

2015 Interim Changes Related to Concrete Structures



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On July 22 through 26, 2014, the American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Bridges and Structures (SCOBS), chaired by Gregg Frederick of Wyoming, convened its annual meeting in Columbus, Ohio. During the meeting hosted by the Ohio Department of Transportation, SCOBS considered and adopted five agenda items specifically related to concrete structures. Technical Committee T-10, Concrete Design, chaired by Loren Risch of Kansas, moved Agenda Items 33 through 37 to the subcommittee ballot for consideration in Columbus after years of development. These agenda items represent revisions and additions to the *AASHTO LRFD Bridge Design Specifications*.

This column reviews these concrete-structures agenda items, which were approved by SCOBS, are included in the 2015 Interim Revisions to the seventh edition of the *AASHTO LRFD Specifications*.

The first three Agenda Items—33, 34, and 35—extend selected concrete-structure provisions to members using specified concrete strengths up to 15 ksi.

Agenda Item 33

Agenda Item 33 combines the recommendations of the National Cooperative Highway Research Program (NCHRP) Report 603, *Transfer, Development, and Splice Length for Strand/Reinforcement in High-Strength Concrete*, by Julio A. Ramirez of Purdue University and Bruce W. Russell of Oklahoma State University and the provisions of the American Concrete Institute (ACI) ACI 318-11, *Building Code Requirements for Structural Concrete*, to include updated provisions for specified concrete strengths up to 15 ksi. The 2013 interim revisions already extended the provision of Articles 5.11.2.1, 5.11.2.4, and 5.11.5.3.1 to 15 ksi. This agenda item extends all the provisions regarding development and splice lengths that can be extended to 15 ksi based upon completed research. In general, development lengths, and lap splice lengths that are based upon them, increase based upon experimental data.

Agenda Item 34

Based mostly upon NCHRP Report 595,

Application of the LRFD Bridge Design Specifications to High-Strength Structural Concrete: Flexure and Compression Provisions, by a research team led by Sami Rizkalla of North Carolina State University, Agenda Item 34 extends the applicability of the flexural and compression design provisions for reinforced and prestressed concrete members to concrete strengths up to 15 ksi. Provisions extending the modulus of elasticity equations for both normal weight and lightweight concrete for concrete strengths up to 15 ksi are based upon the Federal Highway Administration (FHWA) Report FHWA-HRT-13-062, *Lightweight Concrete: Mechanical Properties*, by Ben Graybeal and Gary Greene.

One of the more significant sub-items in Agenda Item 34 is the revision of the relationship for modulus of elasticity in Article 5.4.2.4. The new equation,

$$E_c = 120,000K_c w_c^2 f_c^{0.33}$$

where

K_c = correction factor for source of aggregate to be taken as 1.0 unless determined by physical test, and as approved by the authority of jurisdiction,

w_c = unit weight of concrete (kips/ft³), and

f_c = specified compressive strength of concrete (ksi)

is for concretes with unit weights between 0.090 and 0.155 kips/ft³ and for normal weight concrete with specified compressive strengths up to 15.0 ksi. The new relationship for modulus of elasticity not only yields values consistent with the original relationship for normal weight concrete but also appropriate values for lightweight and higher-strength concrete. The original relationship is retained in the commentary as an alternative.

Agenda Item 35

Agenda Item 35 extends the shear-design provisions in the Sectional Design Model (Article 5.8.3) to concrete compressive strengths up to 15 ksi, based upon NCHRP Report 579, *Application of LRFD Bridge Design Specifications to High-Strength Structural Concrete: Shear Provisions*, by Neil Hawkins and Daniel Kuchma of University of Illinois.

The adoption of Agenda Items 33, 34, and 35,

by virtue of extending the applicability to higher strength concretes, is expected to enable:

- current bridge girders to span longer lengths, support heavier loads, or both; and
- shallower concrete sections to be used for some span lengths.

Agenda Item 36

Agenda Item 36 basically represents a clean-up of the commentary to Section 5. It eliminates 26 sets of text, from as little as a single sentence to as much as several paragraphs, throughout the Section 5 commentary. Reasons for removing the commentary items include:

- The deleted material is more appropriately included in the *AASHTO LRFD Bridge Construction Specifications*,
- The deleted commentary is common knowledge to the reader,
- The deleted commentary is dated, and
- The deleted words, while valuable when this provision was first adopted, are of little value in the current edition.

Agenda Item 37

Finally, Agenda Item 37 removes all reference to stress-relieved strands from the *AASHTO LRFD Bridge Design Specifications*, as they are no longer used. In addition, several provisions insert the necessary information on stress-relieved strands into the *AASHTO Manual for Bridge Evaluation* for use in evaluating existing structures.

Interim revisions to the *AASHTO LRFD Bridge Design Specifications* are considered annually by SCOBS. Their next meeting is scheduled for April 19 through 23, 2015, in Saratoga Springs, N.Y.

EDITOR'S NOTE

If you would like to have a specific provision of the *AASHTO LRFD Bridge Design Specifications* explained in this series of articles, please contact us at www.aspirebridge.org.