

Design Memorandum

TO: All Design Section Staff

FROM: Bijan Khaleghi

DATE: March 18, 2009

SUBJECT: Deep Foundation Program Options

This memorandum supersedes design memorandum issued on September 12, 2008.

The applicability of DFSAP and LPILE programs for static and liquefied soil structural analysis cases have been studied by the Bridge and Structures Office and the Geotechnical Division. As a result, the Bridge Design Office and the Geotechnical Division have decided to put into effect the following guidelines on the use of DFSAP and LPILE programs:

- The DFSAP Program may be used for pile and shaft foundations for static soil structural analysis cases.
- The DFSAP Program may be used for pile and shaft foundations for liquefied soil structural analysis case of a shaft or pile foundation with static soil properties reduced by Geotechnical Division to account for the effects of liquefaction. The liquefaction option in either LPILE or DFSAP programs may not be used (the liquefaction option shall be turned off). The Liquefied Sand soil type shall not be used in LPILE.
- The LPILE Program may be used for a pile supported foundation group. Pile or shaft foundation group effect efficiency shall be taken as recommended in the project Geotechnical Report.

Background:

The adequacy of the DFSAP program for all foundation types and all soils profiles has been recently questioned by the Bridge Office and Consultant engineers. To address these concerns, a parametric study for a range of foundations and soil profiles has been conducted using DFSAP and L-Pile to determine the best approach to characterize the soil for liquefied conditions. Based on the results of this study, it has been determined that both DFSAP and L-Pile provide reasonable and consistent solutions if the input soil parameters are properly reduced to account for the effects of liquefaction as described in the WSDOT Geotechnical Design Manual Chapter 6 Method 2. However, it was also determined that the L-Pile built in liquefaction model tends to produce non-conservative and inconsistent results except for relatively short smaller diameters piles. At this point, the Bridge Office and Geotechnical Division recommend that the built in liquefaction options in both programs not be used.

If you have any questions regarding these issues, please contact Bijan Khaleghi at 705-7181.

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