# General Introduction to the Structures

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# Objectifs

- Identify some basic types of structures, their components, supports and various types of loads
- Discuss some preliminary aspects of structural analysis (Deterrminacy & Stability)

# Generalities about the structures

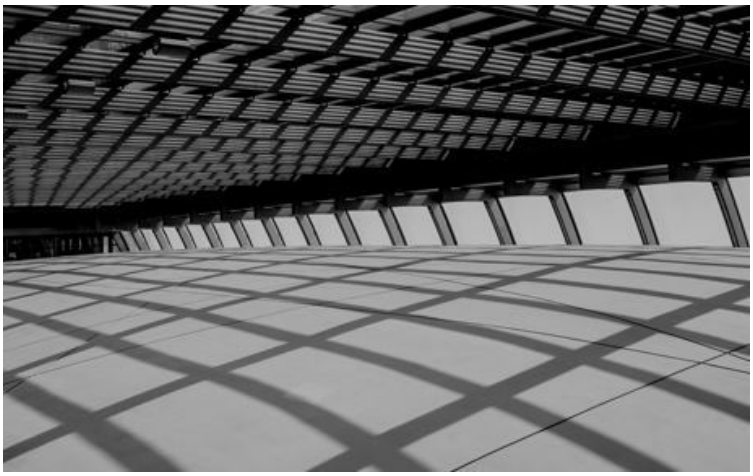
I

## 1. Definition

*Définition*

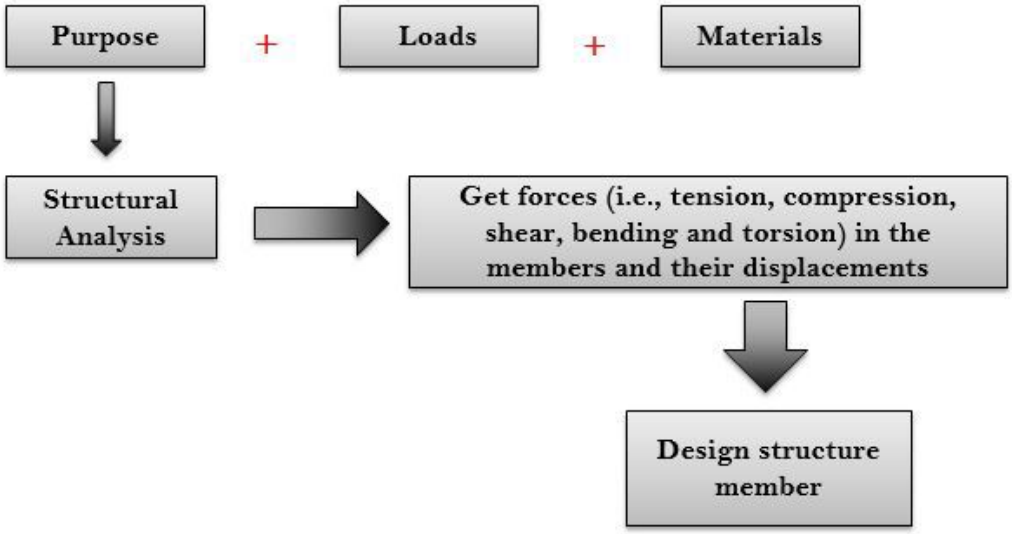
A structure refers to a system of connected parts used to support a load. When designing a structure, the engineer must account for its:

- Safety
- Esthetics
- Serviceability
- Economic
- Environmental constraints.



## 2. Design of the structure

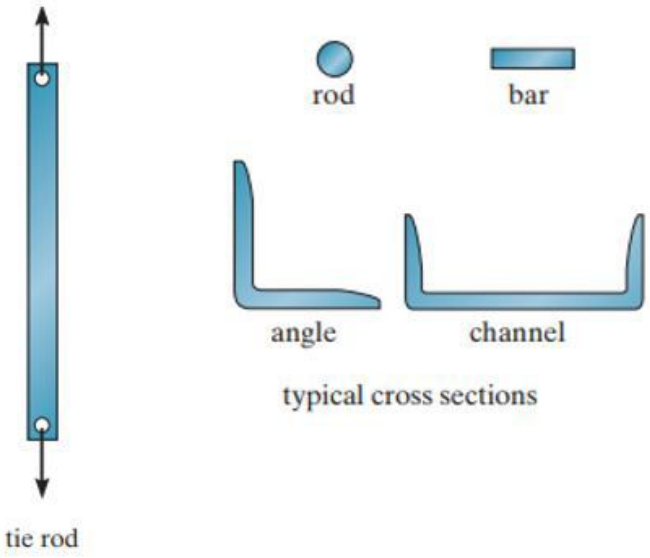
Structural design follows a series of successive approximations in which every cycle requires a structural analysis.




