

Limit Stops in Dynamic Analysis

Question: *How are limit stops handled in dynamic analysis (response spectrum, time history, harmonic)? We noticed that the displacements in the results for dynamic cases could be higher (e.g., 108.45 mm) than those input for limits at the limit stops (e.g., 50 mm and -70 mm). Results indicate that a limit stop has "not reached." Please explain.*

Reply: Dynamic analysis in Caepipe is performed using mode superposition, which is a linear process, whereas analysis of limit stops is a nonlinear process. It is not possible to include nonlinearities in dynamic analysis. As an approximation only, nonlinearities are "sort of" indirectly included in dynamic analysis by using the stiffness associated with them from the first operating case (W+P1+T1) during modal analysis.

In the case of limit stops, if a limit is reached during the first operating case, then the associated stiffness is used in modal analysis. If a limit is not reached, then the limit stop is ignored in modal analysis. Even if a limit is reached and the stiffness is used in modal analysis, it is still not possible to use the actual limits (upper and lower) in modal analysis.

In the example mentioned, the limits are not reached in the first operating case. This status is used in modal analysis and subsequently in dynamic case analysis. So, in effect, this limit stop is not used.