

BUILDING TECHNOLOGY I

3 Introduction to structural systems

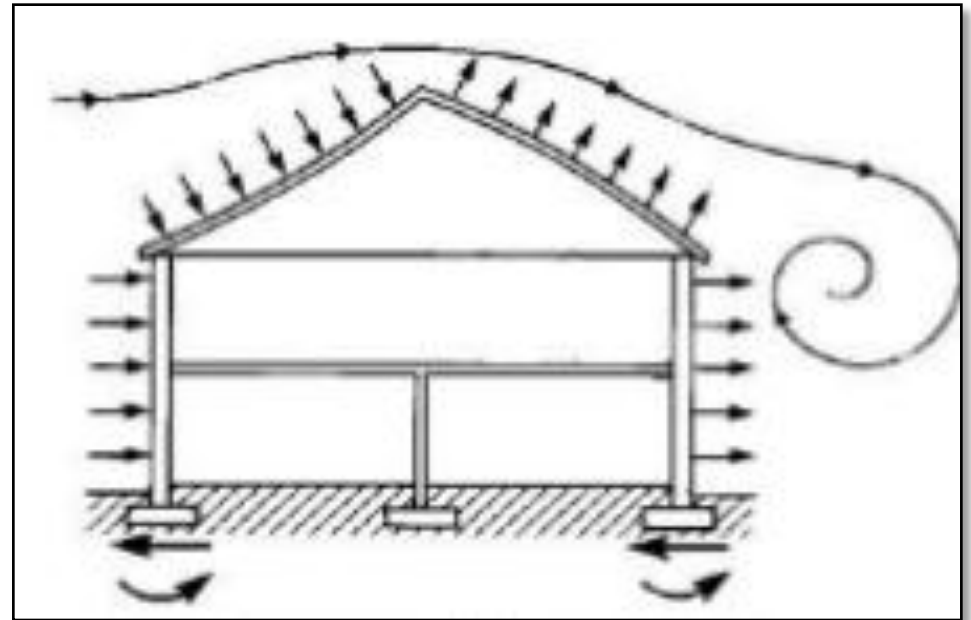
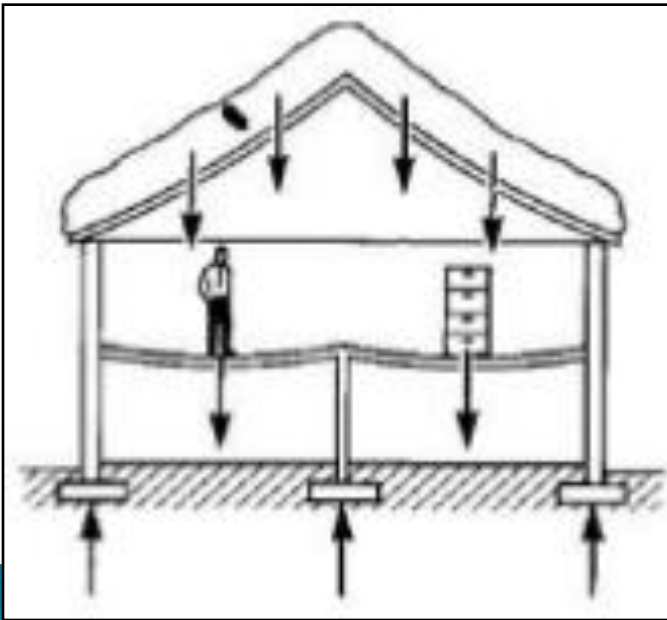
Dr. Ayman A.EL Hamid

Lecture Contents

- 1) Introduction to structural systems**
definition, main concept, components, loads, forces...

