

Ground-Source Bridge Deck Deicing and Integrated Shallow Geothermal Energy Harvesting Systems

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Dissertation submitted to the faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In
Civil Engineering

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Description of item under review for fair use: Figure 4-2. Schematic illustrating the concept of ground-source bridge deck deicing utilizing an energy foundation, which in this case includes the embankment and foundation piles (redrawn after Bowers and Olgun 2013).

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Description of item under review for fair use: Figure 4-3. Schematic illustrating the effects of heating and cooling on the shaft resistance and axial load of a pile. Cooling loads can lead to the development of tensile loads in the pile whereas heating loads can lead to excessive compressive loads in the pile (redrawn after Bourne-Webb et al. 2009).

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Description of item under review for fair use: Figure 5 7. Multilayer finite line source model; (a) effect of the primary segment, and (b) effect of the secondary segments (redrawn after Abdelaziz et al. (2014).

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Description of item under review for fair use: Table 2 1. Summary of energy pile components (Abdelaziz 2013).

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