READY RESULTS
Next Steps to Put NCHRP Research into Practice

NCHRP NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

**FOCUS ON:** NCHRP Report 819

July 2017

# Self-Consolidating Concrete for Cast-in-Place Bridge Components

*Image courtesy of California DOT*

*By eliminating the need for concrete mix vibration, SCC reduces construction time and costs. It also makes it easier to create a surface finish, such as the large-mouth bass motif on the Antlers Bridge near Lakehead, California.*

## REAL-WORLD NEED

Self-consolidating concrete (SCC) is a highly fluid mix that flows easily into and throughout a form under its own weight without requiring mechanical vibration to ensure consolidation. Eliminating the vibration step saves labor and time, which translates into cost savings. In components such as bridge piers that contain a large amount of rebar, SCC also reduces the likelihood that the concrete won't fill the form properly, leaving gaps that need repair after the form is removed.

However, SCC has a relatively short history of use in the United States, and AASHTO's bridge design and construction specifications do not currently address its use for cast-in-place bridge components. Consequently, SCC has not been widely implemented by transportation agencies in the United States.

## RESEARCH SOLUTION

NCHRP Project 18-16 tested how the properties of materials in an SCC mix affected freshly poured, early-age, and hardened concrete. Based on that information, the project developed guidelines for using SCC in cast-in-place bridge components and proposed changes to AASHTO's specifications to encourage appropriate use of the material by state DOTs.

## NEXT STEPS

### Put It into Practice

**REVIEW**

**Learn from other states' experiences by reviewing the literature cited in *NCHRP Report 819* and contacting agencies that have used SCC.**

**CUSTOMIZE**

**Use the proposed AASHTO specifications to create specifications for SCC tailored to the local materials used in your state.**

**EVALUATE**

**Apply the test methods used in this research to evaluate any local materials that vary significantly from the representative materials used in this project.**

**COLLABORATE**

**Consult with members of the AASHTO Subcommittee on Bridges and Structures to learn more about SCC use in other states.**

**PARTNER**

**Apply for NCHRP implementation funding. See trb.org/nchrp.**

# About the Research

## RESEARCH STRATEGY

Investigators conducted a literature review and survey to determine which properties of SCC are considered most important to the performance of cast-in-place bridge components. They determined appropriate test methods and target values for these properties and carried out tests on 40 SCC mixes, correlating results with properties of freshly poured, early-age, and hardened concrete. From this analysis, they developed formulas for predicting concrete performance.

## WHAT WE LEARNED

This project proposed changes to AASHTO's Load and Resistance Factor Design (LRFD) Bridge Design and Construction Specifications to incorporate guidance on using SCC, including design formulas for predicting SCC's performance from its material properties. AASHTO's Subcommittee on Bridges and Structures and its Concrete Design technical committee will be considering these proposed changes. The guidelines for the use of SCC in cast-in-place bridge components address material selection, mix proportioning, methods for testing fresh concrete, properties of hardened concrete, and concrete production and construction. For example, SCC can put more pressure on formwork than vibrated concrete and may require strengthened formwork systems.

## WHY IT MATTERS

The lack of an AASHTO specification for SCC in cast-in-place bridge components has been one impediment to implementing SCC widely at state DOTs. Many states only permit use of materials that are included in AASHTO specifications, or they require independent testing of SCC materials. With the new specification, agencies will have clear guidance and appropriate test methods for the use of SCC. If local stone or sand are significantly different from the representative materials characterized in this project, the test procedures will simplify the evaluation process.

Image courtesy of California DOT

*SCC mixes are very fluid, which lets them flow more easily than traditional concrete through bridge components that are congested with rebar. This helps ensure that the concrete completely fills the form.*

## RESOURCES

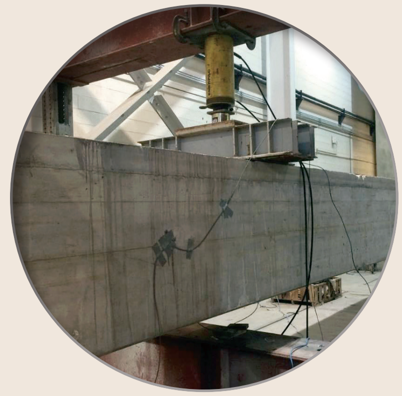

Image from NCHRP Report 819

### NCHRP PROJECT 18-16

### FINAL PRODUCT

*NCHRP Report 819: Self-Consolidating Concrete for Cast-in-Place Bridge Components*
trb.org/NCHRP/Blurbs/174472.aspx

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### ADDITIONAL RESOURCES

Caltrans 2015 *Standard Specifications* (see Section 90-5): dot.ca.gov/des/oe/construction-contract-standards.html

Washington State DOT *Bridge Design Manual (LRFD)* (see Section 5.1.1, paragraph I)
wsdot.wa.gov/Publications/Manuals/M23-50.htm

*NCHRP Report 628: Self-Consolidating Concrete for Precast, Prestressed Concrete Bridge Elements*
trb.org/Main/Blurbs/160383.aspx

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