Structural Systems Main Concept

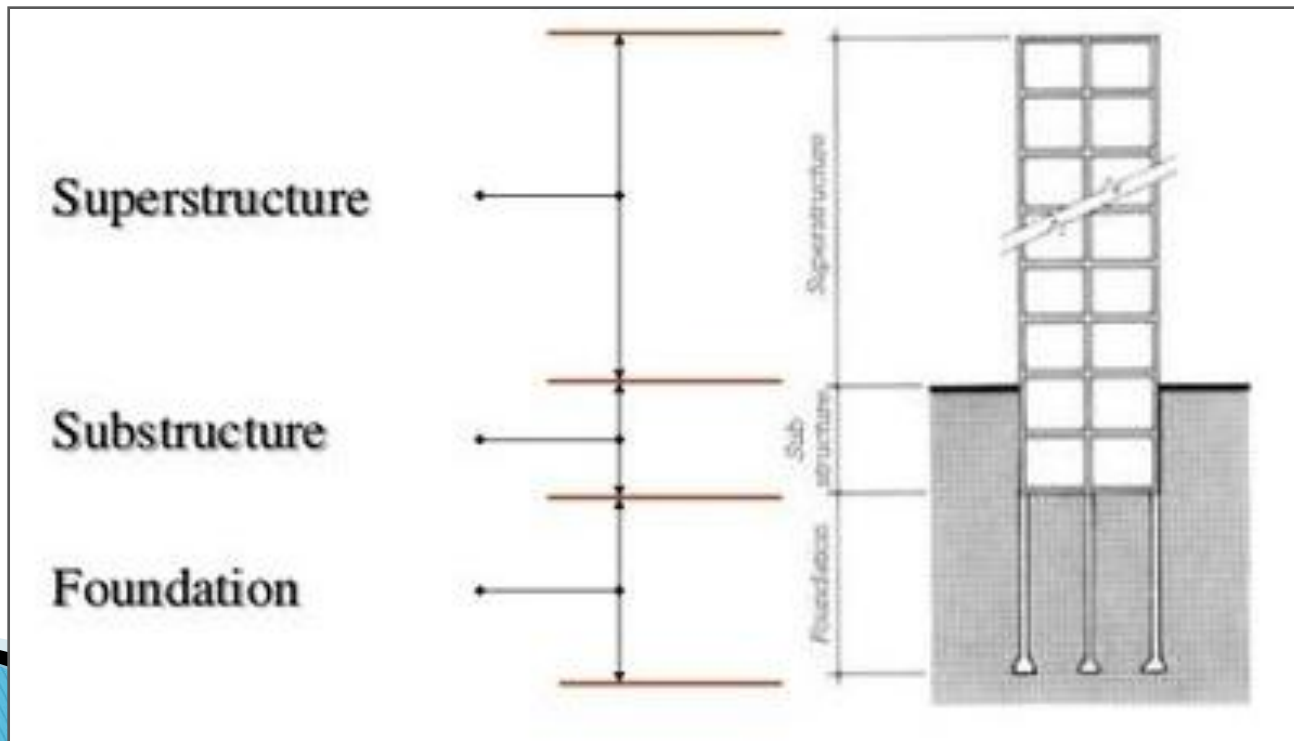
Architectural structure: Is a body or assemblage of bodies in space to form a system capable of supporting loads to provide stability and durability.



