

MANUFACTURING TECHNICAL OBJECTS

The Technological World!



WHAT IS A TECHNICAL OBJECT?

- An object **designed by humans** to **fit a particular need**
 - So, pretty much anything where one or more **materials** has been **transformed** to meet a **need**
- The object must be made from **at least one material**
 - It has to be a **physical object**
 - Think hardware not software



TECHNICAL OBJECT OR NOT?



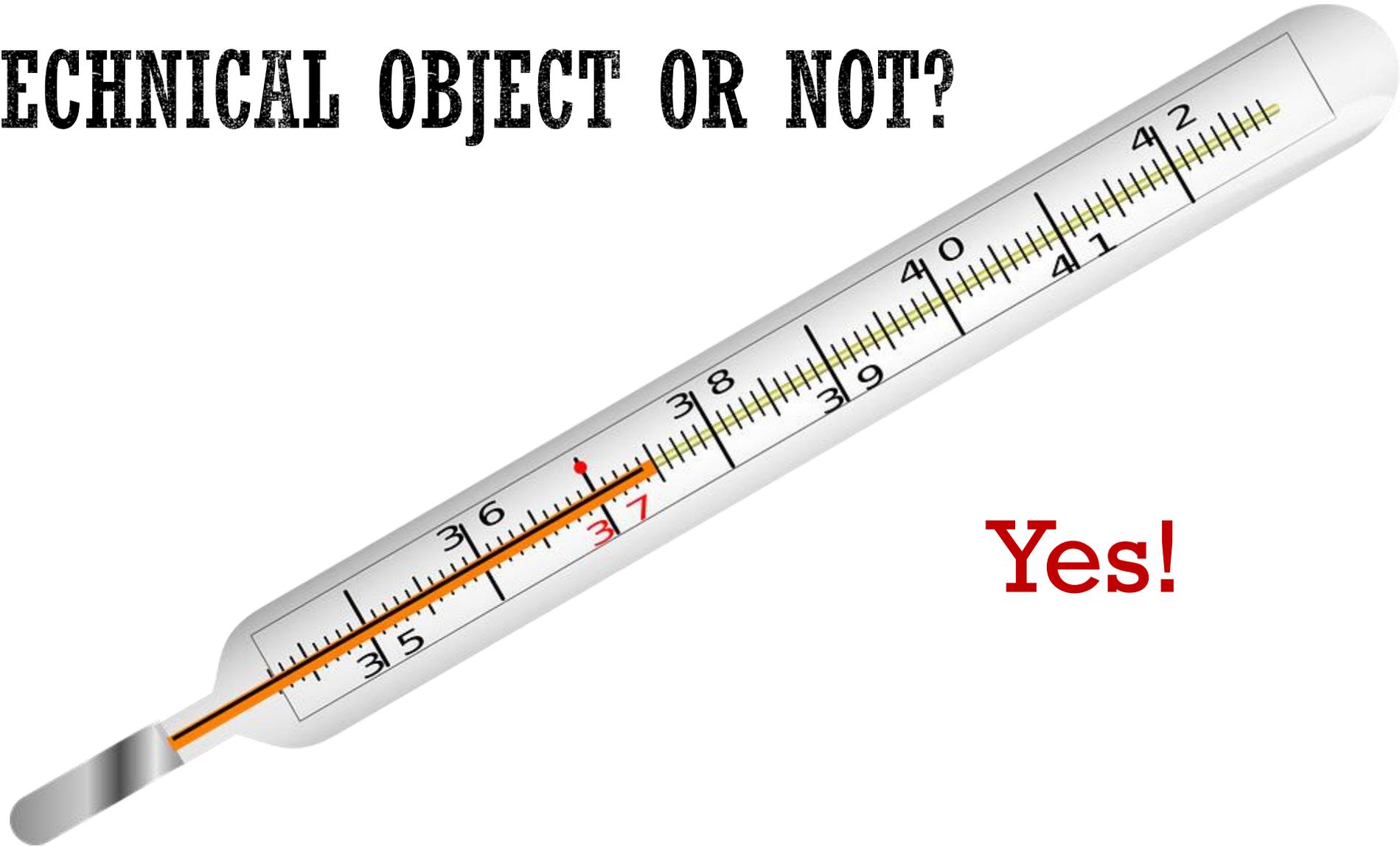
Not!



Yes!



TECHNICAL OBJECT OR NOT?



Yes!



TECHNICAL OBJECT OR NOT?



Yes!



TECHNICAL OBJECT OR NOT?



Yes!



TECHNICAL OBJECT OR NOT?



Nope!



