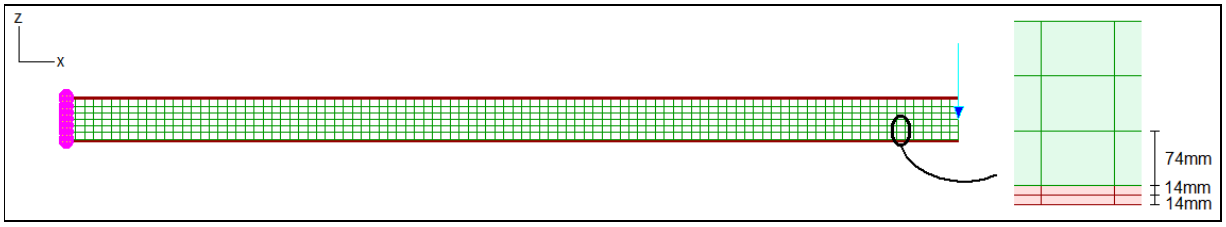
Validation of Sargon Nonlinear solver (CURAN, version 9.60)			
TEST MB014	VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK	Marco Croci	26/11/2010

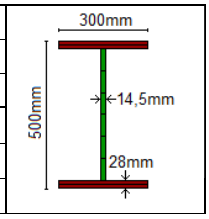


Test description
Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution.
Theoretical check and cross-check with Sargon linear solver (CLEVER)
Test model: **curanMB_014.WSR** Target model: **C014MB_CLEVER.WSR**

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)		QUAD4		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	-1,527E+02	-1,540E+02	theoretical	-0,82
1	σ_{VM} element 135, node 80	N/mm^2	1,667E+02	1,667E+02	cross-check	0,00
1	σ_x element 333, node 351	N/mm^2	-1,061E+02	-1,061E+02	cross-check	0,00

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

Precision of limit multiplier for the analysis: 0.005
QUAD4: bilinear isoparametric element

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