and bonding characteristics of materials. These methods will be validated on SRMDs affected by a range of damage scenarios produced both artificially and during large-scale failure tests. During the large-scale damage tests, damage progression will be monitored in real-time so as to generate an inspection database that will enable making residual life predictions in the field.

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Deliverables will include:

- 1) Quarterly technical reports on progress of work.
- 2) General inspection guidelines and recommendations for the implementation of damage detection methods for in-situ inspection of SRMDs while in service.
- 3) Database relating damage detection results with remaining life of SRMDs.

VI. Estimate of Duration:

24 months

VII. Related Research:

This project is closely related to the daily experimental activity at the Caltrans SRMD testing facility.

VIII. Deployment Potential:

As a result of this research, detailed guidelines for maintenance/inspection of SRMDs will be provided in a format that could be immediately used by on-field personnel.

IX. Date: July 18, 2007