TIDC Transportation Infrastructure Durability Center AT THE UNIVERSITY OF MAINE

The Impact of The Soil Profile and The Bridge Span Length on The Design of Steel Piles in Integral Abutment Bridges (IABs) under thermal loading.

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Abstract

The objective of this study is to identify the impact of the bridge span length and soil conditions around the abutments on the pile forces and displacement, under thermal expansion. That is, how the range of span length and the soil behind the wall will impact the fixity point, pile head displacement, and bending moment in the piles oriented in a weak direction. The study was done by using 3D finite element modeling, varying the bridge span length from 150 to 275 ft., and soil behind the abutment wall from dense to loose, but, keeping the thermal loading, soil around pile and cross-sectional properties of the pile constant.

- Various pile head displacements were generated are representation of constant ΔT and different range of span length and soil behind the abutment wall.

- The increment of bridge span length will increase effective length of the fixity point, the pile head displacement, and the maximum moment at the top and 2nd segment by 0.25 ft, 6.0%, 10% and 2% respectively.

- On the other hand, dense soil behind the wall will decrease effective length of the fixity point by 0.55 ft, the pile displacement by 45%, and the maximum moment at the top and 2nd segment by 35% and 38% in the pile due to more stiffness of abutment with compared to loose soil behind the wall.

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