Wave Equation Analysis of Piles

Effective: November 14, 2008

Description. This work shall consist of conducting Wave Equation Analysis of Piles (WEAP) at each substructure or location specified on the contract plans, using the latest version of the WEAP software program. The analyses assumptions and driving recommendation shall be provided to the Engineer for review and approval, to establish the pile acceptance criteria and ensure the proposed driving system will not overstress the piles.

Submittals. No later than twenty five (25) days prior to driving the test or production piles at the specified location(s), the Contractor shall submit the wave equation analysis results and driving recommendations to the Engineer for review and approval.

The wave equation analysis shall be sealed by a Professional Engineer licensed in the state of Illinois having experience in the use of the WEAP program and selection of the geotechnical and hammer input parameters.

As a minimum, the Contractor shall submit the following analysis assumptions:

1. The pile type and size analyzed at each location.
2. The Nominal Required Bearing specified at each location.
3. The test pile bearing when test pile(s) are specified.
4. The batter angle(s) of any piles specified to be driven in a non-vertical alignment.
5. The proposed or anticipated total pile length and length above ground at end of driving.
6. Ground surface elevation during driving.
7. The assumed subsurface soil profile layer depths and thicknesses, location of water table, soil type and strength parameters.
8. Borings numbers used to develop the design soil profile.
9. Explanation of why any input values were selected that differ from the default values recommend by the program.
10. A completed “Hammer Data Form” documenting the proposed hammer, helmet and cushion information (see attached) or see http://www.dot.il.gov/bridges/bridgforms.html

The recommendations to be included in the submittal are to include:

1. An assessment of the proposed hammer driving system(s) ability of drive the test, production and batter piles to their required bearings at a penetration rate between 2 and 10 blows per inch.
2. The expected stress levels in the piles at the maximum expected hammer energy and any recommended limitations on hammer energy or fuel settings to ensure the pile stresses do not exceed 90% of the pile yield stress.
3. A pile inspector’s charts showing hammer stroke (ft) or Energy versus pile penetration rate (blows/inch) at the nominal required bearing, batter pile bearing and test pile bearing for each substructure specified.

A new analysis is required if the contractor makes driving system changes from what is proposed in the approved analysis.

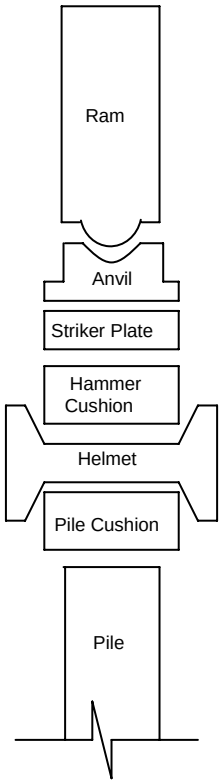
Basis of Payment. This work will not be measured for payment and shall be included in the cost for the various pay items associated with pile foundation construction.

Illinois Department of Transportation

Pile Driving Equipment Data

Structure Number: ____ - _____
Pile Driving Contractor: _____
Abutment /Pier Number(s): _____ Route: _____
Pile Type & Size(s): _____ Section: _____
Nominal Required: _____ County: _____
Production Pile Length(s): _____ Closest Boring(s): _____ Contract: _____

Hammer Manufacturer: _____ Model No: _____
Type (diesel, air/steam hydraulic, etc.): _____ Ram Stroke Type (fixed of Variable): _____
Maximum Operating Energy: _____ Minimum Operating Energy: _____



Maximum Recommended Stroke: _____
Minimum Measurable Stroke: _____
Ram Weight: _____

Anvil Weight: _____
Modifications to Hammer *(if any)*: _____

Striker Plate
Diameter: _____
Thickness: _____
Weight: _____

Hammer Cushion Material 1
Material Type: _____
Diameter: _____
Thickness per Plate: _____
No. of Plates: _____

Hammer Cushion Material 2 (*if composite*)
Material Type: _____
Diameter: _____
Thickness per Plate: _____
No. of Plates: _____

Total Hammer Cushion Thickness: _____

Helmet (Drive Head, Pile Cap) Weight (*including bonnet insert if any*): _____

Pile Cushion (*precast concrete piles only*)
Material: _____
Thickness Per Sheet: _____
Area: _____
No. of Sheets: _____
Thickness Total: _____

Double Acting/Differential Acting Air or Steam
Hammers Net Weight: _____
Cylinder Net Weight: _____
Piston Area: _____

Attach Bounce Chamber Pressure vs. Equivalent Energy Graphs (Closed-End Diesel Hammers Only): _____

Hammer Data Completed by: _____ Contact Phone Number: _____
Date Completed: _____