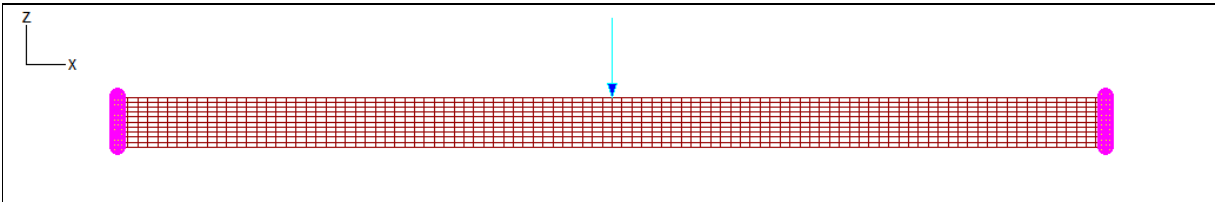


<b>Validation of Sargon Nonlinear solver (CURAN, version 9.70)</b>			
<b>TEST MB033</b>	<b>VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK</b>	<b>Marco Croci</b>	<b>Rev.1-06/04/2011</b>



<b>Test description</b>	
Constitutive law of membranes material: elastic-perfectly plastic.	
When limit load is exceeded there is a collapse.	
Test model: <b>curanMB_033.WSR</b>	

<b>Material properties</b>			
Name	$\nu$	$f_y$	E
S235PP	0,3	235N/mm <sup>2</sup>	210000N/mm <sup>2</sup>

<b>Beam</b>			<b>Constraints</b>		<b>Load (z direction)</b>	
LENGTH L	HEIGHT h	THICKNESS b	LEFT	RIGHT	APPLICATION POINT	FORCE F
10000mm	500mm	100mm	Fixed	Fixed	Middle point	-1600000N

<b>Model data</b>			
Membrane elements	Type	Thickness	d.o.f.
1000 (10x100)	QUAD4SRI	100mm	2178

**CHECK**

Theor. limit load is  $F_{lim} = 8 \cdot b h^2 / 4 \cdot f_y / L = 1175000N$ . Load multiplier is  $F_{lim} / F = 0,7344$

Load case	Value	Unit	CURAN	TARGET	KIND	% diff.
1	Load multiplier	/	7,604E-01	7,344E-01	theoretical	3,54

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

Precision of limit multiplier for the analysis: 0.005  
 QUAD4SRI: bilinear isoparametric element with selective integration