MANUFACTURING TECHNICAL OBJECTS

- In order to make a technical object, one or more materials need to be **manipulated and transformed** to suit the needs of the project
- This means they will be subjected to **mechanical constraints** and **deformations**



MECHANICAL CONSTRAINTS

- Review from previous years:
- **What is a mechanical constraint?**
 - A mechanical constraint describes the **effect of external forces** on a material



MECHANICAL CONSTRAINTS

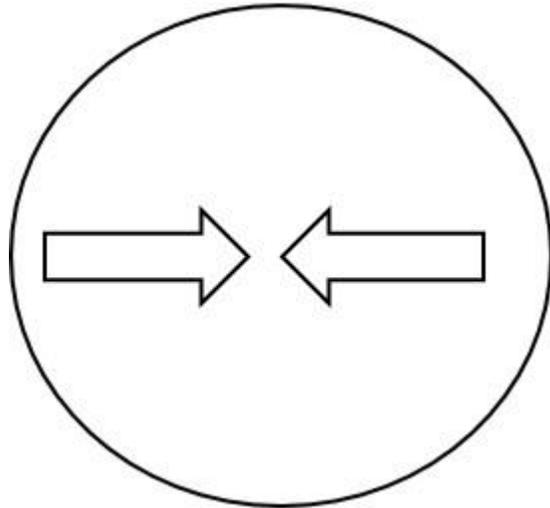
- There are five types of mechanical constraints:
 1. **Compression**
 2. **Tension**
 3. **Torsion**
 4. **Deflection (*Bending*)**
 5. **Shearing**



COMPRESSION

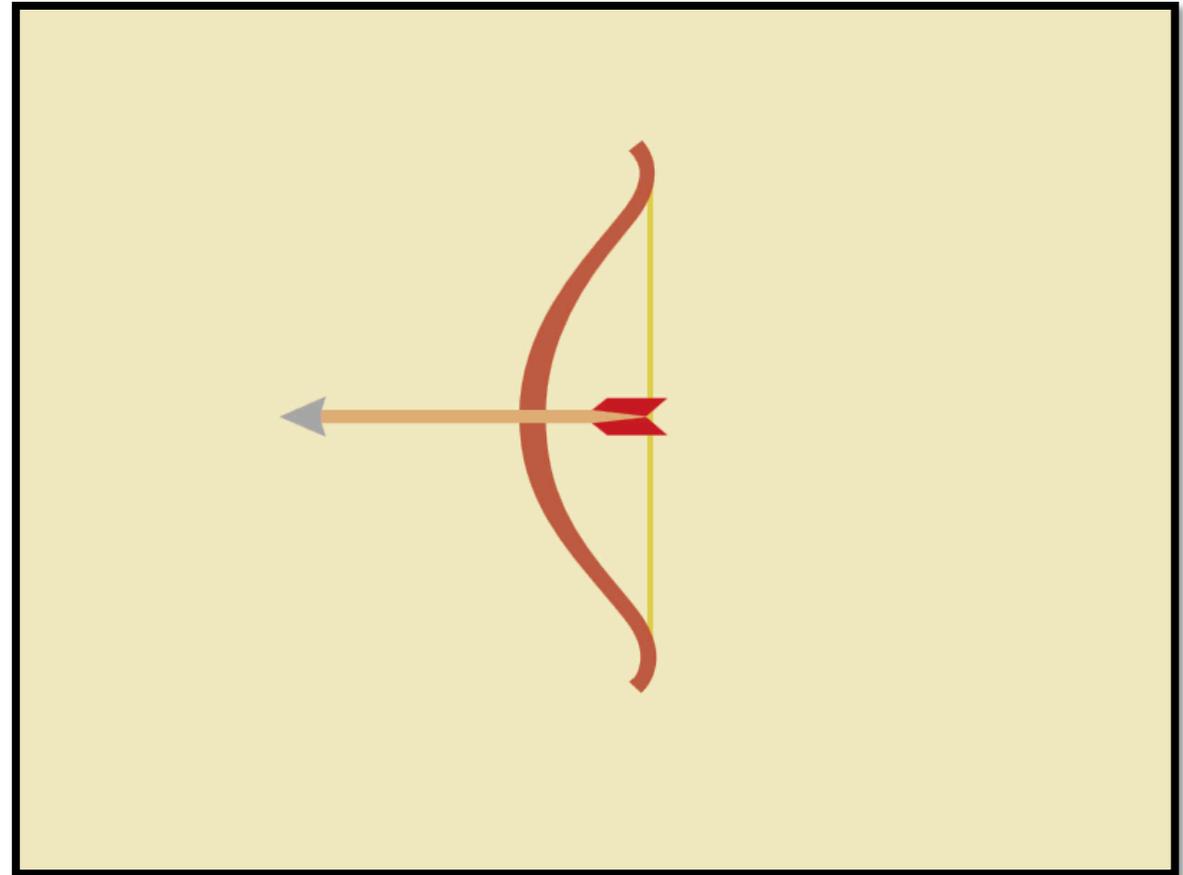
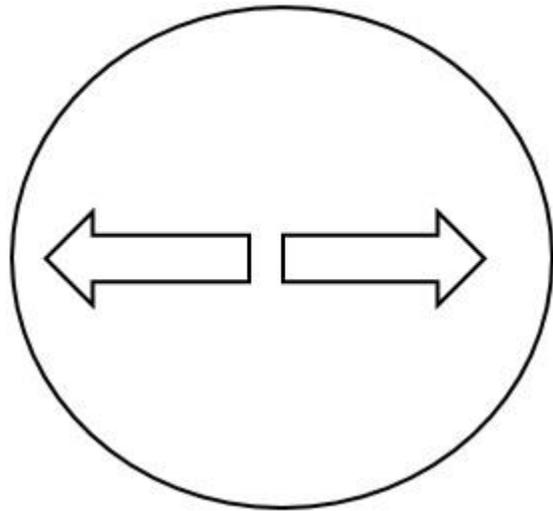
- Force that tends to **crush** materials

