1.5

A plate with a width change as in Fig A.11(c) is subjected to a given force in tension and has given dimensions. It is made of a ductile polycarbonate plastic with a given yield strength. What is the safety factor against large amounts of deformation due to yielding? Does the value seem adequate?

P	w_2	w_1	ρ	t	σ_o
N	mm	mm	mm	mm	MPa
2800	24	16	4.0	6.0	62

$$S = \frac{P}{w_1 t}, \quad X_1 = \frac{\sigma_o}{S}$$

S	X_1	Units for S: N/mm^2 = MPa
MPa		
29.2	2.13 ◄	

The safety factor seems reasonable. Note that the quite ductile polycarbonate can deform by a large amount before failing.

1.6

A shaft with a circumferential groove as in Fig A.12(c) is subjected to a given bending moment and has given dimensions. It is made of a ductile titanium alloy with a given yield strength. What is the safety factor against large amounts of deformation due to yielding? Does the value seem adequate?

M	d_2	d_1	ρ	σ_o
N·mm	mm	mm	mm	MPa
250,000	22	18	2.0	830

$$S = \frac{32M}{\pi d_1^3}, \quad X_1 = \frac{\sigma_o}{S}$$

S	X_1	
MPa		Units for S: N/mm^2 = MPa
436.6	**1.90**	◀

The safety factor seems adequate. Note that the ductile titanium alloy can deform by a large amount before failing.