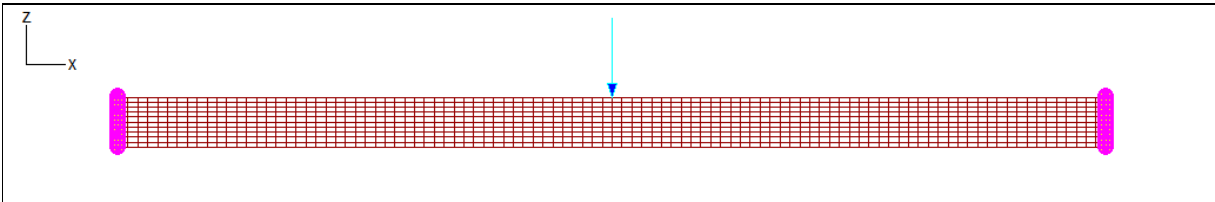


| | | | |
|--------------------------------------------------------------------|---------------------------------------------------------|--------------------|-------------------|
| Validation of Sargon Nonlinear solver (CURAN, version 9.60) | | | |
| TEST MB007 | VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK | Marco Croci | 25/11/2010 |



| Test description | |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution. | |
| Theoretical check and cross-check with Sargon linear solver (CLEVER) | |
| Test model: curanMB_007.WSR | Target model: C007MB_CLEVER.WSR |

| Material properties | | |
|----------------------------|-----|-------------------------|
| Name | ν | E |
| S235LE | 0,3 | 210000N/mm ² |

| Model data |
|-------------------|
|-------------------|

| Beam | | | Constraints | | Load (z direction) | |
|-------------|--------|-----------|--------------------|-------|---------------------------|----------|
| LENGTH | HEIGHT | THICKNESS | LEFT | RIGHT | APPLICATION POINT | FORCE |
| 10000mm | 500mm | 100mm | Fixed | Fixed | Middle point | -100000N |

| Membrane elements | Type | Thickness | d.o.f. |
|-------------------|----------|-----------|--------|
| 1000 (10x100) | QUAD4SRI | 100mm | 2178 |

| CROSS CHECK |
|--------------------|
|--------------------|

Displacement in the middle of the beam is $\delta = FL^3/192EI + L\chi T/2GA$ where χ is shear factor and T is internal shear force

| Load case | Value | Unit | CURAN | TARGET | KIND | % diff. |
|-----------|-----------------------------------|-------------------|------------|------------|-------------|---------|
| 1 | Node 127 displacement (z) | mm | -2,435E+00 | -2,455E+00 | theoretical | -0,82 |
| 1 | σ_{vm} element 44, node 97 | N/mm ² | 1,134E+01 | 1,134E+01 | cross-check | 0,00 |
| 1 | σ_x element 44, node 97 | N/mm ² | 1,143E+01 | 1,143E+01 | cross-check | 0,00 |

% difference = (CURAN - TARGET) / TARGET * 100

Precision of limit multiplier for the analysis: 0.005
 QUAD4SRI: bilinear isoparametric element with selective integration