Question 1403181000

Pure tensile test.

• Tensile test

Simulate a tensile test of a rectangular bar of base "*b*", height "*h*" and length "*l*" pulled by a force "*F*" allowing contraction in all directions.
Assume linear elastic, small displacement.

Check:.

Stress: $\sigma_z = F_z/bh$

Displacement in "z": $L'-L=L\ \varepsilon_z = LF_z/bhE$.

Lateral displacement: $b'-b=b\ \varepsilon_x = -\nu LF_z/bhE$.

Energy: $En = LF_z^2/bhE2$

Reaction force: F_z

$$\begin{pmatrix}\varepsilon_x\\ \varepsilon_y\\ \varepsilon_z\end{pmatrix} = \frac{1}{E}\begin{pmatrix}1 & -\nu & -\nu\\ -\nu & 1 & -\nu\\ -\nu & -\nu & 1\end{pmatrix}\begin{pmatrix}\sigma_x\\ \sigma_y\\ \sigma_z\end{pmatrix}$$

input	E	MPa	2.00E+05
	v	-	0.266
	Fz	N	1000
	b	mm	10
	h	mm	1
	L	mm	100
Output	sz	MPa	100
	L'-L	mm	5.00E-02
	b'-b	mm	-1.33E-02
	En	J	2.50E-02
	Fz	N	1000