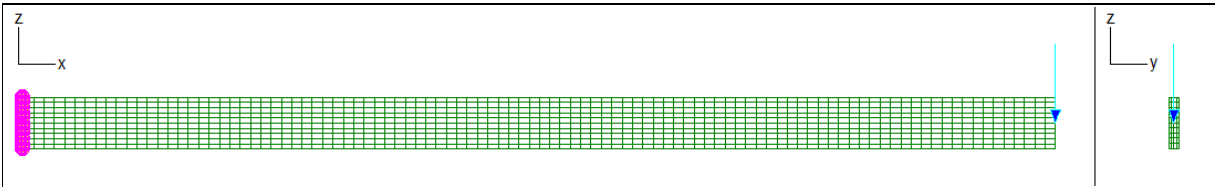


<b>Validation of Sargon Nonlinear solver (CURAN, version 9.60)</b>			
<b>TEST SO003</b>	<b>VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK</b>	<b>Marco Croci</b>	<b>30/11/2010</b>



<b>Test description</b>	
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: <b>curanSO_003.WSR</b>	Target model: <b>C003SO_CLEVER.WSR</b>

<b>Material properties</b>		
Name	ν	E
S235LE	0,3	210000N/mm <sup>2</sup>

<b>Model data</b>
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<b>Beam</b>			<b>Constraints</b>		<b>Load (z direction)</b>	
LENGTH	HEIGHT	THICKNESS	LEFT	RIGHT	APPLICATION POINT	FORCE
10000mm	500mm	100mm	Fixed	Free	Right end	-100000N

Solid elements	Type	d.o.f.
4000 (100x10x4)	BRICK8SRI	16500

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

Load case	Value	Unit	CURAN	TARGET	KIND	% diff.
1	Node 2844 displacement (z)	mm	-1,521E+02	-1,527E+02	theoretical	-0,38
1	$\sigma_{vm}$ element 3027, node 3393	N/mm <sup>2</sup>	1,964E+02	1,964E+02	cross-check	0,00
1	$\tau_{zx}$ element 3027, node 3393	N/mm <sup>2</sup>	-5,666E-01	-5,666E-01	cross-check	0,00

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

Precision of limit multiplier for the analysis: 0.005  
BRICK8SRI: trilinear isoparametric element with reduced integration