Minnesota Department of Transportation

Memo

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September 18, 2008

To: Bridge Design Engineers

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MEMO TO DESIGNERS (2008-01): Prestressed Concrete Design – Calculation of Prestress Losses and Beam Camber & Deflection

The prestress loss provisions adopted in the 2005 interims of the AASHTO LRFD Bridge Design Specifications provide loss estimates that are substantially lower than those of the previous provisions. A review by the Mn/DOT Bridge Office has resulted in the following policy for calculation of prestress losses:

1) Calculate the short term losses (elastic shortening losses) in accordance with AASHTO LRFD Article 5.9.5.2.3a or 5.9.5.2.3b as appropriate. Do not transform the strands. Also, do not include any elastic gains due to the application of loads.
2) For pretensioned I-beam and rectangular beam sections, calculate the time-dependent losses using the approximate method of AASHTO LRFD Article 5.9.5.3. For post-tensioned slabs, calculate the time-dependent losses using the refined method of AASHTO LRFD Article 5.9.5.4.
3) For bridges where live load distribution has been determined using the approximate methods of AASHTO LRFD Articles 4.6.2.2 or 4.6.2.3, check the tensile stress limits given in AASHTO LRFD Article 5.9.4 using the Service III load combination. For bridges where live load distribution has been determined using a refined analysis, check the tensile stress limits using the Service I load combination.
4) Use the table shown in Figure 1 below to report the prestress losses in the bridge plan. Until the standard sheets are revised, add the table to the prestressed beam sheet in the bridge plan and mark the sheet "Modified". Load rating is currently done using VIRTIS, which calculates losses using the AASHTO Standard Specifications. Including the losses in the bridge plan will provide a permanent record from which the load rating engineer can manually input the losses into VIRTIS to get a load rating more consistent with the design.

CALCULATED PRESTRESS LOSSES		
ELASTIC SHORTENING LOSS	____	KSI
LONG TERM LOSSES	____	KSI

FIGURE 1

Accomplishment of the above policy using commercial computer programs requires use of correct input and settings within the programs. For example, the current version of CONSPAN does not allow the option of ignoring elastic gains due to the application of loads. Therefore the losses must be entered manually. For questions about computer programs, contact Khalid Obeidat at khalid.obeidat@dot.state.mn.us or by phone at 651-366-4485.

Calculation of prestressed beam camber and deflection in accordance with the *MEMO TO DESIGNERS (2007-03)* has caused some confusion in regards to computer programs and transforming of the strands. Therefore, the *MEMO TO DESIGNERS (2007-03)* is hereby deleted and is superceded by the following:

1) Complete the prestressed beam design using one of the available programs without transforming the strands. Change both the camber and deflection multipliers at erection from the default values of 1.8 and 1.85 to a value of 1.5.
2) Report the values determined above on the prestressed concrete beam sheet in the bridge plan.

If you have any questions or concerns about the policy, please contact Dave Dahlberg at dave.dahlberg@dot.state.mn.us or by phone at 651-366-4491.

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