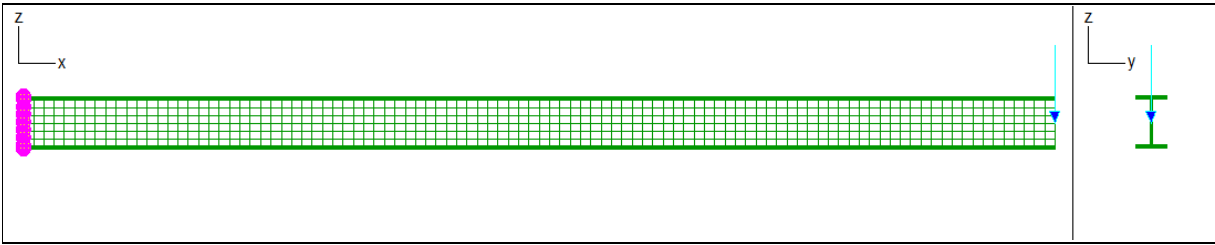


<b>Validation of Sargon Nonlinear solver (CURAN, version 9.70)</b>			
<b>TEST SO016</b>	<b>VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK</b>	<b>Marco Croci</b>	<b>Rev.2-11/04/2011</b>

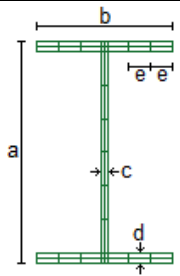


<b>Test description</b>	
Constitutive law of solids material: linear elastic. Solution should coincide with a linear elastic analysis solution.	
Cross-check solver: CLEVER (Sargon)	
Test model: <b>curansO_016.WSR</b>	Target model: <b>C016SO_CLEVER.WSR</b>

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

<b>Model data</b>
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Beam		Constraints		Load (z direction)	
LENGTH	SHAPE SIZES	LEFT	RIGHT	APPLICATION P.	FORCE
10000mm	See image	Fixed	Free	Right end	-100000N
a	b	c	d	e	
500mm	300mm	14,5mm	28mm	50mm	
Solid elements		Type		d.o.f.	
4400		BRICK8WI		20700	



<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 2339 displacement (z)	mm	-1,536E+02	-1,540E+02	theoretical	-0,23
1	$\sigma_x$ element 3922, node 6191	N/mm <sup>2</sup>	1,777E+02	1,777E+02	cross-check	0,00
1	Node 1734 reaction (z)	N	-7,070E+03	-7,070E+03	cross-check	0,00

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

Precision of limit multiplier for the analysis: 0.005  
 BRICK8WI: isoparametric element with Wilson-Ibrahimbegovic modification