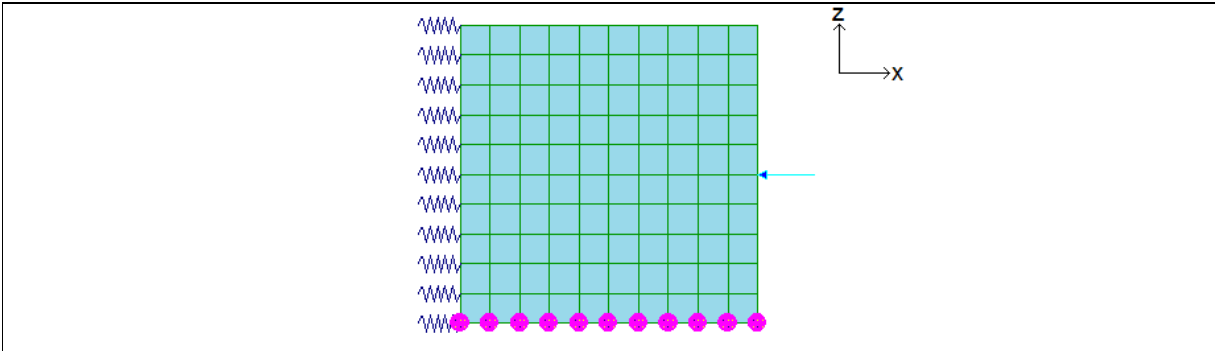


Validation of Sargon Nonlinear solver (CURAN, version 9.70)

TEST SP003

VALIDATION, RELIABILITY, BENCHMARK

Marco Croci Rev.1-16/03/2011



Test description

A square concrete block made up with plate-shell elements is simply supported on its lower side; no-compression springs constrain the block in case of +x translation, but they do not react in case of -x translation.

Test model: **curanSP_003.WSR**

Springs properties

| k_1 [N/mm] | D_y [mm] | k_2 [N/mm] | D_u [mm] | Law |
|--------------|------------|--------------|------------|----------------|
| ∞ | ∞ | ∞ | ∞ | no compression |

Concrete properties (plate-shell elements)

| ρ | E | ν | F_y | F_t |
|------------------------|----------------------|-------|-------------------|-------------------|
| $2,5e-05\text{N/mm}^3$ | 25491N/mm^2 | 0,2 | 20N/mm^2 | 20N/mm^2 |

Load

| Force | Direction |
|---------------------|-----------|
| $F = 10000\text{N}$ | -x |

CHECK

Since springs do not react to -x translations, a force in -x direction causes a rigid body translation: a null load multiplier should be computed by Curan.

| Load case | Value | Unit | CURAN | THEORETICAL | % diff. |
|-----------|-----------------|------|-----------|-------------|---------|
| 1 | Load multiplier | / | 0,000E+00 | 0,000E+00 | 0,00 |

$$\% \text{ difference} = (\text{CURAN} - \text{THEORETICAL}) / \text{THEORETICAL} * 100$$

Precision of limit multiplier for the analysis: 0.005