



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Seismic /
Structures

OCTOBER 2015

Project Title:
Seismic - Ductile Behavior of Reinforced
Concrete Arch Ribs – Plastic Hinging under
High Compressive Axial Loads

Task Number: 2879

Start Date: January 1, 2016

Completion Date: July 1, 2018

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Ductile Behavior of Reinforced Concrete Arch Ribs – Plastic Hinging under High Compressive Axial Loads

Provide guidance on methods for analysis and design of arch elements
in seismic design of arch bridges.

WHAT IS THE NEED?

Arch bridges offer unique functionality in bridging over canyons, rivers, and large industrial facilities in addition to their esthetic value. Arch bridges, when subjected to earthquakes, most likely will form plastic hinges in the arch ribs. These ribs should be detailed to provide the ductility needed by earthquakes, as it is expected from columns in Ordinary Standard (OS) bridges. Most Caltrans' column tests are applicable to OS bridge columns, not the arch ribs with high axial loads. There is a need to quantify the ductile behavior of various arch rib sections under increasing axial loads by physical testing.

WHAT ARE WE DOING?

This research project will construct and test eight arch specimens. Test results will provide the basis for proposed simplified design equations to predict ductile behavior of arch elements and provide the design guidelines and various structural details for arch ribs in arch bridges.

WHAT IS OUR GOAL?

Provide guidance on methods for analysis and design of arch elements in seismic design of arch bridges. Provide structural details needed for successful plastic hinging of arch ribs. Provide methods to minimize damage to the arch elements in seismic events.

A final report will be provided to present the key aspects and procedures of the study, along with recommendations to facilitate the adoption of the new design and construction guidance material for arch bridge methods by Caltrans Engineers.



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knowledge that improves
California's transportation system

WHAT IS THE BENEFIT?

This research will support the strategic objectives of the Division of engineering Services to: ensure reliability and structural integrity and balance performance, cost and time to optimize total value.

WHAT IS THE PROGRESS TO DATE?

Begin work as described in the scope.