

Obtain results for individual stages of a staged-construction load case

Tutorial	
Name:	Obtain results for individual stages of a staged-construction load case
Description:	Options and an example of how to obtain results for individual stages of a staged-construction load case.
Program:	SAP2000
Version:	14.2.4
Model ID:	na

Results which are reported for the individual stages of a staged-construction [load case](#) are cumulative. For example, Stage 2 results contain contribution from both Stage 1 and Stage 2.

To obtain response from load applied only during a particular stage, either of the following two methods are available:

- Post-process [SAP2000](#) output. To obtain results for Stage *n*, for example, subtract Stage *n-1* results from those of Stage *n*.
- Redefine the single staged-construction load case as a chained sequence of load cases, each using stiffness at the end of the previous case. Next, define a [load combination](#) which collects results only for a given Stage *n* as follows:
$$\text{Stage } n \text{ results} = (\text{cumulative Stage } n \text{ results}) - (\text{cumulative Stage } n-1 \text{ results})$$

Example

To demonstrate this second method, a point load is applied to the free end of a horizontal cantilever, as shown in Figure 1:

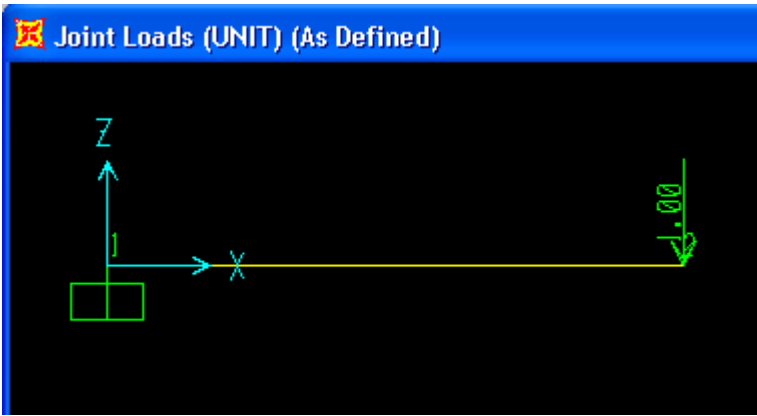


Figure 1 - Horizontal cantilever

A [staged-construction](#) load case (STAGED) is defined, then incremental loads of 1kN, 10kN, and 100kN are applied in Stages 1, 2, and 3, as shown in Figure 2:

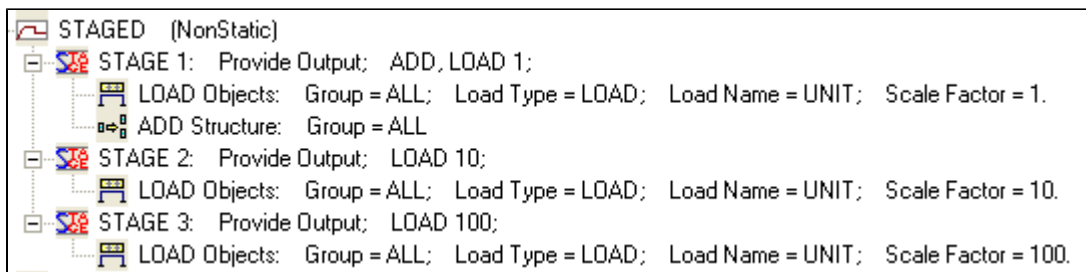


Figure 2 - Staged-construction load case

Noncumulative results are then obtained for Stages 2 and 3 by defining staged-construction load cases which have only single stages. These [load cases](#) (named STAGED stage 1, STAGED stage 2, and STAGED stage 3) are equivalent to the original STAGED case except that loading is represented by a chained sequence of individual load cases. Next, [load combinations](#) (named stage 1 only, stage 2 only, and stage 3 only) are defined in a similar manner. Once analysis is run, results are obtained for individual stages, as shown in Figure 3:

SAP2000 v14.2.4 Advanced - cantilever model V14.2.4

Joint Displacements

File View Format-Filter-Sort Select Options

Units: As Noted Joint Displacements

	Joint Text	OutputCase Text	CaseType Text	StepType Text	StepNum Unitless	U3 m
▶	2	STAGED	NonStatic	Step	1	-0.000973
	2	STAGED	NonStatic	Step	2	-0.010702
	2	STAGED	NonStatic	Step	3	-0.107997
	2	STAGED stage 1	NonStatic	Step	1	-0.000973
	2	STAGED stage 2	NonStatic	Step	1	-0.010702
	2	STAGED stage 3	NonStatic	Step	1	-0.107997
	2	stage 1 only	Combination			-0.000973
	2	stage 2 only	Combination			-0.009729
	2	stage 3 only	Combination			-0.097295

Record: 1 of 9 Add Tables... Done

$-0.010702 - (-0.000973) = -0.009729\text{m}$

$-0.107997 - (-0.010702) = -0.097295\text{m}$

Figure 3 - Individual stage results

Attachments

- [SAP2000 V14.2.4 model](#) (zipped SDB file)