Lecture 10- summary

No material or structural element can sustain infinite load!

Physical reason: Atomic bonds inside a material can only sustain a critical load, on the order of a few nN.

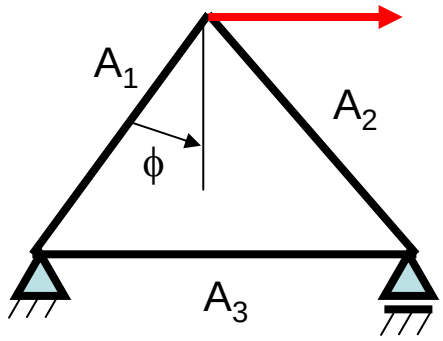
Therefore - need to satisfy two condition in structural problems:

1. Static equilibrium, that is, statically admissible (S.A.)
2. Strength compatibility (S.C.)

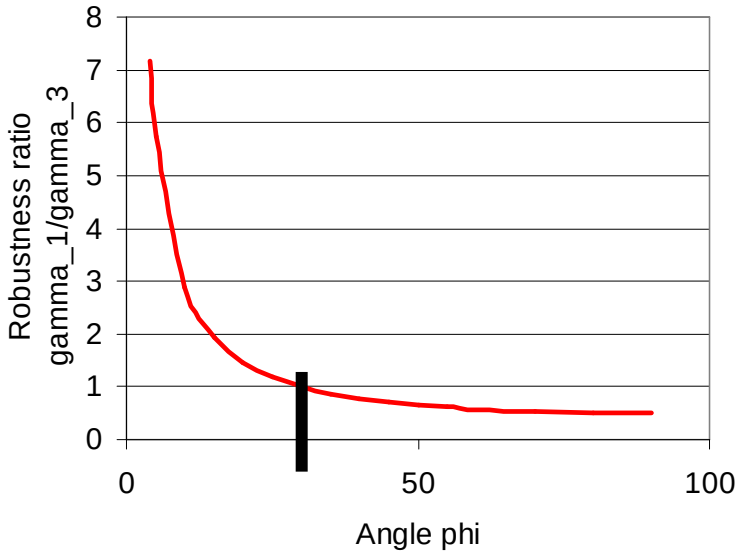
$$\forall i;\ \vec{F}^{ext}(\vec{x}_i) + \vec{R}(\vec{x}_i) + \sum_j \vec{F}_S^j(\vec{x}_i) \overset{\text{S.A.}}{=} 0$$

$$\forall j;\ \vec{F}_S^j \in D_S \Leftrightarrow f\left(F_S^j = \vec{F}_S^j \cdot \vec{n}_j\right) \overset{\text{S.C.}}{\leq} 0$$

Expression of S.C. in terms of material strength σ_0: $\forall j;\ f = \left|F_S^j\right| - (\sigma_0 A)^j \leq 0$



$A_1/A_3=2$ same strength σ_0



Same robustness for
30 degree angle

Failure occurs simultaneously in all rods