# Manufacturing technical objects

The Technological World

Chapter 12, pg 385-401

# What's a technical object?

| | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| Cell phone | Thermometer | Hammer | Rock | Travel Coffee mug |
| Technical object | Technical object | Technical object | NOT A TECHNICAL OBJECT | Technical object |

# What's a technical object?

- Def:An object **designed by humans** to **fit a particular need**
  - So, pretty much anything which, the **material** has been **transformed** to meet a **need**
  - *Which could be something to play candy crush saga on, to figure out the temperature, to hit a nail in place, or to satisfy one's caffeine fix*
- The object must be made from **at least one material**

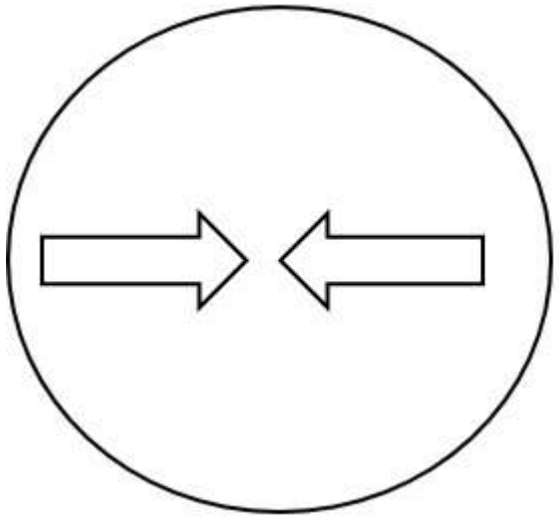
# What's a Mechanical Constraint?

- Def: A mechanical constraint describes the effect of external forces on a material
- There are five types of mechanical constraints:
  1. Compression
  2. Tension
  3. Torsion
  4. Deflection (*Bending*)
  5. Shearing