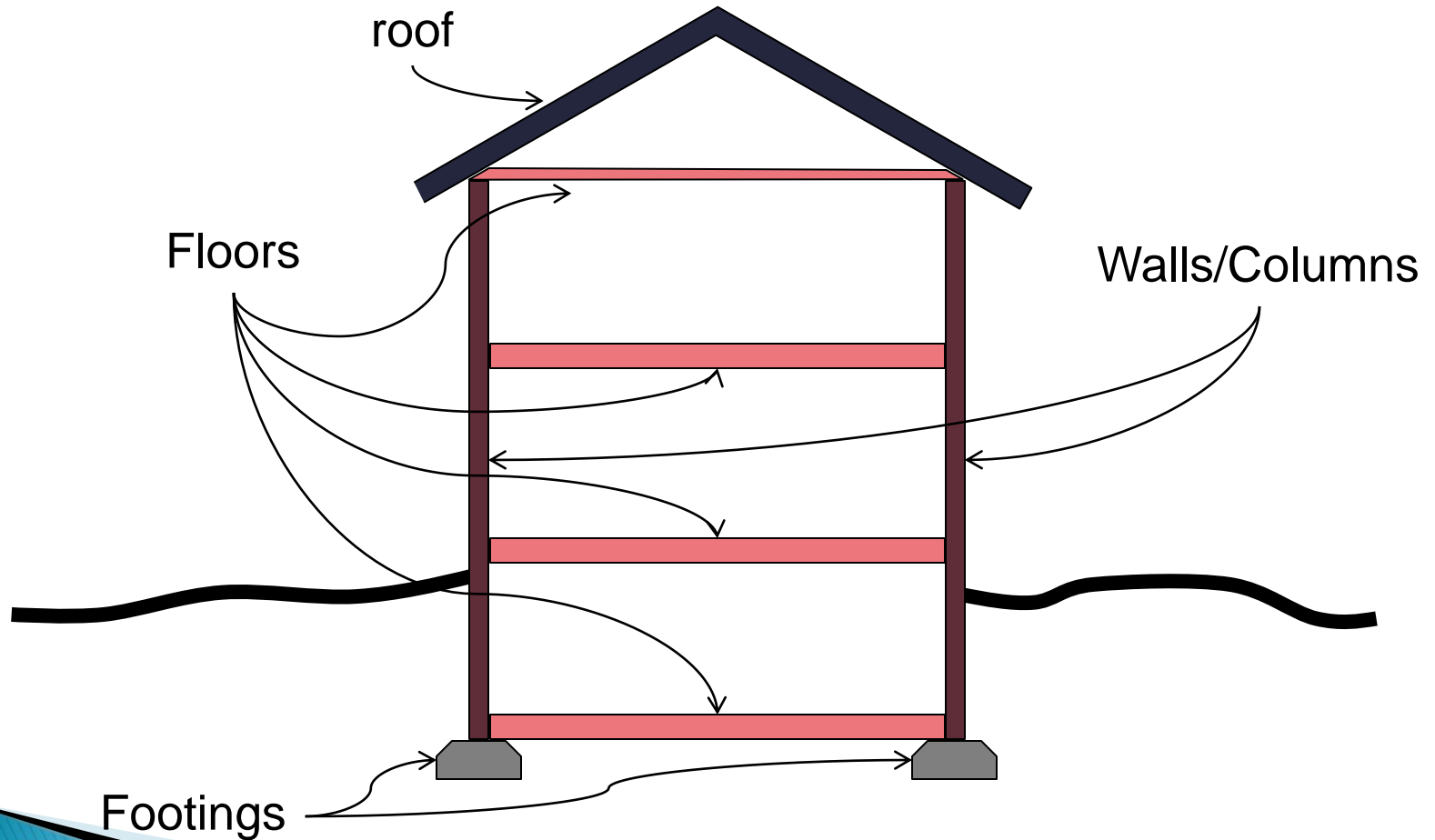
Structural Systems Main Concept

Any structure consists of two portion:

1. **Superstructure:** Building parts located above the ground level such as column, beam, floor, wall & roof.
2. **Substructure:** Is all structural work below the ground level.

