

Selection of materials based on mechanical properties

Classification of Engineering materials:-

1) Metal and their alloys, ^{← hardened material - ductile} such as iron, steel, copper, aluminium, etc. ^{← one or more metals.}



2) Non metals, such as glass, rubber, plastic, etc.

Metals may be classified as,

- 1) Ferrous metals, => which have the iron as their main constituent. Such as cast iron, wrought iron, and steel.
- 2) Non-ferrous metals.

which have a metal other than iron as their main constituent, such as copper, aluminium, brass, tin, zinc, etc.

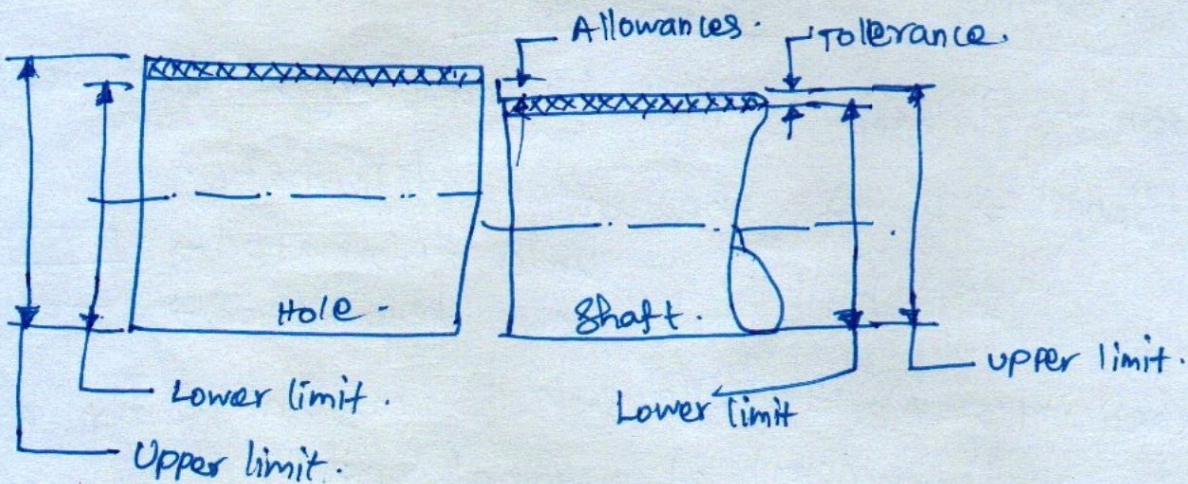
Mechanical properties of materials:-

- 1) Strength => Resisting the external load without break.
- 2) Stiffness => Resist the under deformation.
 under deformation → 
 over deformation → 
- 3) Elasticity => Ability to regain its original position after removal of external load.
- 4) plasticity => It does not come to its original position after removal of external load.
- 5) Ductility => It is the special property it is drawn in to wires.
- 6) Brittleness => Breaking of material under distortion.

- 7) Toughness \Rightarrow It resist the sudden load (or) It should withstand the sudden load.
- 8) Machineability \Rightarrow It is easy to machining (or) It is easy to cut.
- 9) Under deformation ^(within yield point stress)
- 9) Fatigue \Rightarrow under deformation, the dimensions does no change.
- 10) Hardness \Rightarrow Resisting to wear, deformation.
Ability of a metal to cut another metal.
- 11) Resilience \Rightarrow It is a property of a material to absorb energy and resist shock and impact load.

Fits and tolerances:-

Tolerances:-



Allowances:-

It is the difference between the hole and the shaft size.

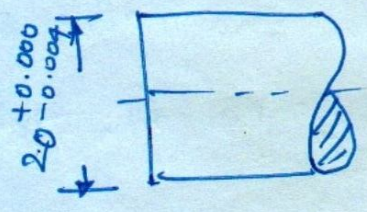
Tolerances

It is the difference between upper limit to the lower limit.

The maximum permissible variation in the dimension.

The tolerance may unilateral (or) bilateral.

