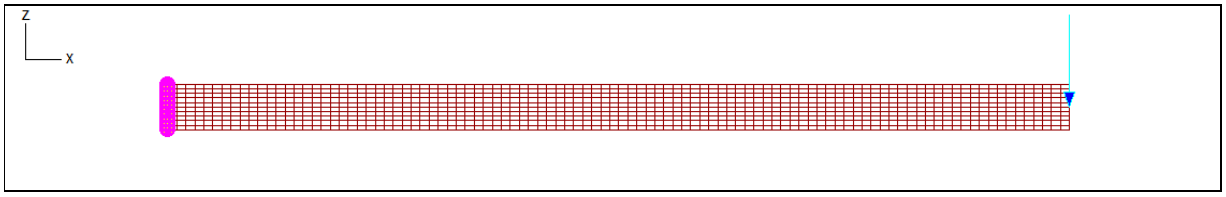
Validation of Sargon Nonlinear solver (CURAN, version 9.60)			
TEST MB002	**VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK**	**Marco Croci**	**24/11/2010**



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_002.WSR** Target model: **C002MB_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	Free	Right end	-100000N

Membrane elements	Type	Thickness	d.o.f.
1000 (10x100)	QUAD4	100mm	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	-1,500E+02	-1,527E+02	theoretical	-1,75
1	σ_{VM} element 730, node 749	N/mm^2	7,586E+01	7,586E+01	cross-check	0,00
1	τ_{zx} element 730, node 749	N/mm^2	-1,640E+01	-1,640E+01	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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