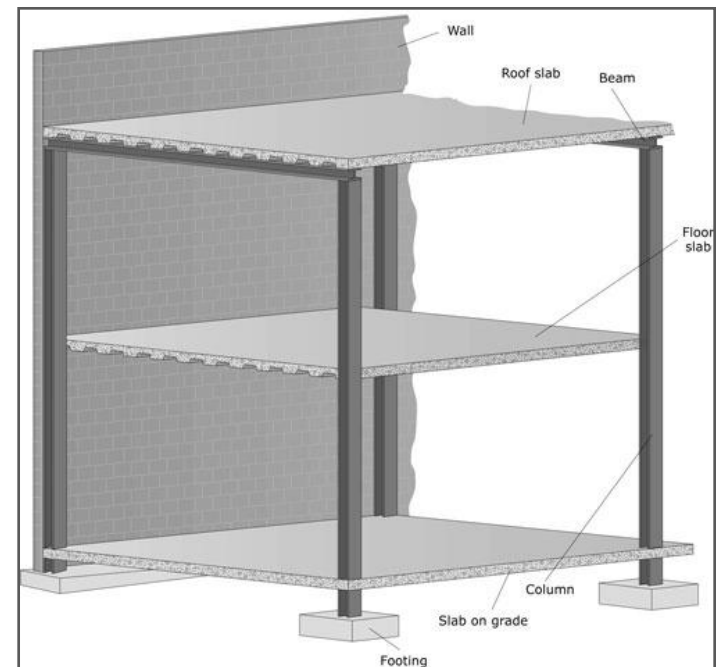


Structural Systems Components

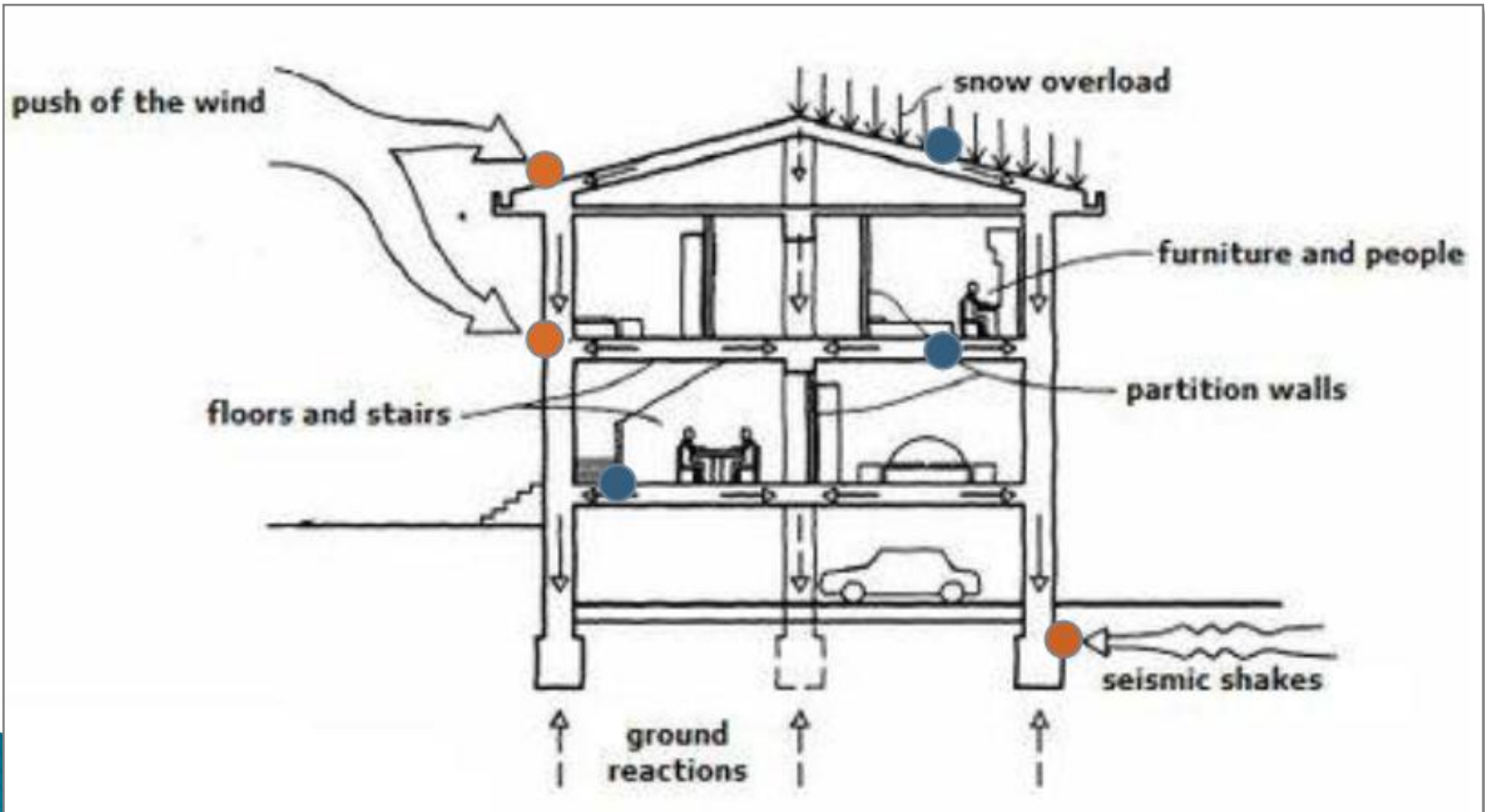


Structural Systems Components

1. **Roofs:** Are the horizontal/sloping planes & the primary sheltering element for all interior spaces.
2. **Walls:** Are the vertical constructions of a building that enclose a building. They may be internal partitions used to enclose, separate and protect interior spaces.
3. **Floors:** Are the horizontal planes that support dead and live loads

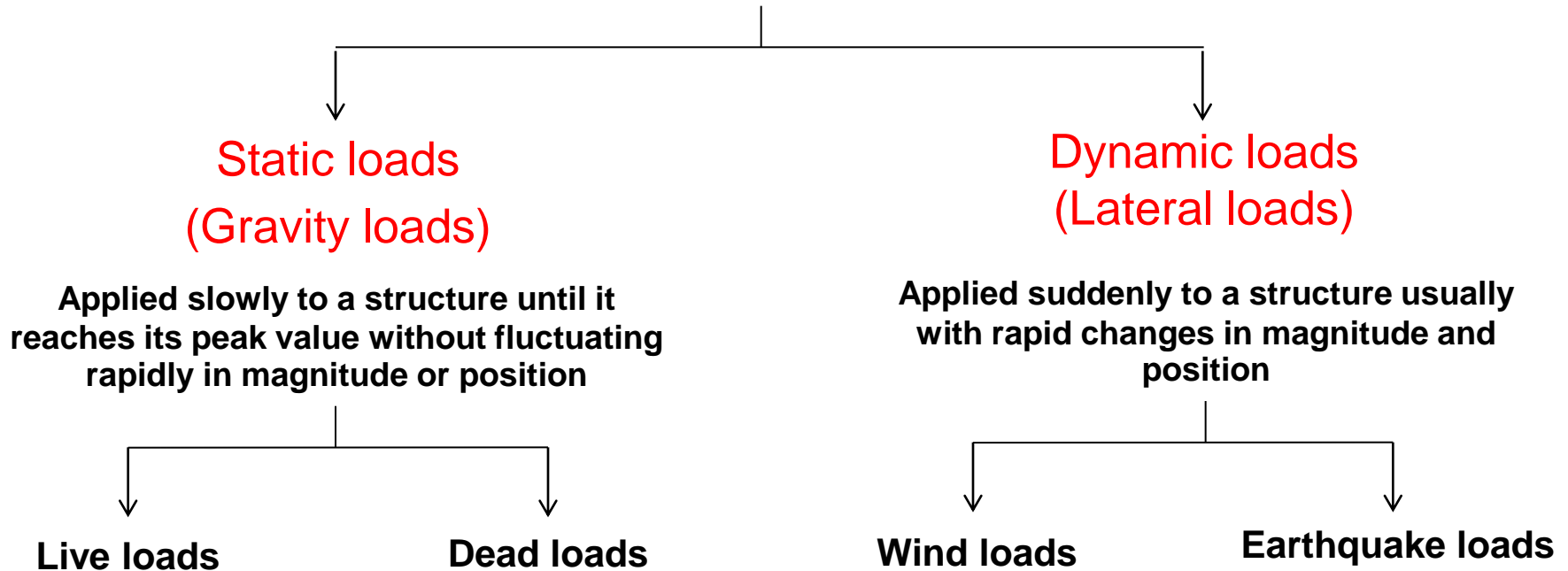


Structural Systems Loads



Structural Systems Loads

A building structure must be able to support two types of loads



Structural Systems Loads

Static loads

Dead loads: Are relatively fixed and include the weight of the building structure itself as well as the weight of any permanent elements within the building such as mechanical equipment.

