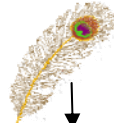


Grade 7 - Unit 4 – Structures and Forces Concepts

Solid (Mass)



Frame



Shell



Combination



- Function**
- Containing
 - Transporting
 - Sheltering
 - Supporting
 - Lifting
 - Fastening
 - Separating
 - Communicating
 - Breaking
 - Holding

External Force



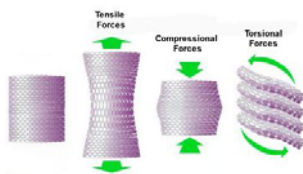
Internal Force

Compression

Tension

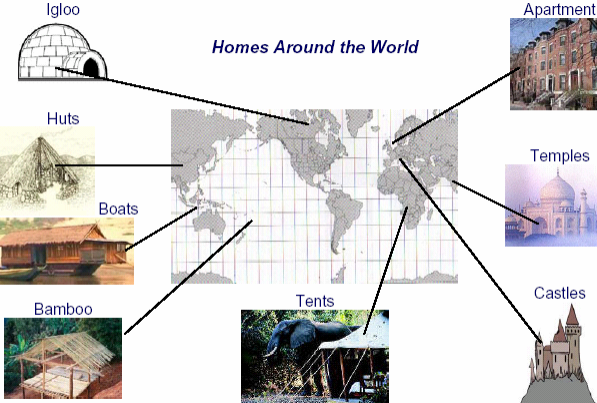
Shear

Torsion



Material Properties

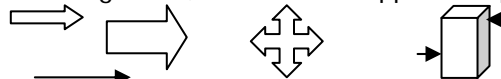
- Corrugation
- Lamination
- Composite
- Woven and Knit
- Different Arrangements
- Better Fasteners
- New Materials



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

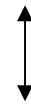
Design Natural



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