INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 18-15
Technical Advisory

August 6, 2018

TO: **All Design, Operations, and District Personnel, and Consultants**

FROM: ***/s/Elizabeth W. Phillips***
Elizabeth W. Phillips
Manager, Office of Standards and Policy
Bridge Design Division

SUBJECT: **Pile Driving**

REVISES: ***Indiana Design Manual*** **(IDM) Section 408-3.01**

EFFECTIVE: **Stage 3 submittals on or after September 1, 2018**

A cost-effective pile foundation should consider both the number of piles driven, as well as the pile driving equipment necessary for installation. Increasing the nominal driving resistance, R_{ndr}, may reduce the total number of piles, but increase the installation costs when a contractor must rent a larger hammer and/or crane to achieve the higher driving resistance.

Designers should limit R_{ndr} to 426 kips for routine bridge projects. This value correlates to commonly owned pile hammers with maximum energy ratings of 69,000-75,000 ft-lbs. Limiting R_{ndr} also reduces the risk of pile damage during installation.

Higher R_{ndr} values may be feasible based on specific site conditions where higher installation costs are offset by a significant reduction in the number of piles. Where higher R_{ndr} values are considered appropriate, the designer should coordinate with the project geotechnical engineer.

The *Indiana Design Manual* has been revised to incorporate this guidance and is included for reference on the following page.

Contact Jeremy Hunter with questions and comments at (317) 233-2997 or by email at jhunter@indot.in.gov.

408-3.01 General [Rev. Aug. 2018]

If underlying soils cannot provide adequate bearing capacity, scour resistance, or tolerable settlements, piles may be used to transfer loads to deeper suitable strata through friction or end bearing. The selected type of pile is determined by the required bearing capacity, length, soil conditions, and economic considerations. Steel pipe piles and steel H-piles are most commonly used. Other pile types, such as auger-cast piles or timber, may be considered.

If a spread footing is unsuitable or uneconomical for foundation support, driven piles should be considered. The geotechnical engineer should be contacted to determine the most appropriate pile type, size and nominal resistance to support the desired pile loads.

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Typical pile types, sizes, and nominal resistances for piles terminating in soil, soft rock, or shale, are listed in Figure 408-3A.

The factored design soil resistance may be increased if the field method of resistance/capacity determination is by static load test and if approved by the Office of Geotechnical Engineering.

For piles seated on hard rock, such as limestone, etc., the maximum nominal geotechnical resistance shall be less than or equal to $0.65A_sF_y$. The maximum factored geotechnical resistance shall be less than or equal to $0.46A_sF_y$. This does not apply to piles seated in soft rock, such as shale, weathered rock, etc.

For friction piles, the geotechnical resistance factors for pile analysis shown in Figure 408-1A shall be reduced by 20% if the number of piles in a pile group is 4 or less.