Live loads: Are movable loads which may not be present all the time. They include the weight of a building occupants and furniture.



Structural Systems Loads

Dynamic loads

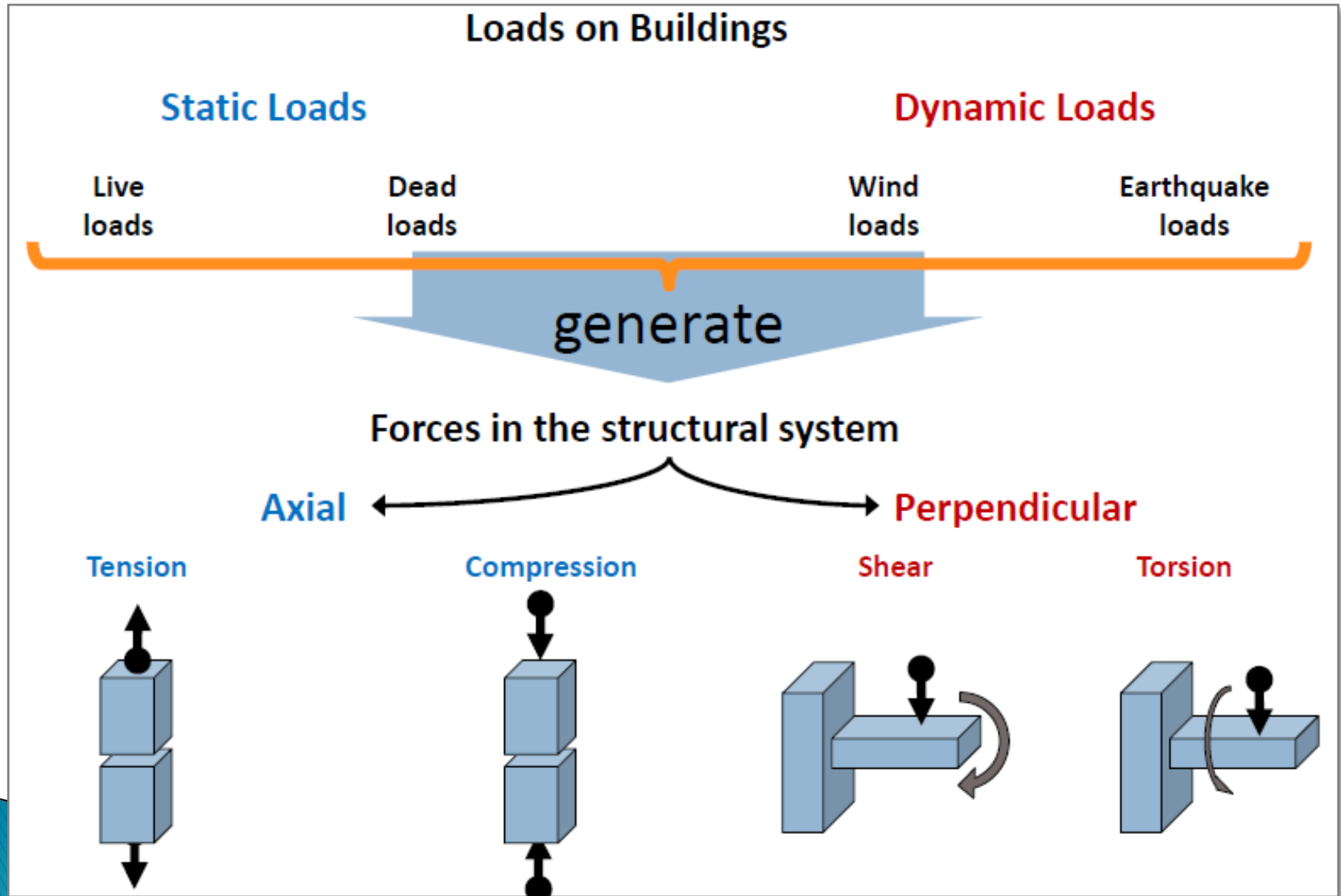
Wind loads: Are relatively the positive or negative pressures exerted on a building when it obstructs the flow of moving air. Wind loads generally act perpendicular to the surfaces of the house.