## 3. Structural elements

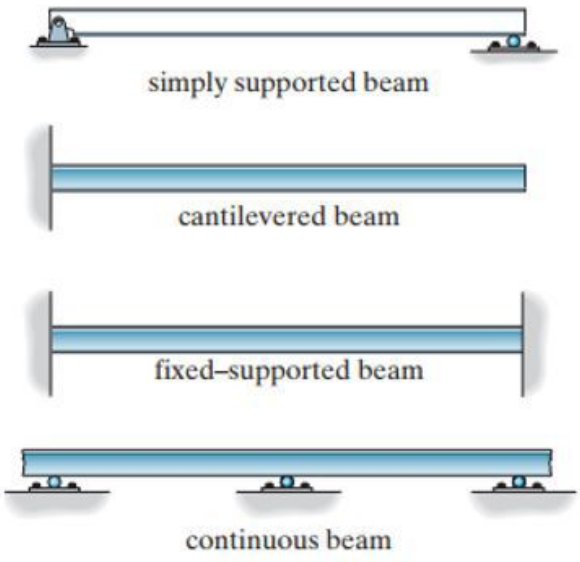
*Définition : a) Tie rods*

Tie rods are structural members subjected to a tensile force are often referred to as tie rods or bracing struts.



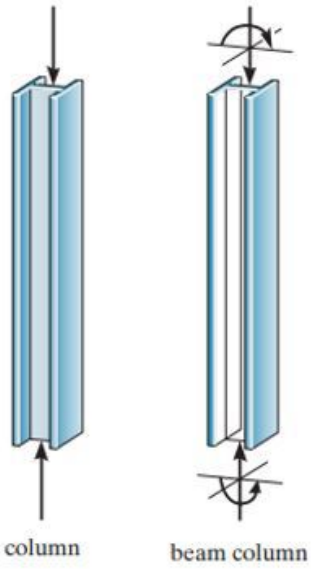

*Définition : b) Beams*

Beams are horizonal membres designed to resist bending moment. They are often fixed or pin supported and can be in the form of a steel plate girder, reinforced concrete, or laminated wood.




*Définition : c) Columns*

Columns are generally vertical members and resist axial compressive loads. If the column also resists bending, it is called a beam column.

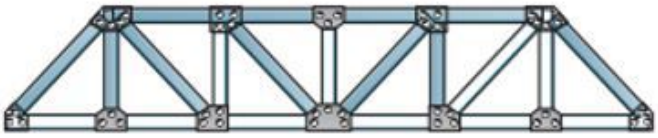



# 4. Types of structures

*Définition : a) Trusses*

Consist of slender elements, usually arranged in triangular fashion.

*3D trusses*



*Plan trusses*

## *Définition : b) Cables & Arches*

Two other forms of structures used to span long distances are the cable and the arch. Cables are usually flexible and carry their loads in tension. Preferred than truss for span more than 150 ft (46 m). In contrast, the arch must be rigid and achieves its strength in compression.

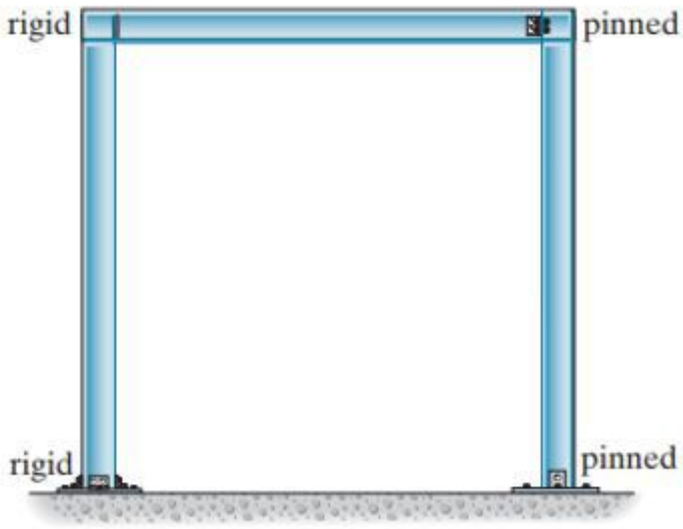
*Cables support their loads in tension*

*Arches support their loads in compression*

### *Définition : c) Frames*

Frames are often used in buildings and are composed of beams and columns that are either pin or fixed connected.

