

IOWA DEPARTMENT OF TRANSPORTATION

To Office Bridges and Structures Date November 17, 2006
Attention All Employees Ref No. 521.3
From Gary Novey
Office Bridges and Structures
Subject MM No. 154 (Design of Cofferdam Seal Coat)

The present office policy regarding design of a seal coat allows a design bond stress of 5 psi between a steel H-pile and the seal coat concrete [Methods Memo No. 21]. The allowable bond stress generally is based on the minimum of the policies in other states. The 13th edition of the AASHTO standard specifications permitted a higher value of 10 psi, but this higher value was removed from the specifications in later editions.

Because its value of 5 psi was not based on tests, the Florida DOT recently funded research to determine a more realistic value. On the basis of the research, the Florida DOT increased the allowable to 36 psi for all contact area between steel piles and seal coat concrete [Florida DOT 2000]. Researchers recommended a higher value, 145 psi, but over an area limited by the size of the pile [Mullins et al 2002].

Revising the present office policy to increase the allowable bond stress would have the advantage of reducing the thickness of seal coat for major river bridges and, in some cases, reducing the number of extra piles required to carry uplift on the seal coat. Therefore, the office policy is changed as follows.

- The allowable bond stress between a steel H-pile and seal coat concrete shall be 10 psi.
- The total uplift load carried by each pile also shall be limited to the friction resistance available for the pile embedment in the soil. Friction resistance shall be determined from the latest edition of the Soils Design Section's "Foundation Soils Information Chart, Pile Foundation."
- The minimum seal coat thickness shall be 3 feet (1.000 m).
- The maximum seal coat thickness for typical river conditions should be limited to 6 feet (2.000 m). Greater depths may be used with approval by the section leader.
- The minimum factor of safety shall be 1.1 for the following combination of vertical forces: seal coat weight, hydraulic head and allowable pile uplift load for all piles considering the smaller of the H-pile/seal coat bond or H-pile/soil friction force. Bond and friction forces include safety factors, so the overall factor of safety will be greater than 1.1.

- The maximum allowable flexural tension stress in the seal coat shall be 250 psi. This stress should be checked for uplift on the cantilevered seal coat beyond the pile group and any other condition that causes significant flexural stress. The Iowa DOT standard specifications provide safety by requiring a minimum flexural strength of 500 psi in test beams before the cofferdam can be dewatered [IDOT SS 2405.03].

References:

Florida Department of Transportation. (2000). "Table 5.3." *Structural Design Guidelines*. Florida Department of Transportation, Tallahassee.

Mullins, G., Sosa, R., Sen, R. and Issa, M. (2002) "Seal Slab/Steel Pile Interface Bond from Full-Scale Testing." *ACI Structural Journal*, 99(6), pp 757-763.

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