CERTIFICATIONS

MODAL ANALYSIS

Modal analysis, or the mode-superposition method, is a linear dynamic-response procedure, which evaluates and superimposes free-vibration mode shapes to characterize displacement patterns. Mode shapes describe the configurations into which a structure will naturally displace. Typically, lateral displacement patterns are of primary concern.

Mode shapes of low-order mathematical expression tend to provide the greatest contribution to structural response. As orders increase, mode shapes contribute less, and are predicted less reliably. It is reasonable to truncate analysis when the number of mode shapes is sufficient.

A structure with N degrees of freedom will have N corresponding mode shapes. Each mode shape is an independent and normalized displacement pattern, which may be amplified and superimposed to create a resultant displacement pattern.

CERTIFICATIONS

MODAL ANALYSIS

Numerical evaluation proceeds by reducing the equations of motion (N simultaneous differential equations coupled by full mass and stiffness matrices) to a much smaller set of uncoupled second order differential equations (N independent normal-coordinate equations). The orthogonality of mode-shape relations enables this reduction.