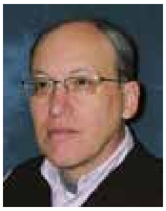
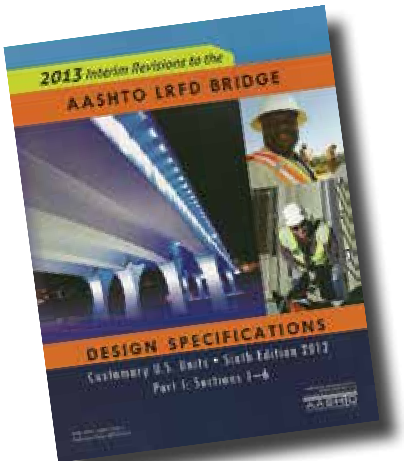
2013 Interim Changes Related to Concrete Structures



by Dr. Dennis R. Mertz



The American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Bridges and Structures considered and adopted five agenda items specifically related to concrete structures at their annual meeting hosted in July 2012 by the Texas Department of Transportation in Austin, Tex. Technical Committee T-10, Concrete Design, developed Agenda Items 35 through 39 over the past several years and moved them to the subcommittee ballot for consideration in Austin. The agenda items represent revisions and additions to the *AASHTO LRFD Bridge Design Specifications*. This column reviews the 2012 concrete-structures agenda items, which have become the 2013 Interim Revisions.

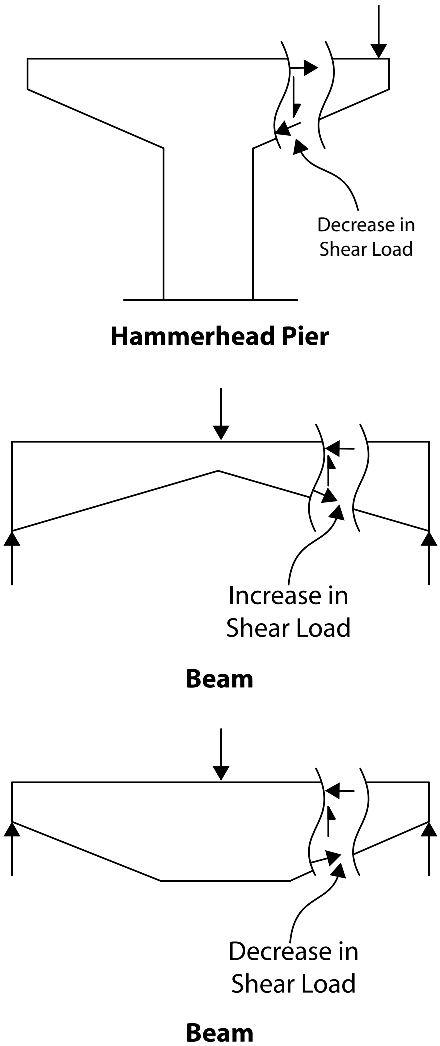
Article 5.8.2.8 of the general shear provisions and Article 5.8.6.2 of the segmentally constructed bridge shear provisions required that the effects of inclined flexural compression or tension to be considered. Many times, the effect may be beneficial rather than detrimental. To simplify design, **Agenda Item 35** revises both of these articles to require their effect be considered where it is "detrimental (increase in shear load) but may be ignored if the effect is beneficial (decrease in shear load)."

In the design of segmentally constructed bridges, Article 5.8.6.2 of the Specifications was not clear how much of the web depth an inclined tendon had to traverse in order for the vertical component of prestressing to effectively reduce the applied shear. **Agenda Item 36** clarifies this by inserting modified language from the *AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges*. The revised article states that the vertical component of inclined tendons shall only be considered to reduce the applied shear where the tendons extend through the web depth, engage both the flexural compression and flexural tension zones and are anchored or fully developed by anchorage, deviators, or internal ducts located in the top or bottom $^{1}/_{3}$ of the webs.

Agenda Item 37 extends the provisions for development of prestressing strand in Article 5.11.4 to "normal-weight concrete with specified concrete compressive strengths up to 10.0 ksi at transfer (f'_{ci}) and up to 15.0 ksi for design (f'_c)." This extension is based upon research reported by Ramirez and Russell in the National Cooperative Highway Research Program (NCHRP) Report 603, *Transfer, Development, and Splice Length for Strand/Reinforcement in High-Strength Concrete*.

Agenda Item 38 results from NCHRP Report 679, *Design of Concrete Structures Using High-Strength Steel Reinforcement* by Shahrooz et al., which concludes that reinforcing steel with specified minimum yield strengths of up to 100 ksi can be successfully used in nonseismic bridge applications for both increased corrosion resistance and higher yield strength. A value of yield strength, f_y, not exceeding 100 ksi was found to be permissible without requiring significant changes to the LRFD specifications or, more critically, to the design philosophy and methodology prescribed therein. Some limitations to this increase were identified. This agenda item extends the minimum yield strength for use in design to 100 ksi for most nonseismic applications. Where higher yield strengths are not permitted by the specifications, the yield strength defaults to the existing values. Appendix D5 defines the articles where a minimum yield strength up to 100 ksi is permitted.

NCHRP Report 603, cited in the discussion of **Agenda Item 37** above, also addresses development of deformed reinforcement. Based on the research, **Agenda Item 39** revises Articles 5.11.2 and 5.11.5 to allow these provisions to apply to development and splice lengths of deformed reinforcement in tension for normal weight concrete with specified concrete compressive strengths up to 15.0 ksi provided that minimum transverse reinforcement is provided along the development and splice lengths. **A**



Article 35: Conditions that decrease and increase shear load. Figure: PCI.

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 a www.aspirebridge.org.*