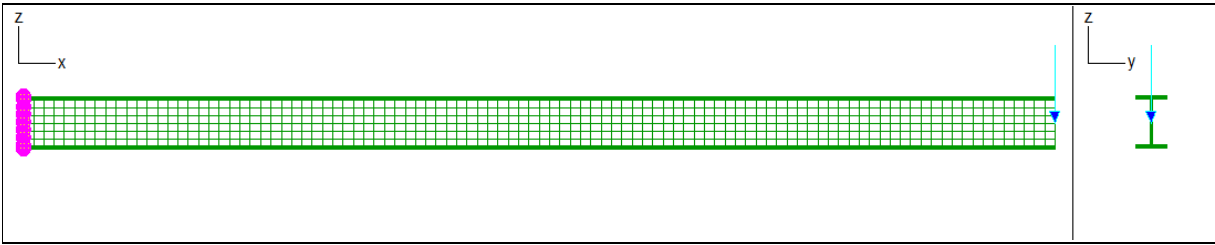


Validation of Sargon Nonlinear solver (CURAN, version 9.60)			
TEST SO014	VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK	Marco Croci	01/12/2010

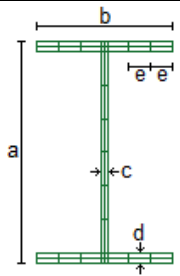


Test description	
Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution.	
Theoretical check and cross-check with Sargon linear solver (CLEVER)	
Test model: curansO_014.WSR	Target model: C014SO_CLEVER.WSR

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
a	b	c	d	e	
500mm	300mm	14,5mm	28mm	50mm	
Solid elements		Type		d.o.f.	
4400		BRICK8		20700	



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 2339 displacement (z)	mm	-1,524E+02	-1,540E+02	theoretical	-1,01
1	σ_{vm} element 3922, node 6191	N/mm ²	1,749E+02	1,749E+02	cross-check	0,00
1	τ_{zx} element 3922, node 6191	N/mm ²	-1,443E+01	-1,443E+01	cross-check	0,00

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

Precision of limit multiplier for the analysis: 0.005
BRICK8: trilinear isoparametric element