- Symbol



TENSION

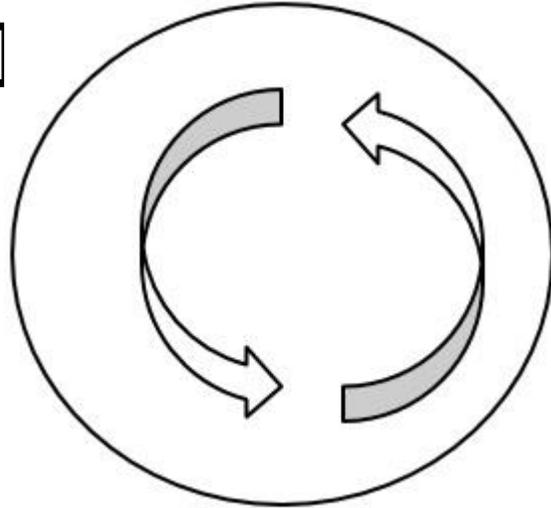
- Force that **stretches** materials
- Symbol



TORSION

- Force that **twists** materials

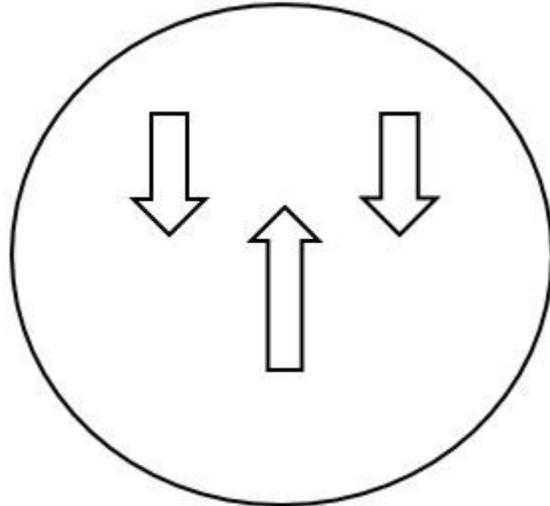
- Symbol



DEFLECTION (*BENDING*)

- Force that **bends** materials

- Symbol



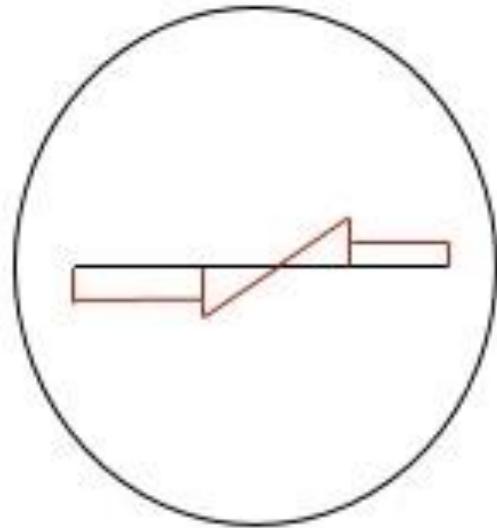
In sec 2 you may have learned that this constraint is called **Flexion**



