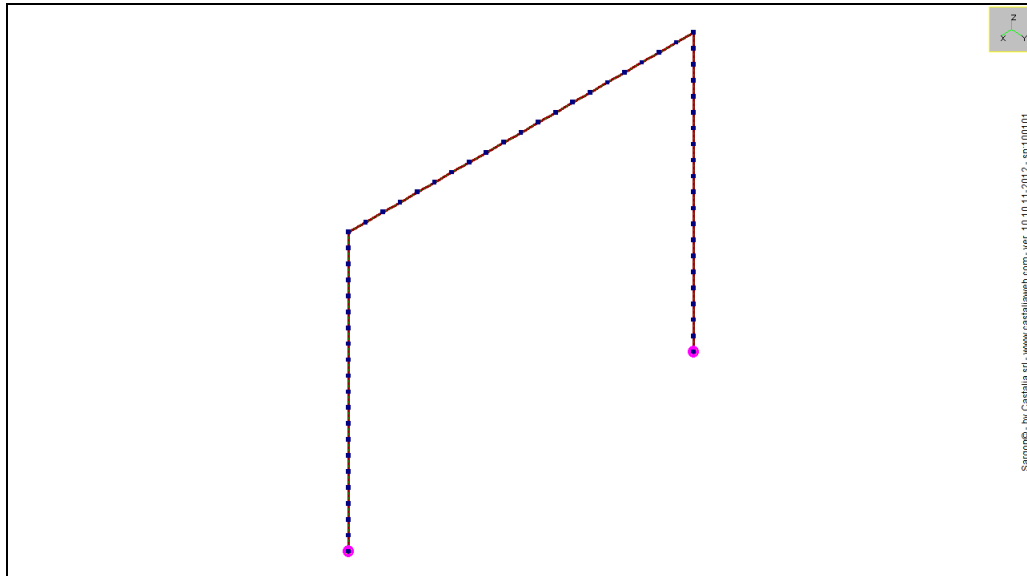


| | | |
|--|----------------|------------------------|
| SARGON BUCKLING SOLVER | TEST 04 | Tested by: M. Croci |
| VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK | rev.1 14/12/12 | Checked by: P. Rugarli |



| MODEL TO BE CHECKED (A) | | | |
|-------------------------|-----------------|-------------|-----------------|
| | MODEL NAME | OUTPUT FILE | ANALYSIS TYPE |
| A | buckling_04.wsr | .bou | Sargon buckling |

| REFERENCE MODELS | | | |
|------------------|--------------------------|-------------|-------------------------------|
| | MODEL NAME | OUTPUT FILE | ANALYSIS TYPE |
| B | buckling_04.nas | .out | NEiNastran buckling |
| C | buckling_04.sdb | .log | Sap2000 buckling |
| D | buckling_04_soclever.wsr | .sou | Sargon second order nonlinear |

| CROSS-CHECK | |
|---|--|
| The multiplier computed by Sargon buckling (A) is compared to those computed in reference models: % difference (A-X) is equal to $(A-X)/X*100$, where X value is the result of considered reference X model (for example B). | |

| A | B | % diff. (A-B) | C | % diff. (A-C) | D | % diff. (A-D) |
|---------|---------|---------------|---------|---------------|---------|---------------|
| 31,5593 | 31,5623 | -0,01 | 31,5594 | 0,00 | 31,5625 | -0,01 |

Settings for Sargon analyses:

- Buckling: modes: 1; subspace order: 10; tolerance: 1e-6; max number of iterations: 50
- Second order non linear: load steps: 1; tolerance: 1e-6; max number of iterations: 10

Note well: the second order analysis performed by Sargon solver (SOCLEVER) is different from a buckling analysis. Second order step by step does not assume that internal forces grow linearly with load multiplier, as in eigenvalue analysis. Multiplier by second order step by step solver were got by artificially increasing 10 or 100 times the load applied, so that convergence could not be reached. The multiplier < 1 is then multiplied times the increasing factor applied.

Nastran model was automatically created by Femap from the neutral file automatically created by Sargon (.wsr → .neu → .nas).

Sap2000 models were prepared by converting cross sections analysis data (A, J2, etc), with no use of cross-section dimensions, as Sap2000 does not manage all fillet radius precisely

The model used here is similar to buckling_03, but loads are different (only vertical loads here).