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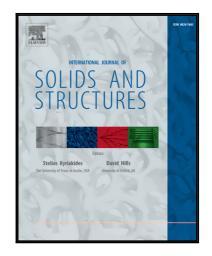
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## Insights on the Vibration Characteristics of Double-Layer Cable Nets of D<sub>4h</sub> Symmetry

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## Abstract

Coupling shallow cable nets into multi-layer configurations offers the possibility of altering the vibration properties of single-layer systems in a beneficial way. When members of appropriate stiffness and damping characteristics are employed as coupling devices, there will be a dynamic interaction between the motions of the layers, with the combined system expected to exhibit a higher stiffness and damping response than the individual layers. Vertical coupling of two identical single-layer cable nets of  $C_{4v}$  symmetry results in a double-layer configuration of  $D_{4h}$  symmetry, the vertical motions of which are strongly influenced by the symmetry properties of the configuration as well as the stiffness and damping properties of the coupling members. By considering a 32-node double-layer cable net as a case study, the present investigation employs group theory to reveal important insights on the vibration characteristics of cable nets of the type in question, at the same time laying out a computational framework for an efficient vibration analysis of such systems.

Keywords: cable net; vibration; symmetry; group theory; eigenvalue problem; mode shape

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