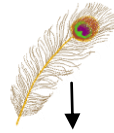


Structures and Forces Concept Map

Solid (Mass)



Frame



Shell



Combination



Function
 Containing
 Transporting
 Sheltering
 Supporting
 Lifting
 Fastening
 Separating
 Communicating
 Breaking
 Holding

External Force

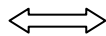


Internal Force

Compression



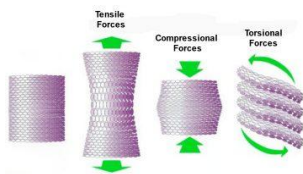
Tension



Shear

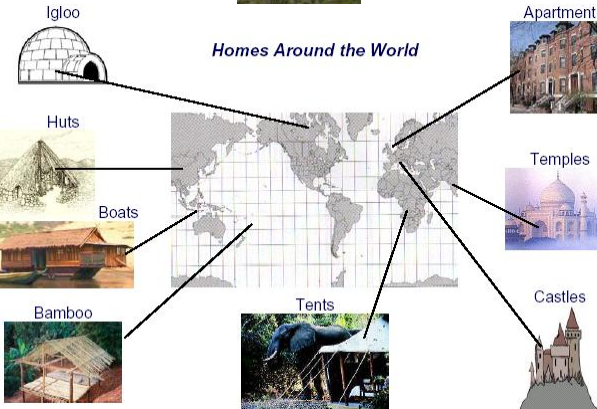


Torsion



Material Properties

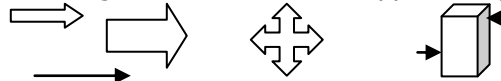
Corrugation
 Lamination
 Composite
 Woven and Knit
 Different Arrangements
 Better Fasteners
 New Materials



Force is a push or pull causing an object to change shape, or movement.

Force affects a structure depending on –

its magnitude, direction and application point



Supporting the Load
Centre of Gravity
Symmetry
Structural Stability

(firm foundation, strength & stiffness of materials)

Structural Failure

buckling shearing separating deforming
Metal Fatigue

Human



Joints (FIXED or MOVABLE)

Friction
 Interlocking
 Mass
 Ties
 Bonding (Adhesive, Melted)

Natural Forces

Climate (Weather) – Terrain – Earthquakes

Design Natural



Manufactured



Static Load



Dynamic Load

Bridge Types

Beam
 (simple, i-beam, girder)
Truss
 (interlocking triangles)
Suspension
Arch
 (keystone spreads load)
Cantilever

Plants



Evaluating Structural Design

Costs
 Benefits
 Reliability
 Effectiveness & Efficiency
 Margin of Safety
 Environmental Impact