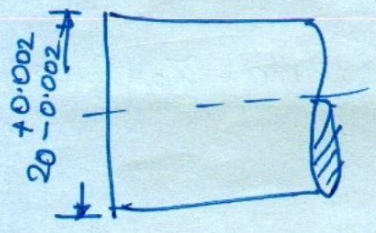
unilateral



In this, the tolerance is allowed on one side of the normal size.

e.g. $20^{+0.000}_{-0.004}$

bilateral

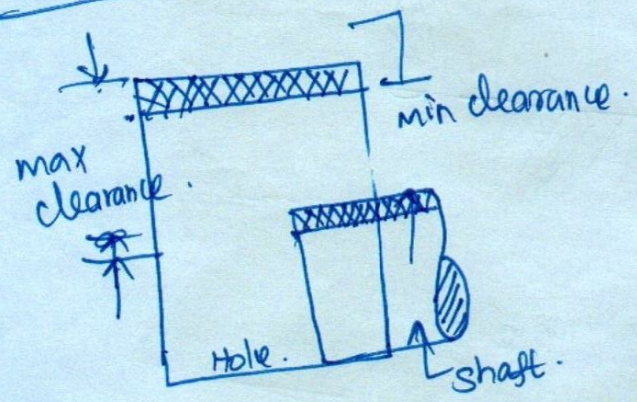


In this, the tolerance is allowed on both sides of the normal size.

e.g. $20^{+0.002}_{-0.002}$

Fits:-

b) clearance fit:-



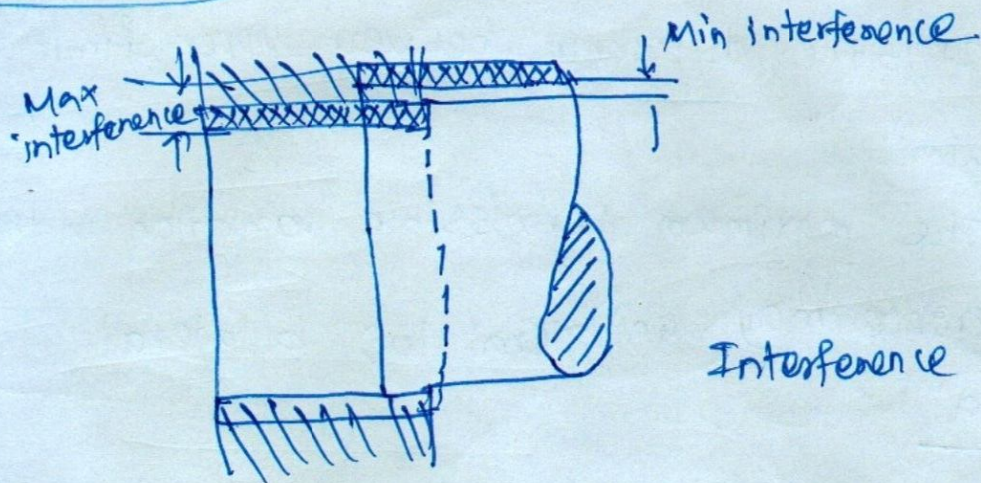
clearance fit.

The size limits for mating parts are so selected that clearance b/w them always occur.

Max. size of hole to the min size of shaft difference is max clearance.

Min size of hole to the max size of shaft difference is ~~min~~ min clearance.

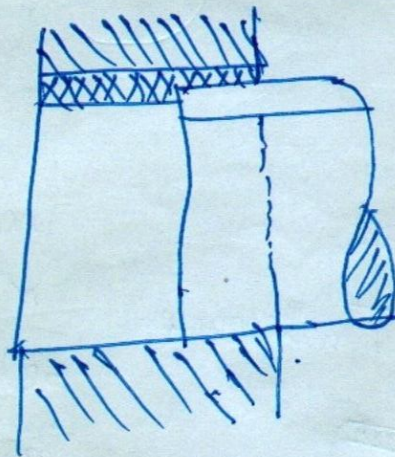
2) Interference fit:-



Interference fit is the type of fit b/w two mating parts such that there is always interference existing b/w them.

3) Transition fit:-

Transition fit is the type of fit b/w two mating parts such that the tolerance zones of hole and shaft overlaps.



Transition fit.