Gregory E. Sanders

From: Gregory E. Sanders
Sent: Monday, November 13, 2017 2:50 PM
To: BRPM; BRSSE; BRLLD; BRSD
Subject: Development Section Bulletin No. 17-06-DSB Implement New P/S Service III and Temporary Stress Limits (AASHTO LRFDUS-7-I2)

<<Development Section Bulletin>>

No. 17-06-DSB Implement New P/S Service III and Temporary Stress Limits (AASHTO LRFDUS-7-I2)
Contact: Development Section
Effective: Beginning Prestressed Designs

Instructions:

For all prestressed structural components:

1. Implement new Service III Limit live load factor of 1.0 (was 0.8) when using the refined* estimate of time-dependent losses and elastic gains are considered in accordance with AASHTO LRFD Table 3.4.1-1 and Table 3.4.1-4 which could result in added strands, reduced girder spacings or reduced span lengths.

    - Based on maintaining same service level of reliability as prestressed girders and beams designed in accordance with AASHTO Standard Specifications and pre-2005 AASHTO LRFD Specifications because of past successful performance (Wassef et al., 2014).

    - Current bridge inspections of MoDOT bridges with prestressed girders and beams designed in accordance with post-2005 AASHTO LRFD Specifications do not generally show problems with cracking at the bottom flange in positive moment regions.

2. Implement new temporary stress limit check of 0.65 (was 0.60) before losses in accordance with AASHTO LRFD 5.9.4.1.

3. Implement performing service stress limit check at top of girders and beams near interior supports in accordance with AASHTO LRFD 5.14.1.4.6 using as the allowed service stress limit a modified "temporary tensile stress limit before losses" where f'c is substituted for f'ci ($0.24\sqrt{f'c}$ in lieu of $0.24\sqrt{f'ci}$) and new Service III Limit live load factor of 1.0. According to AASHTO LRFD, alternatively the top of girders at interior supports may be designed as reinforced concrete members at the strength limit state where the strength limit load factors shall be used. EPG 751.22.2.3 would seem to support this alternate method where it states that girders and beams shall be designed as a reinforced concrete section at regions of negative flexures (i.e., negative moments). Therefore, either method is acceptable.

* According to Wassef et al. (2014), the change in load factor should also be applied when using the approximate estimate of time-dependent losses; however, this was not adopted by AASHTO.

Revisions:

The in-house preliminary prestressed girder/beam design spreadsheet has been updated.

EPG revisions are not necessary since EPG generally instructs users to follow AASHTO LRFD except for Item No. 3 above where existing guidance will need to be amended since alternate limit checks are allowed by AASHTO LRFD.

Program LEAP BRIDGE CONCRETE:

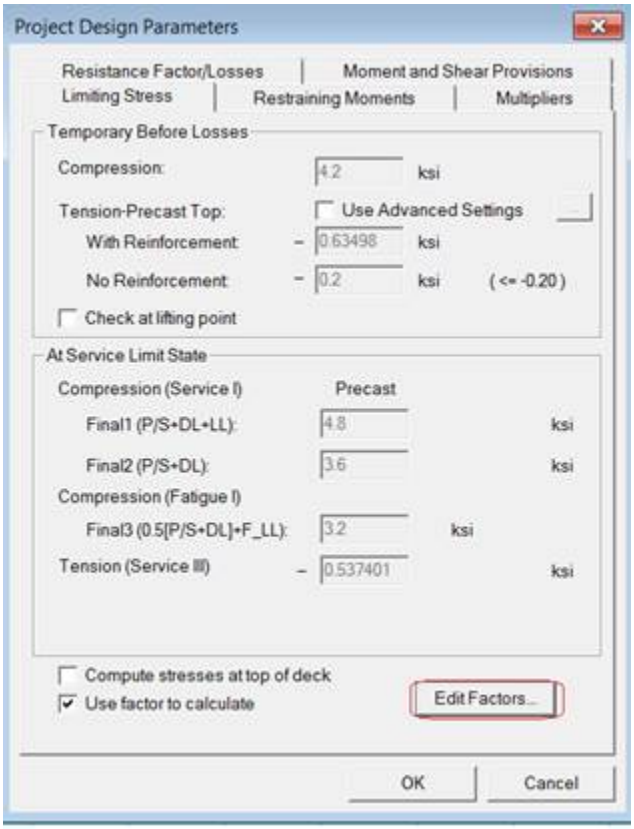
Select “LRFD-7 2016 Interims” for design using updated specification. For Item No. 3, the service stress limit check may need to be checked by hand if LEAP does not allow for modifying the allowed tensile stress limit (same for LEAP CONSPAN).

