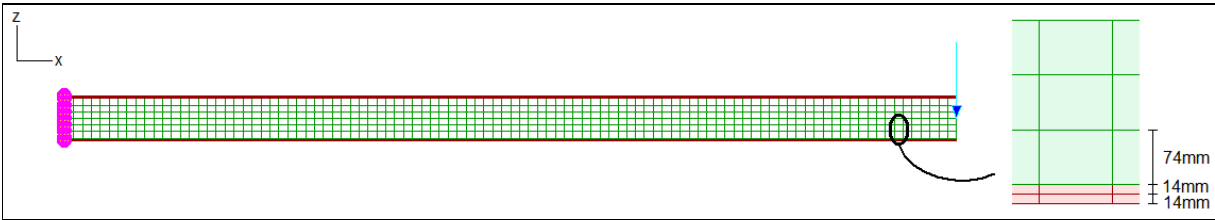


Validation of Sargon Nonlinear solver (CURAN, version 9.60)
TEST MB016
VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK
Marco Croci
26/11/2010

Test description

Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution.

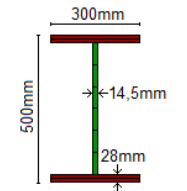
Theoretical check and cross-check with Sargon linear solver (CLEVER)

 Test model: **curanMB_016.WSR**

 Target model: **C016MB_CLEVER.WSR**
Material properties

Name	ν	E
S235LE	0,3	210000N/mm ²

Model data

Beam		Constraints		Load (z direction)		
LENGTH	SHAPE SIZES	LEFT	RIGHT	APPLICATION P.	FORCE	
10000mm	See image	Fixed	Free	Right end	-100000N	
Membrane elements		Type	Thicknesses		d.o.f.	
1000 (10x100)		QM6WI	See image		2200	

CROSS CHECK

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

Load case	Value	Unit	CURAN	TARGET	KIND	% diff.
1	Node 24 displacement (z)	mm	-1,539E+02	-1,540E+02	theoretical	-0,04
1	σ_{vm} element 135, node 80	N/mm ²	1,666E+02	1,666E+02	cross-check	0,00
1	τ_{zx} element 333, node 351	N/mm ²	-1,486E+01	-1,486E+01	cross-check	0,00

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

Precision of limit multiplier for the analysis: 0.005

QM6WI: 4 nodes incompatible element with Wilson-Ibrahimbegovic modification