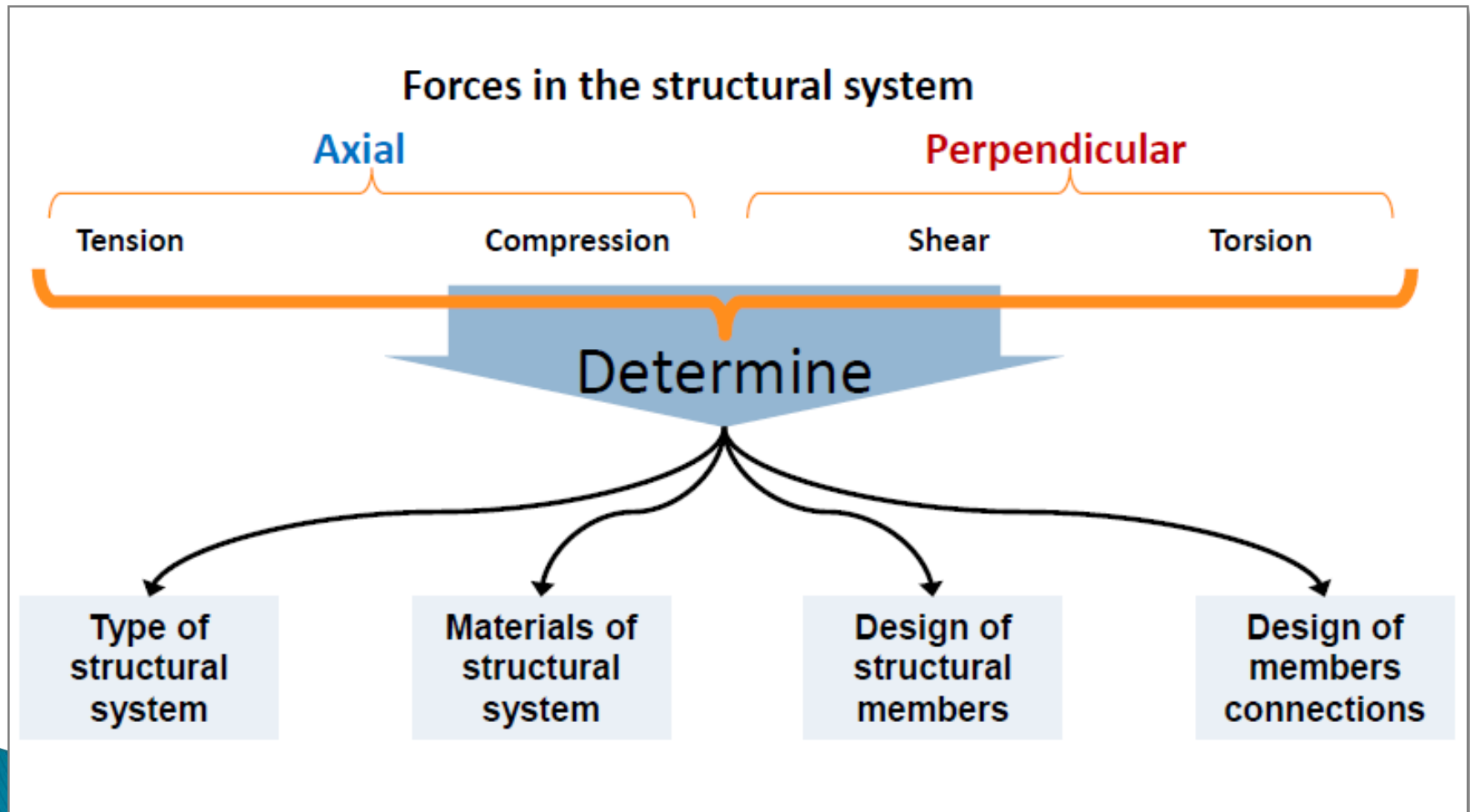
Earthquake loads: These forces act horizontally on each element of the structure.