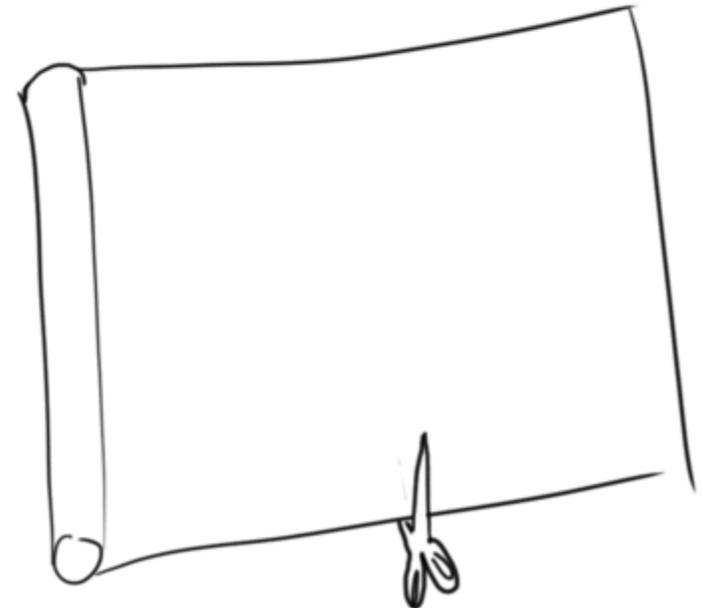
SHEARING

- Force that **cuts and/or tears** materials

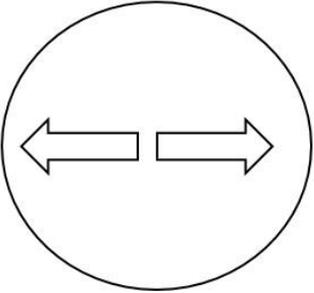
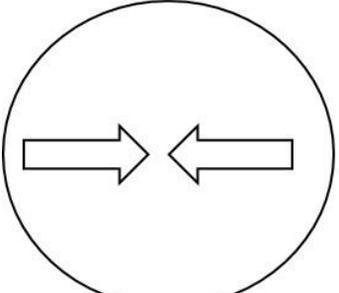
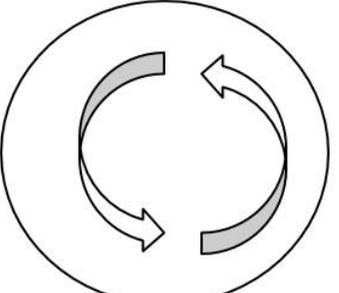
- Symbol



How I cut wrapping paper

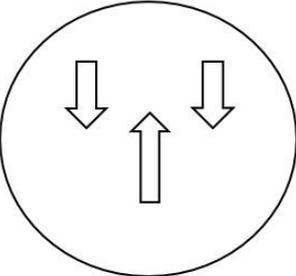
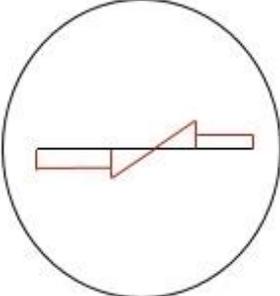
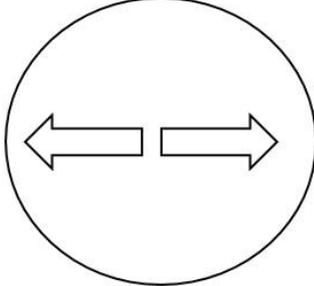


In the following examples, name the Mechanical Constraint

Scenario	A game of tug o' war	A car getting crushed in a scrap yard	A dish cloth being rung out
Type of Constraint	Tension	Compression	Torsion
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	Deflection	Shearing	Tension
Symbol			



MECHANICAL DEFORMATIONS

- A deformation is caused by a material's inability to prevent **mechanical constraints** from **altering its shape**
 - Mechanical constraints **cause** the deformation
 - As the **force** applied **increases**, the **degree of deformation increases.**



MECHANICAL DEFORMATIONS

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



IN THE FOLLOWING EXAMPLES, NAME THE DEFORMATION, AND THE TYPE OF MECHANICAL CONSTRAINT CAUSING IT.



IN THE FOLLOWING EXAMPLES, NAME THE DEFORMATION, AND THE TYPE OF MECHANICAL CONSTRAINT CAUSING IT.

Scenario	Bending a spoon	Using a slingshot	Smashing a watermelon
Type of Deformation	Plastic		
Mechanical Constraint causing it	Deflection		

IN THE FOLLOWING EXAMPLES, NAME THE DEFORMATION, AND THE TYPE OF MECHANICAL CONSTRAINT CAUSING IT.



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Scenario	Bending a spoon	Using a slingshot	Smashing a watermelon
Type of Deformation	Plastic	Elastic	Fracture
Mechanical Constraint causing it	Deflection	Tension	Compression

**COMPRESSION, SHEARING,
TENSION, TORSION OR
DEFLECTION?**

Elastic, Plastic or Fracture?

