NEVADA DEPARTMENT OF TRANSPORTATION

RESEARCH DIVISION

COLUMN AND FOOTING POCKET CONNECTIONS FOR CAST-IN-PLACE AND PRECAST CONSTRUCTION

Key · Points

Project Number:
593-18-803

Start Date:
November 13, 2018

Duration:
24 months

Project Cost:
$217,512.00

Researcher:
University of Nevada, Reno

Principal Investigator:
Dr. M. Saiidi, with Dr. M. Moustafa

NDOT Champions:
Troy Martin, Structures
Jeffery Cobb, Construction Admin

PROBLEM

NDOT is exploring the use of prefabricated concrete bridge columns as a method to increase the usage of Accelerated Bridge Construction (ABC). A major impediment to the usage of ABC has been a limited amount of research on the seismic behavior of prefabricated bridge element connections. Test data is necessary to demonstrate that the detailing practices used for the precast column research can be applied to cast-in-place (CIP) and precast construction in accordance with the proposed design and detailing standards and still provide adequate performance.

OBJECTIVE

Develop a new design and detailing procedure for CIP and precast column pocket connections for application in conventional and accelerated bridge construction in Nevada. Accomplishing the overall objective will contribute to NDOT's ongoing efforts to update and develop new design and detailing standards for the footing and pier cap connection areas for both CIP and precast construction.

METHODOLOGY

Taking advantage of the lessons learned from a significant number of recent studies by the PI, Dr. Saiidi and others, to simplify conventional construction by reducing steel congestion in connections. The detailing procedure for precast columns will integrate results from recent tests, analyses, and design method developments to propose practical design methods that NDOT may adopt to finalize its ABC program. Also included are innovative materials to further enhance the seismic performance of bridge column-footing hinge connections through low-yield Copper, Aluminum, and Manganese (CAM) bars and hinges. To verify the applicability of precast pocket detailing to CIP construction and CAM hinges, the details will be combined in a large-scale, two-column bent model.

Fig. 6 – CAM bars with threaded couplers (left) and headed couplers (right)

IMPLEMENTATION POTENTIAL

The potential payoff to NDOT is three-fold: (1) ABC with superior seismic performance, (2) improved constructability of conventional reinforced concrete bridges, and (3) foundation cost reduction. The research results will help NDOT with innovations and will be translated into step-by-step design procedures and examples to help facilitate implementation in designing new bridges.

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