# Compression

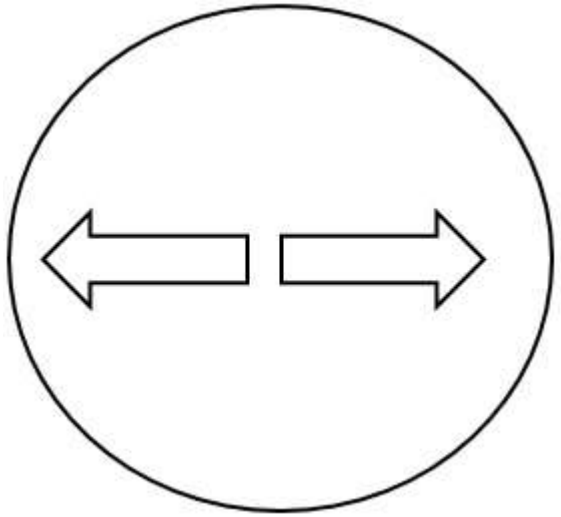
- Def: Force which crushes materials

- Symbol



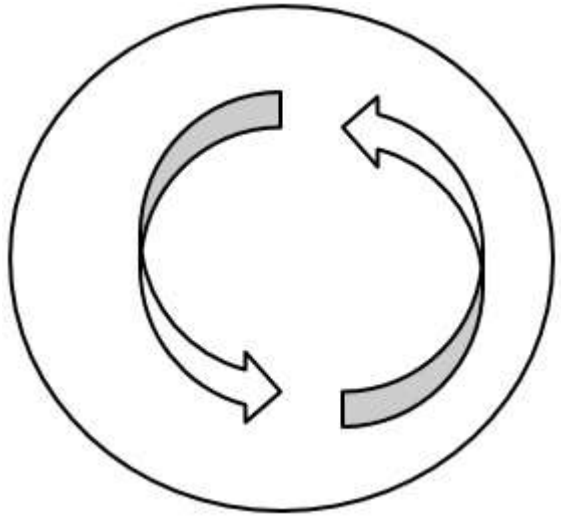
# Tension

- Def: Force which stretches materials
- Symbol



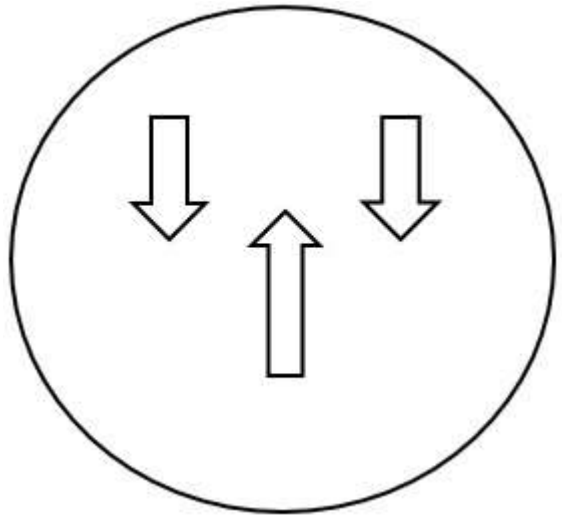
# Torsion

- Def: Force which twists materials
- Symbol



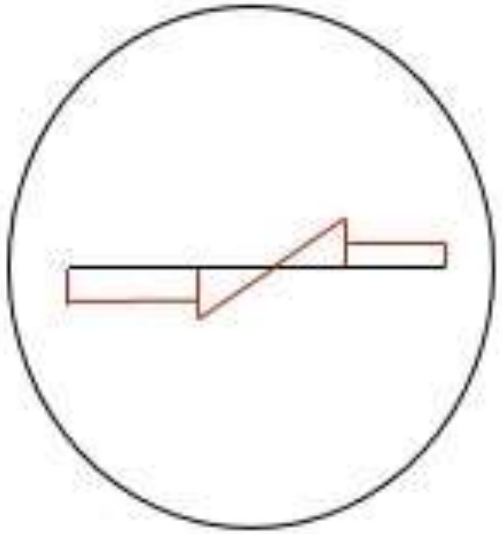
# Deflection (*Bending*)

- Def: Force which bends materials
- Symbol



# Shearing

- Def: Force which cuts and/or tears materials
- Symbol



In the following examples, name the Mechanical Constraint

| Scenario | Students are involved in a tug of war game | A car getting crushed in a scrap yard | A dish cloth being rung out |
|---|---|---|---|
| Type of Constraint | | | |
| Symbol | | | |

In the following examples, name the Mechanical Constraint

| Scenario | Hockey players curving the end of their sticks. | Ripping a candy wrapper off. | Swinging on a swing set. |
|---|---|---|---|
| Type of Constraint | | | |
| Symbol | | | |

# Deformations

- Def: A deformation is caused by a material's inability to prevent mechanical constraints from altering their shape

- Three categories of deformations ***(each is more damaging than the previous)***
  1. Elastic: Temporary; object goes to original shape after constraint is removed.
  2. Plastic: Permanent; object is deformed after constraint is removed.
  3. Fracture: Permanent; object breaks.

# Relationship between deformation and mechanical constraint

- Mechanical constraints **causes** the deformation
- As the **force** applied **increases**, the **degree** of **deformation increases.**

- Ex: Bending a pencil

In the following examples, name the **deformation,** and the type of **mechanical constraint** causing it.

| Scenario | Peeta Mellark bending a metal cane | Katniss Everdeen shooting an arrow from her bow | Haymitch Abernathy breaking a bottle by smashing it with a hammer |
|---|---|---|---|
| Type of Deformation | | | |
| Mechanical Constraint causing it | | | |

# Mechanical Properties

- Def: Way materials react to mechanical constraints.
- 6 key properties
  1. Hardness:
  2. Elasticity
  3. Resilience
  4. Ductility
  5. Malleability
  6. Stiffness

# Hardness

- Ability to resist indentation or abrasion

# Elasticity

- Ability to return to original shape after undergoing a constraint

# Resilience

- Ability to resist shocks without breaking

# Ductility

- Ability to be stretched without breaking

# Malleability

- Ability to be flattened or bent without breaking

# Stiffness

- Ability to retain their shape when subjected to various constraints

# Other Properties of Materials

While not mechanical properties (i.e. property to resist a mechanical constraint) these are equally vital in choosing materials for technical objects

1. Resistance to corrosion : Resists effects of corrosive substances
2. Electrical conductivity
3. Thermal conductivity

# Degradation vs Protection

## Degradation

- Material's properties weaken due to the effects of the surrounding environment

## Protection

- Material's properties are enhanced to prevent or delay degradation

# Categories of Materials and their Properties

- 5 main categories
  1. Wood and Modified Wood
  2. Ceramics
  3. Metals and Alloys
  4. Plastics
  5. Composites

Use your textbook  to help you find the required information for you notes. These notes will **be picked up for marks**.

# Answers of Note Taking Assignment

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