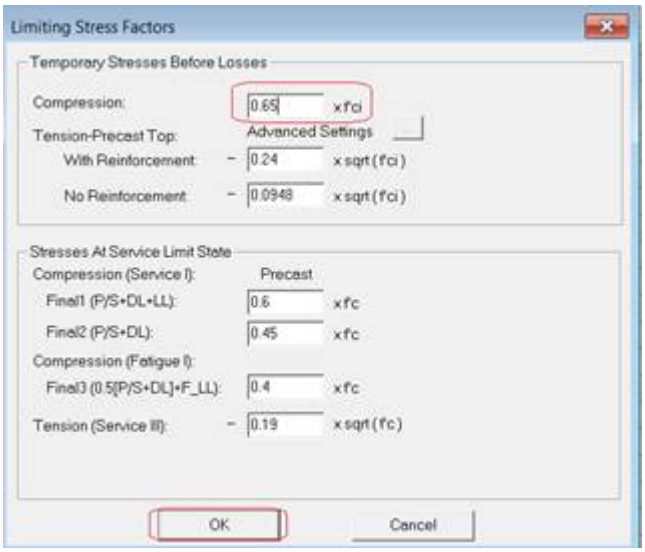
Program LEAP CONSPAN (not updated for 2016 AASHTO LRFDUS-7-I2):

Use following steps to manually update input.

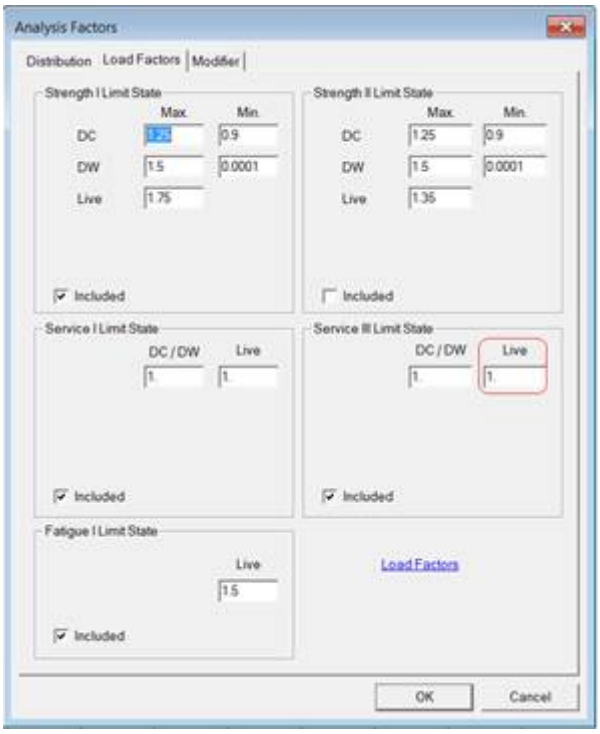
..

1. CONSPAN default value set for Project Design parameters => Limiting stress => temporary compression stress for 0.6 f’ci. As per latest AASHTO LRFD 5.9.4.1.1 it should be 0.65 f’ci.





2. CONSPAN default value set for Analysis Factors => Service III Limit State => Live use 0.8. As per AASHTO LRFD table 3.4.1-1 it should be 1.0.



Reference:

Wassef, Wagdy G.; Kulicki, John M.; Nassif, Hani; Mertz, Dennis; and Nowak, Andrzej S. 2014. NCHRP Web-Only Document 201: Calibration of AASHTO LRFD Concrete Bridge Design Specifications for Serviceability. TRB, National Research Council, Washington, DC, pp. 96-128.

Gregory Sanders, P.E.
Structural Development and Support Engineer
Missouri Dept. of Transportation
Bridge Division
Tele: 573.526.0245
Fax: 573.526.5488