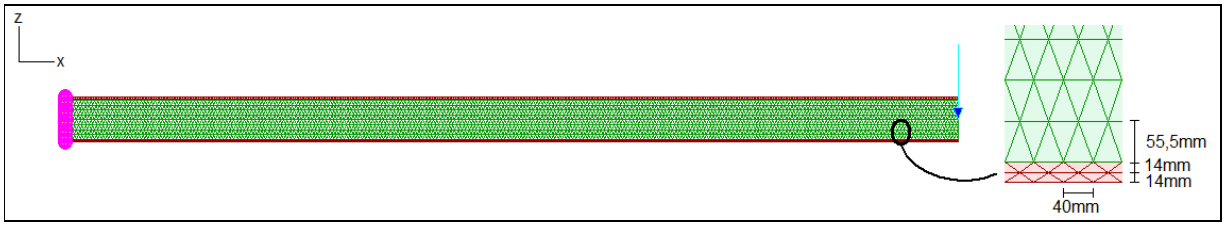
Validation of Sargon Nonlinear solver (CURAN, version 9.60)			
TEST MB013	**VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK**	**Marco Croci**	**29/11/2010**

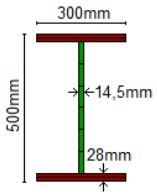


Test description
Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution.
Theoretical check and cross-check with Sargon linear solver (CLEVER)
Test model: **curanMB_013.WSR** Target model: **C013MB_CLEVER.WSR**

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.
6012		CST		See image	6512



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 16 displacement (z)	mm	-1,529E+02	-1,540E+02	theoretical	-0,69
1	σ_{VM} element 4476, node 2437	N/mm^2	1,798E+02	1,798E+02	cross-check	0,00
1	τ_{zx} element 4473, node 2429	N/mm^2	-1,453E+01	-1,453E+01	cross-check	0,00

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

Precision of limit multiplier for the analysis: 0.005