Structural Systems Forces



Structural Systems Forces

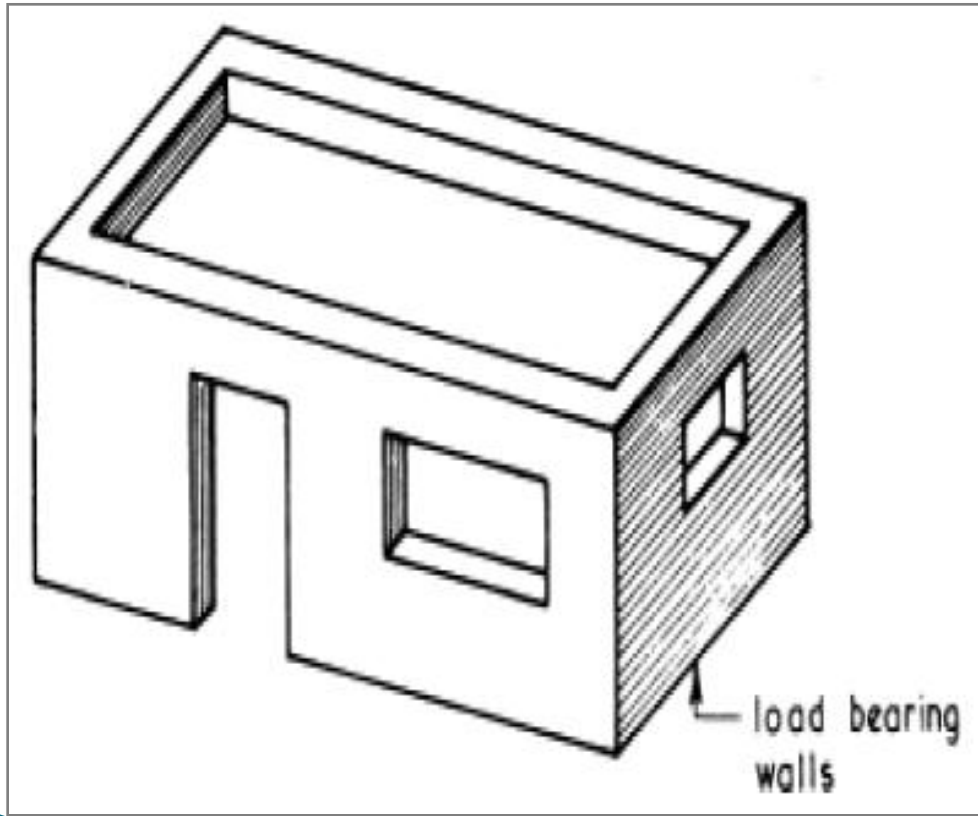


1) Types of Structural Systems (basic forms, load transfer, comparison...)

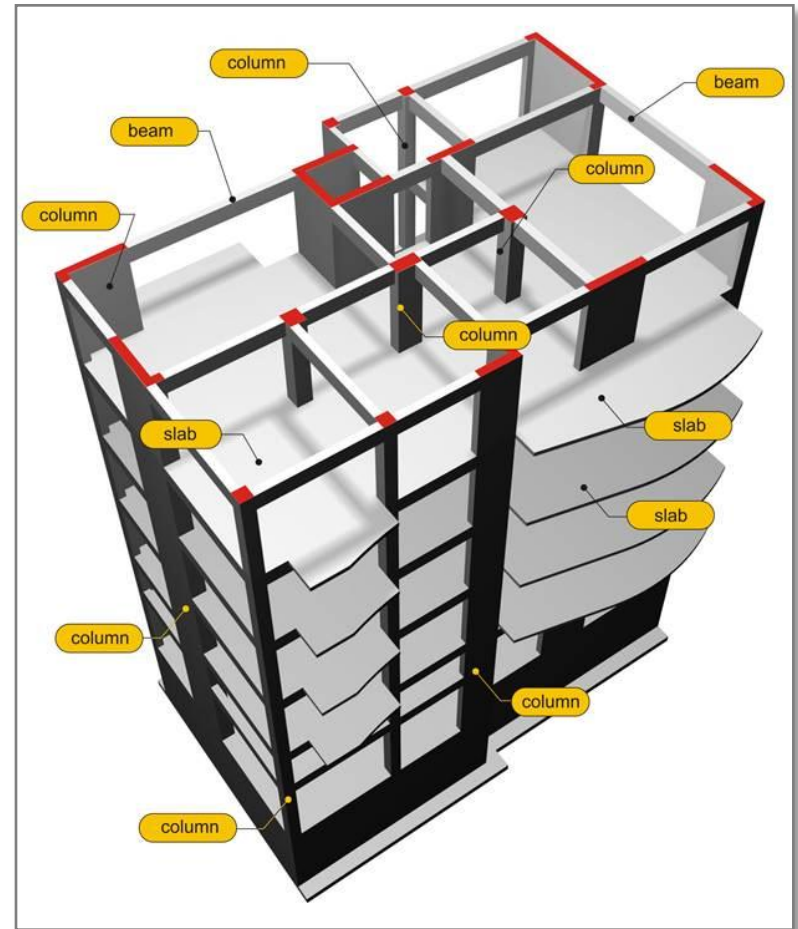
2) Foundation Systems (introduction, types, isolated foundation,...)

Types Of Structures Building forms

Building basic forms:



