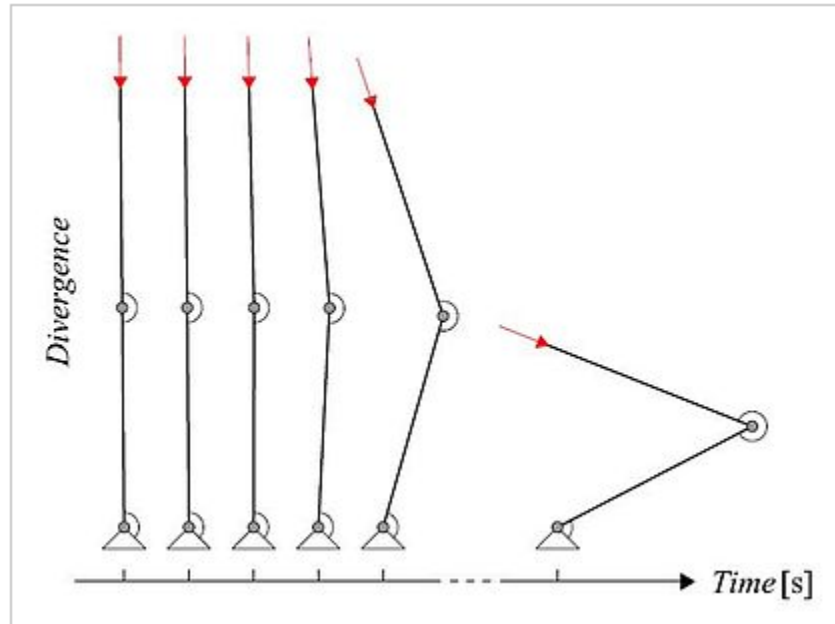


# Buckling

**Buckling** occurs physically when a structure becomes unstable under a given loading configuration, and mathematically when a **bifurcation** occurs in the solution to equations of static equilibrium. The two primary means for performing buckling analysis include Eigenvalue and Nonlinear buckling analyses. Buckling must be explicitly evaluated for each set of loads considered because, unlike natural frequencies, buckling **modes** are dependent upon a given **load pattern**. When evaluating buckling, any number of **load cases** may be defined, each of which should specify loading, convergence tolerance, and the number of modes to be found. Since the first few buckling modes may have similar factors, we recommend finding a minimum of six modes.

Additional information is available in the [CSI A nalysis Reference Manual](#) (Chapter XVII Load Cases, Linear Buckling Analysis).



[1]

## Articles

## Test Problems

Title	Description	Program
<a href="#">Interpreting buckling analysis results for different initial conditions</a>	Buckling analysis may begin with either zero initial conditions or the stiffness taken from the end of a nonlinear load case. This test problem compares the associated output.	SAP2000
<a href="#">P-Delta effect for a cantilevered column</a>	Calculation and verification of the P-Delta effects of a cantilevered column.	SAP2000

## Attribution

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