

Maintenance

MAY 2019

Project Title:

Determination of In-Situ Precast Concrete Girder Compressive Strength

Task Number: 2748

Start Date: March 1, 2016

Completion Date: December 31, 2017

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Determination of In-Situ Precast Concrete Girder Compressive Strength

To compare the compressive strength of in-situ precast concrete girders with their design strengths in order to aid in the load rating process.

WHAT IS THE NEED?

Caltrans has approximately 1,200 precast/post-stress I girder bridges in their current inventory. The only information available to evaluate these structures for load carrying capacity is the original concrete design compressive strength values listed on the project plan sheets. Based on investigations and industry practice, the minimum concrete strength specified in the design plans is typically achieved within a few days after the concrete is placed. The 28-day strengths and beyond have been found to be significantly higher than design strengths based on surveys of manufacturer's data. An evaluation of representative samples for in-situ compressive strength of these bridges can help Caltrans 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 WAS OUR GOAL?

The goal of this research was to field test fifty-two existing precast/post-stress I girder bridges in California for in-situ concrete compressive strength. Field testing data would be taken with four different nondestructive testing methodologies utilized to establish the existing concrete compressive strength. The resulting data would be analyzed, calibrated, and then used to create a model to predict the in-situ concrete compressive strength of other bridges in the State.

WHAT DID WE DO?

Researchers at San Jose State University in consultation with Caltrans selected 52 bridges in seven counties in the state of California for testing to determine the compressive strength of the bridge girders. Different non-destructive test (NDT) methods



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were performed on the bridges. Utilizing more than one technique ensured higher quality and reduced uncertainty in determining the in-situ concrete compressive strength.

Concrete cylinders, slabs, and retaining walls were constructed at San Jose State University to calibrate the NDT equipment. The data collected from all the laboratory testing in combination with data supplied by the manufacturer of the NDT equipment were utilized to develop strength prediction charts for the different bridge girders.

Concrete cores from five selected bridges in Santa Clara County and San Bernardino County were taken, and compressive strength and NDT tests were performed and analyzed. Results obtained from these cores were compared to the data from the lab testing to verify accuracy of the compressive strength predictions.

WHAT WAS THE OUTCOME?

The outcome of this research is a safe method for Caltrans to increase the capacity of existing precast/pre-stressed I girder bridges across the State. Without predicted in-situ concrete compressive strength determinations, 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.

WHAT IS THE BENEFIT?

This research benefits Caltrans by providing a process to increase concrete compressive strength for analysis of precast pre-stressed concrete girders. This process will provide more accurate estimates of concrete compressive strengths that are needed to increase capacity, and lessen the

need for costly and unnecessary upgrades. The potential cost savings to the State is millions to hundreds of millions of dollars.

IMAGES



Image 1: Bridge Core in Lab

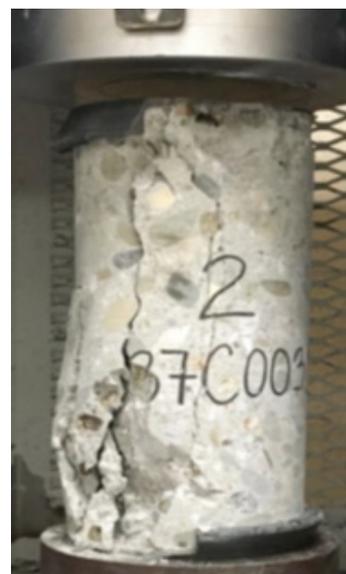


Image 2: Bridge Core after Testing