

Safety: Damage Tolerance

Tolerance

We consider two types of tolerance in design and resistant materials technology. One type of tolerance relates to the permitted upper and lower size limits of components. The other type of tolerance relates to the amount of force that a structure can withstand or tolerate before structural failure occurs.

Damage Tolerance

Damage tolerance is the ability of a structure to withstand the damaging effects of:

- impact forces
- forces of compression, tension, torsion, shear
- forces that cause fatigue in metals (metal fatigue) and other resistant materials.

These forces may be applied:

- instantly, or over a very short time, e.g. a car crash
- over a long period, e.g. tension force in a suspension bridge.



The force may be constant or recurring e.g. vibration or hammering.

A final important consideration is the strength left in the structure after the damaging force has been applied.

The strength of a structure and its damage tolerance depends on many things, including the:

- type of structure
- design of the structure
- type of materials used in the structure
- size of the materials used in the structure
- way that parts of the structure are fixed together
- relationship between the strength of the structure and the loads applied to it.