

LFR Shear Rating – V_{ci} / M_{cr} Calculation

Applies to the following products:

- BrR -- all versions up to and including 7.7.1

Description

For LFR shear load ratings of prestressed concrete members, the computation of the cracking moment parameter, M_{cr} , used in Eq. (9-27) for the girder shear strength provided by concrete controlled by flexure-shear cracking, V_{ci} , is incorrect for points-of-interest (POIs) located in negative moment regions.

The equation for V_{ci} is,

$$V_{ci} = 0.6 \sqrt{f'_c} b' d + V_d + \frac{V_i M_{cr}}{M_{max}} \quad (9 - 27)$$

From the AASHTO Standard Specifications for Highway Bridges, 17th edition, 2002, the definition of the cracking moment is, “moment causing flexural cracking at section due to externally applied loads”. The equation for the cracking moment is given as,

$$M_{cr} = \frac{I}{Y_t} (6 \sqrt{f'_c} + f_{pe} - f_d) \quad (9 - 28)$$

BrR is computing the cracking moment based on flexural cracking occurring at the bottom of the member at all locations along the length of the member.

Flexural cracking occurring at the bottom of the member is correct for positive moment regions, but in negative moment regions, flexural cracking will occur at the **top** of the member.

The result is that V_{ci} shear strengths may be overestimated in negative moment regions potentially leading to unconservative shear load ratings.

This error affects LFR analysis of prestressed concrete girders made continuous for live load, post-tensioned multi-cell box girders and post-tensioned advanced concrete girders.

Workaround

There is no workaround to this issue.

Resolution

The issue will be corrected in version 7.8.