WAVE-PROPAGATION AND LUMPED-MASS MODELING OF A VIBRATORY RIGID DRUM ON AN ELASTIC HALF-SPACE

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Vibratory drum rollers are commonly used to compact soil in geoconstruction projects. To improve our ability to extract information about the underlying soil from the instrumented drum, a more robust model of the drum/soil interaction is required. A reasonable starting point is to develop a solution for a drum of infinite or finite length vibrating vertically on the surface of an elastic half-space. Several approaches can be taken to this problem including a lumped-mass model, a wave propagation based model or finite element models. The roots for these approaches lie mostly in the dynamic foundation modeling [1], the elastic half-space theory [2] and contact stress theory [3,4].

This complex problem involves a curved rigid surface with a contact width that varies cyclically with the vibrating drum. A wave-propagation approach and a lumped-mass-parameter approach based on contact stresses are chosen for modeling this problem.

The paper will describe the methods used, the complexities, assumptions, results and their applications for compaction quality control.

References

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