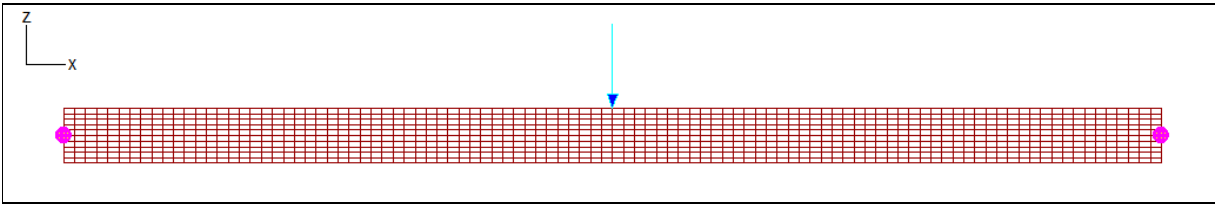


Validation of Sargon Nonlinear solver (CURAN, version 9.70)			
TEST MB042	VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK	Marco Croci	Rev.1-08/04/2011



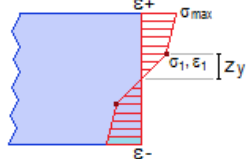
Test description
Constitutive law of membranes material: elasto-plastic (bilinear).
Test model: curanMB_042.WSR

Material properties					
Name	v	ϵ_1	σ_1	ϵ_2	σ_2
S235_EP2_ISO	0,3	0,001119	235N/mm ²	0,01678	360N/mm ²

Beam			Constraints		Load (z direction)	
LENGTH L	HEIGHT h	THICKNESS b	LEFT	RIGHT	APPLICATION POINT	FORCE F
10000mm	500mm	100mm	Simple support		Middle point	-900000N

Model data			
Membrane elements	Type	Thickness	d.o.f.
1000 (10x100)	QUAD4	100mm	2218

CHECK

<p>The check is done considering maximum normal stress in x direction, using the following formula: $\sigma_{max} = \sigma_1 + (\epsilon - \epsilon_1) * E_t$ where $\epsilon = h * \sigma_y / (2 * E * z_y)$. z_y is the height where s_1 is reached</p>	
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Load case	Value	Unit	CURAN	TARGET	KIND	% diff.
1	σ_x element 491, node 557	N/mm ²	4,223E+02	4,272E+02	theoretical	-1,14

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

Precision of limit multiplier for the analysis: 0.01
 Interpolation in stress recovery: not required
 QUAD4: bilinear isoparametric element