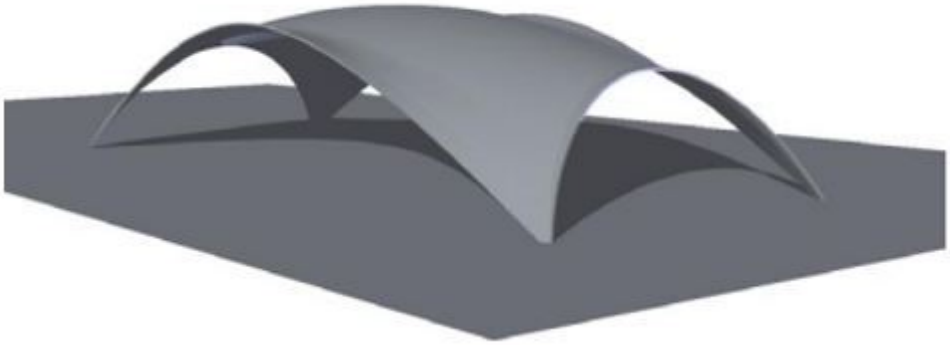
The loading on a frame causes bending of its member.




*Frame members are subjected to internal axial, shear and moment loadings*

### *Définition : d) Surface structures*

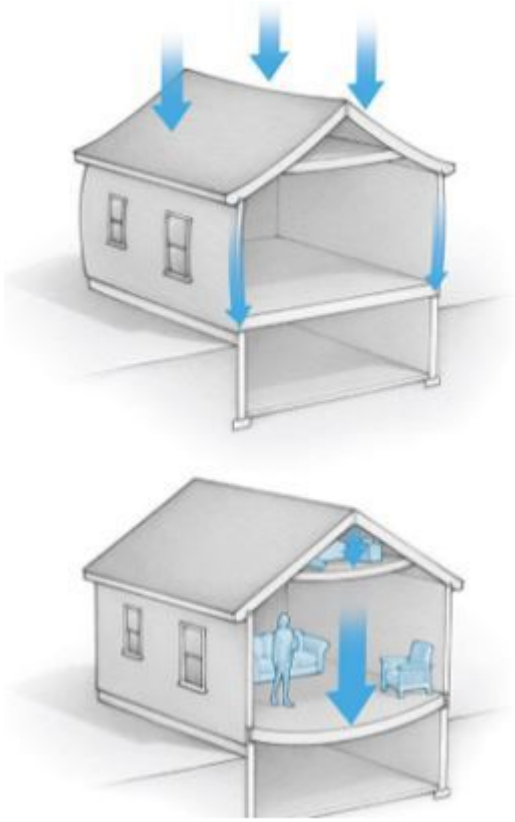
A surface structure is made from a material having a very small thickness compared to its other dimensions. Sometimes this material is very flexible and can take the form of a tent or air-inflated structure. In both cases the material acts as a membrane that is subjected to pure tension.



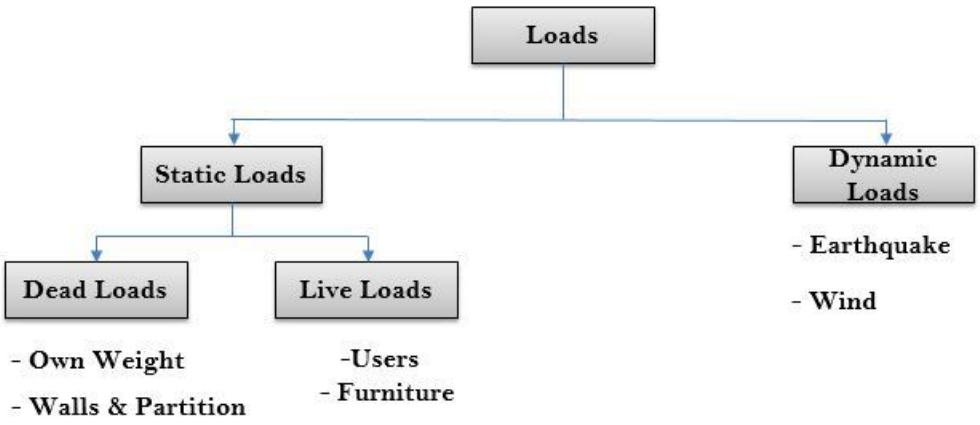
## 5. Loads

### *Définition*

It is essential to first identify the loads acting on a building before designing it.



Loads types:


Loads
Static Loads
Dynamic Loads
Dead Loads
Live Loads
- Own Weight
- Walls & Partition
-Users
- Furniture
- Earthquake
- Wind