



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Maintenance

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Structures Maintenance and
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Determination of In-situ Compressive Strength of Precast Concrete Girders

To determine the compressive strength of in-situ precast concrete girder bridges to assess their strength and capacity before implementing upgrades

WHAT IS THE NEED?

Caltrans inventory comprises of over 1,200 precast "I" concrete girder bridges in the CA highway system. The Structure Maintenance & Investigation (SM&I's) load rating branch recently began rerating those bridges under Load and Resistance Factor Design (LRFD) code and current design permit loading.

This survey suggested that the majority of the bridges ratings are dropping. In such analysis, the original "design" values for concrete compressive strength were used, because the as-built concrete girder strength remains unknown. However, recent test data from the precast industry, and a knowledge of the industry's manufacturing processes, indicates that the precast compressive strength should be on the order of twice as high as the strength values used at the design stage.

Therefore, Caltrans is seeking a way to field verify such assumption through in-situ testing of the concrete compressive strength. An increased assumed concrete compressive strength used in the analysis would have a significant positive effect upon girder capacity since underestimating bridge load ratings can result in unnecessary postings, rehabilitations, retrofits, replacements, and/or higher user costs. Reliable estimates of the actual in-situ concrete compressive strengths are needed and any follow-up seismic/strengthening upgrades would be based on the actual in-situ concrete compressive strength.



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WHAT ARE WE DOING?

This research proposes to evaluate the in-situ strength of concrete in bridge girders. This research also proposes to implement a simple methodology, using NDT, to assess the in-situ concrete strength.

By utilizing a careful and extensive screening process, two hundred of the state's in-service precast concrete girder bridge will be evaluated for In-situ compressive strength over a two-year period. Different Non Destructive Test (NDT) methods will be used in the evaluation process. Utilizing more than one technique will ensure higher quality and reduce uncertainty in determining the In-situ Compressive Strength. Data will be tabulated and compared with the data available at the time of design and construction phase.

WHAT IS OUR GOAL?

The goal of this research is to field test 200 selected existing Pre-cast/Post-Stress I girder bridges in California for In-situ concrete compressive strength. All field data taken with five different nondestructive testing methodologies will be utilized to establish the existing concrete compressive strength.

A table summarizing the evaluated In-situ compressive strength of the PC/PS I girder bridges will be compared with the design and field compressive strength available at the time of placement to identify the reserve in strength capacity for future expansion and to check their design with the new modified codes of practice for safety considerations.

WHAT IS THE BENEFIT?

The major benefit of this proposed work will be to evaluate current In-situ compressive strength of existing PC/PS I Girder bridges and increased capacity recognition. Without In-situ concrete strength determination, it is anticipated that the majority of the state's precast girder bridges will be downgraded for capacity and subsequently require strengthening or replacement resulting in millions of dollars of unnecessary upgrades.

The tabulated data from the project will result in a cost effective preservation of existing bridge inventory while allowing bridge raters and designers to maximize transportation system performance and accessibility with regards to permit routing of the state's extensive port and trucking industry.

WHAT IS THE PROGRESS TO DATE?

Contract has not been executed yet.