Minnesota Department of Transportation

MS 610

3485 Hadley Avenue North

Oakdale, MN 55128

Office Tel: (651) 366-4506

Office Fax: (651) 366-4497

Memo

TO: Bridge Design Engineers
Construction Managers Group (CMG)
Resident Engineers

FROM: Arielle Ehrlich
State Bridge Design Engineer

DATE: November 21, 2012

MEMO TO DESIGNERS (2012-02): Transition to New MnDOT Pile Formula 2012 (MPF12)

Based on the results of a recent MnDOT research project, MnDOT will discontinue the use of the current MnDOT Nominal Resistance Pile Driving Formula (known as the LRFD formula) for construction control and replace it with a new pile driving formula designated the MnDOT Pile Formula 2012 (MPF12). The MPF12, which was calibrated for site conditions typically encountered in Minnesota, more reliably predicts the nominal resistance of driven piles using LRFD methodology.

This change in formula will not affect the design of bridges, but will require a change in the standard plan notes. The Required Nominal Pile Bearing Resistance Tables from Appendix 2-H Article F, page 2-104, of the MnDOT LRFD Bridge Design Manual are hereby replaced with the attached tables.

For the MPF12, note that CIP piles and H-piles have different resistance factors (φ_{dyn}). As a result, there are now four tables presented for use depending on the type of pile used.

A revised special provision will be released shortly that covers the use of the MPF12. The special provision will include limitations on MPF12 usage, such as blow count range and pile hammer qualifications.

In order to educate field personnel, the Bridge Construction Unit will organize a number of training sessions statewide to provide information regarding the transition to the MPF12. These sessions will be beneficial for personnel from MnDOT Districts, MnDOT State Aid, consultant inspectors, and geotechnical consultants. The tools used by inspectors to calculate driven pile capacities and pile forms will also be revised to reflect the new formula. Look for more information in the coming months.

This new formula should be utilized for all bridge projects with letting dates after February 28, 2013.

If you have any questions contact me or Dave Dahlberg at (651) 366-4491.

Thank you.

cc: Dave Conkel/Local Consultants
Colleen Harer/Design Consultants
Gary Person/Foundations (MS 645)

Current standard plan notes, Appendix 2-H, Article F

<table>
<tr><td colspan="3">_____ ABUTMENT
REQUIRED NOMINAL PILE BEARING
RESISTANCE R_n – Tons/Pile</td></tr>
<tr><td>FIELD CONTROL METHOD</td><td>φ_{dyn}</td><td>* R_n</td></tr>
<tr><td>Mn/DOT Nominal Resistance Formula</td><td>0.40</td><td></td></tr>
<tr><td>PDA</td><td>0.65</td><td></td></tr>
</table>

* R_n = (Factored Design Load) / φ_{dyn}

<table>
<tr><td colspan="3">PIER _____
REQUIRED NOMINAL PILE BEARING
RESISTANCE R_n – Tons/Pile</td></tr>
<tr><td>FIELD CONTROL METHOD</td><td>φ_{dyn}</td><td>* R_n</td></tr>
<tr><td>Mn/DOT Nominal Resistance Formula</td><td>0.40</td><td></td></tr>
<tr><td>PDA</td><td>0.65</td><td></td></tr>
</table>

* R_n = (Factored Design Load) / φ_{dyn}

Revised standard plan notes, Appendix 2-H, Article F

H-Piles

<table>
<tr><td colspan="3">_____ ABUTMENT
REQUIRED NOMINAL PILE BEARING
RESISTANCE FOR H-PILES R_n – Tons/Pile</td></tr>
<tr><td>FIELD CONTROL METHOD</td><td>φ_{dyn}</td><td>* R_n</td></tr>
<tr><td>MnDOT Pile Formula 2012 (MPF12)
$R_n = 20\sqrt{\dfrac{W \times H}{1000}} \times \log(\dfrac{10}{S})$</td><td>0.60</td><td></td></tr>
<tr><td>PDA</td><td>0.65</td><td></td></tr>
</table>

* R_n = (Factored Design Load) / φ_{dyn}

<table>
<tr><td colspan="3">PIER _____
REQUIRED NOMINAL PILE BEARING
RESISTANCE FOR H-PILES R_n – Tons/Pile</td></tr>
<tr><td>FIELD CONTROL METHOD</td><td>φ_{dyn}</td><td>* R_n</td></tr>
<tr><td>MnDOT Pile Formula 2012 (MPF12)
$R_n = 20\sqrt{\dfrac{W \times H}{1000}} \times \log(\dfrac{10}{S})$</td><td>0.60</td><td></td></tr>
<tr><td>PDA</td><td>0.65</td><td></td></tr>
</table>

* R_n = (Factored Design Load) / φ_{dyn}

CIP Piles

<table>
<tr><td colspan="3">_____ ABUTMENT
REQUIRED NOMINAL PILE BEARING
RESISTANCE FOR CIP PILES R_n – Tons/Pile</td></tr>
<tr><td>FIELD CONTROL METHOD</td><td>φ_{dyn}</td><td>* R_n</td></tr>
<tr><td>MnDOT Pile Formula 2012 (MPF12)
$R_n = 20\sqrt{\dfrac{W \times H}{1000}} \times \log(\dfrac{10}{S})$</td><td>0.50</td><td></td></tr>
<tr><td>PDA</td><td>0.65</td><td></td></tr>
</table>

* R_n = (Factored Design Load) / φ_{dyn}

<table>
<tr><td colspan="3">PIER _____
REQUIRED NOMINAL PILE BEARING
RESISTANCE FOR CIP PILES R_n – Tons/Pile</td></tr>
<tr><td>FIELD CONTROL METHOD</td><td>φ_{dyn}</td><td>* R_n</td></tr>
<tr><td>MnDOT Pile Formula 2012 (MPF12)
$R_n = 20\sqrt{\dfrac{W \times H}{1000}} \times \log(\dfrac{10}{S})$</td><td>0.50</td><td></td></tr>
<tr><td>PDA</td><td>0.65</td><td></td></tr>
</table>

* R_n = (Factored Design Load) / φ_{dyn}