

## Linear static analysis

This very general template can be used for setting up a linear static implicit analysis for solving a sequence of independent load cases without reforming the stiffness matrix for each load case, see for example Figure 1. It will provide control card settings and database output requests in line with the baseline recommendations of Appendix P of the Keyword Manual, and the Guideline to implicit analyses using Ansys LS-DYNA. Loading, boundary conditions, tied contacts etc. must be set up by the user.

In the Ansys LS-DYNA software, an implicit analysis is either fully nonlinear or fully linear. (From R15, the option to perform a linear analysis considering nonlinear contacts was added). In a linear static analysis, small deformations and small strains are the basic assumption. No iterations or checks of convergence with respect to residuals or equilibrium are performed. If non-linear material models are used, they will be linearized at the initial configuration, and the corresponding tangent stiffness will be used in step 1. But the stresses and strains will still be computed based on the obtained displacements using the corresponding (non-linear) material and element routines, as a postprocessing step. If consistent estimates of stresses and strains from a linear analysis are of interest, it is highly recommended to use a linear elastic material model (\*MAT\_ELASTIC) and an element type suited for linear analyses. From R15 of LS-DYNA, material models are automatically linearized in linear analyses. Should the applied force cause a deformation that is not consistent with the assumption of small strains, erroneous results may be obtained.

In a linear static analysis, sufficient boundary conditions are required in order to prevent rigid body modes or mechanisms, or the solution may result in spurious deformations.

Tied contacts are valid in linear analyses. Other contacts should be used with great care. Non-linear constraints in LS-DYNA, such as joints, will be linearized, and thus the results in a linear analysis will not be correct.

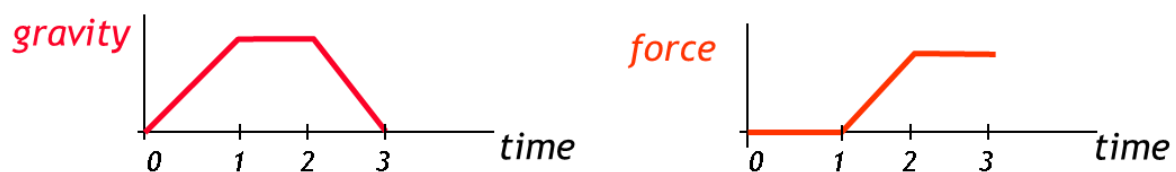


Figure 1. Definition of multiple load cases for linear static analyses. Each time ( $t=1, 2, \dots$ ) corresponds to a new load case.