AASHTO T-16

- T-16 June 25, 2018
- Update various tables to 2018 NDS for 9th Edition in 2020. Similar to effort to update for the 7th Edition 2014.
- LRFD Bridge Design Specifications Section 10, Article 10.7.8 - FYI

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2018 AASHTO BRIDGE COMMITTEE AGENDA ITEM: 18

SUBJECT: LRFD Bridge Design Specifications: Section 10, Article 10.7.8

TECHNICAL COMMITTEE: T-15 Substructures and Retaining Walls

☒ **REVISION** ☐ **ADDITION** ☐ **NEW DOCUMENT**

☒ **DESIGN SPEC** ☐ **CONSTRUCTION SPEC** ☐ **MOVABLE SPEC**
☐ **MANUAL FOR BRIDGE EVALUATION** ☐ **SEISMIC GUIDE SPEC** ☐ **MANUAL BRIDGE ELEMENT INSP**
☐ **OTHER** Click here to enter text

DATE PREPARED: 1/2/2018
DATE REVISED: Click here to enter a date

AGENDA ITEM:

In Article 10.7.8, revise Equation 10.7.8-7 as follows:

$\sigma_{dr} = \varphi_{da}(\underline{2.6}F_{co})$ (10.7.8-7)

OTHER AFFECTED ARTICLES:

None

BACKGROUND:

In previous Allowable stress design practice, $\sigma_{dr} = 3(F_{co})$. During a previous update of the Section 10, Article 10.7.8, Equation 10.7.8-7 was adjusted to remove a factor of 3. This appears to have been done to accommodate an issue in translation of the driving stress equation from allowable stress design to load and resistance factor design. The change in the equation results in a driving stress for timber piles that is greatly reduced from successful past practice, and limits potential use in transportation applications. To be consistent with that previous practice, considering the currently specified resistance factor in Article 8.5.2.2 of 1.15, need a coefficient of 3/1.15 = 2.6 to restore the equation to be consistent with past practice. The proposed equation has been modified to bring the equation into alignment with past practice without affecting any other articles in the design specifications.

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$$\sigma_{dr} = \varphi_{da}\,(\underline{2.6}F_{co}) \qquad (10.7.8\text{-}7)$$

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- Wisconsin DOT regarding the Wet Service Factor C_M, affecting the permissible bending stress.

1. Various codes (AASHTO Standard Specs 2002, the most recent AASHTO LRFD, NDS versions in 2015 and 2018) all say to use C_M=1.0 for flexure when $(F_b)(C_F) \leq 1150$ psi, otherwise C_M=0.85.

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support the design load.

Wet Service Factor, C_M

When dimension lumber is used where moisture content will exceed 19% for an extended time period, design values shall be multiplied by the appropriate wet service factors from the following table:

Wet Service Factors, C_M

F_b	F_t	F_v	$F_{c\perp}$	F_c	E and E_{min}
0.85*	1.0	0.97	0.67	0.8**	0.9

* when $(F_b)(C_F) \leq 1{,}150$ psi, $C_M = 1.0$

** when $(F_c)(C_F) \leq 750$ psi, $C_M = 1.0$

- 2018 NDS

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- Wisconsin uses with 3x12 laminations, so C_F = 1.0. Usually the species is Douglas Fir-Larch, No. 1 & Better. In the most recent versions of NDS and AASHTO LRFD, F_b = 1200 psi. However, in older codes such as the AASHTO 2002 Standard Specifications, F_b = 1150 psi. The 1200 psi value at least goes back to 2005, which is the version (year) of NDS specifically referenced by the MBE and its ASR load rating example.

- Due to the $(F_b)(C_F) \leq 1150$ psi threshold, the calculations using F_b = 1200 psi actually result in a *lower* load rating then if one were to use F_b = 1150 psi. The threshold of 1150 psi seems somewhat arbitrary; do you know the history?

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- Wisconsin is suggesting this reduction in calculated capacity is likely an unintended consequence of changing the tabulated design values. Seems there should be a provision that says something like $(C_M)(F_b)(C_F)$ should not be less than 1150 psi when $(F_b)(C_F)$ is between 1150 psi and 1350 psi. Otherwise bridges adequately designed and in good condition using use F_b = 1150 psi have lower load ratings and will require load postings due to the increase in tabulated F_b from 1150 psi to 1200 psi.

- How could we go about coordinating a change as suggested by Wisconsin with NDS and thus a resulting change in AASHTO?