Solid construction

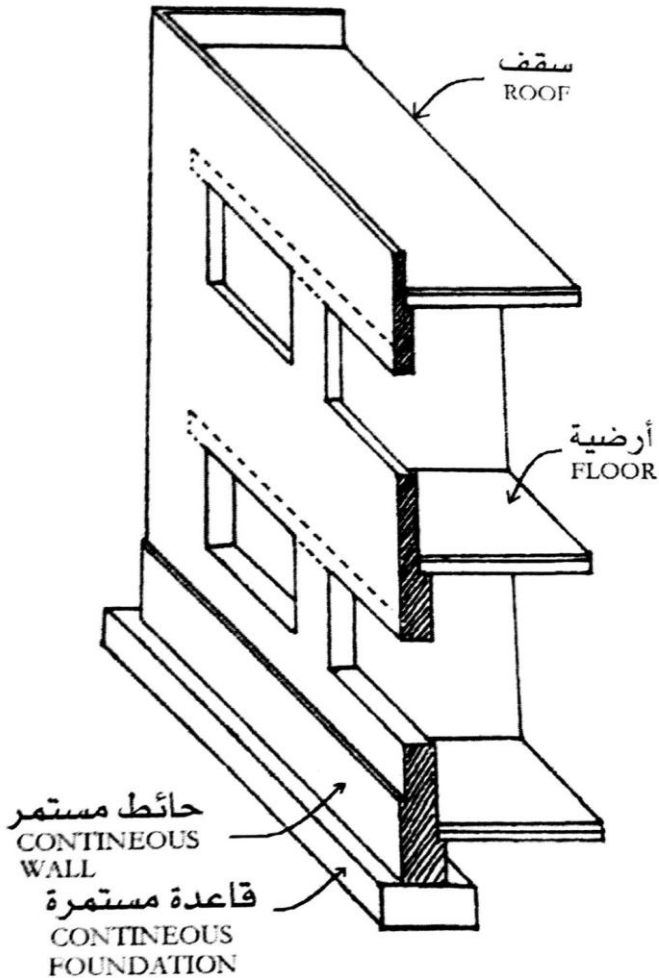


Framed or skeleton construction

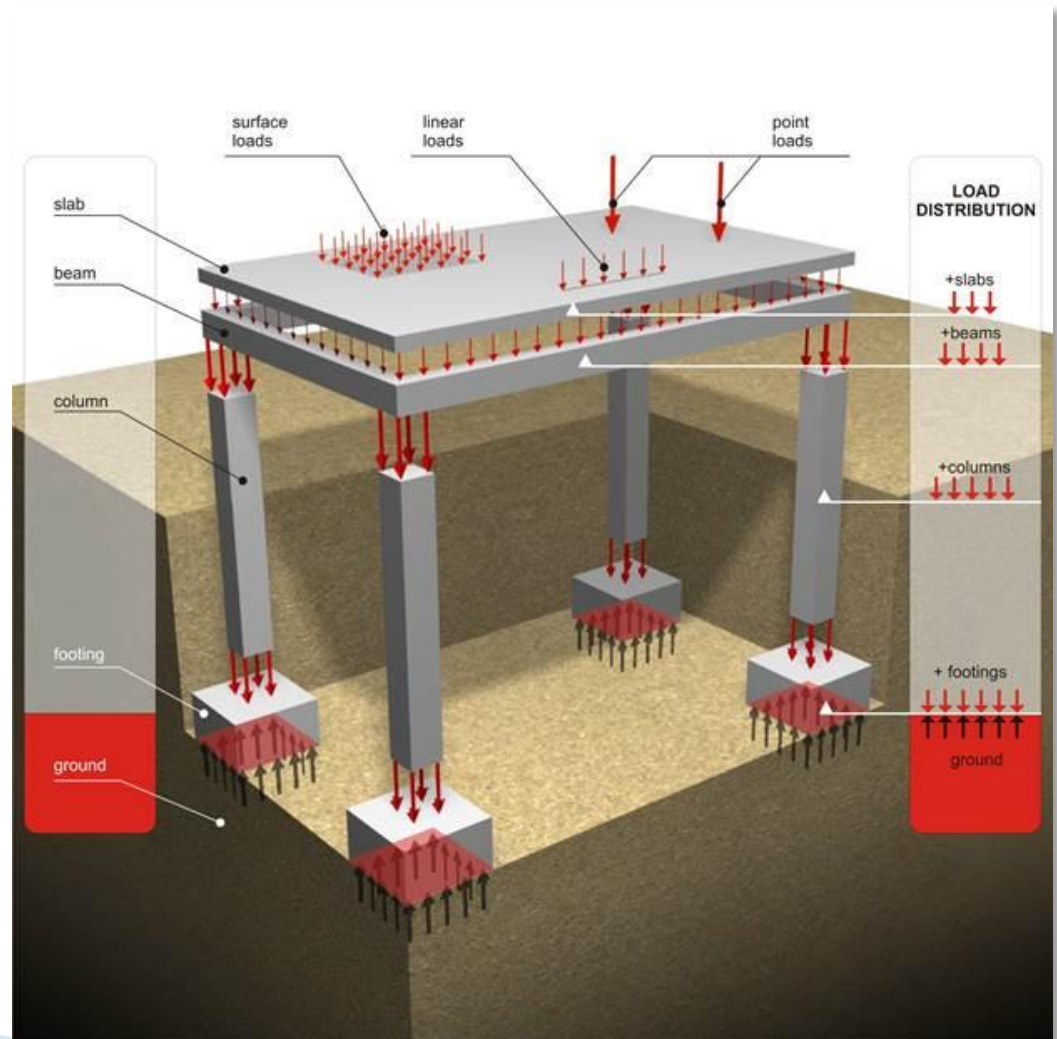
Types Of Structures Load transfer

Load transfer to building elements:





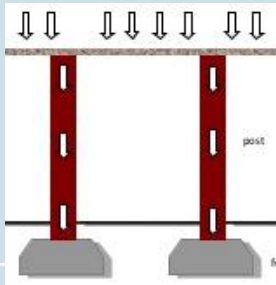
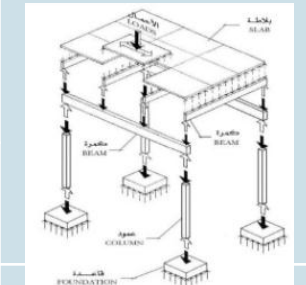
Wall bearing construction







Skeleton construction



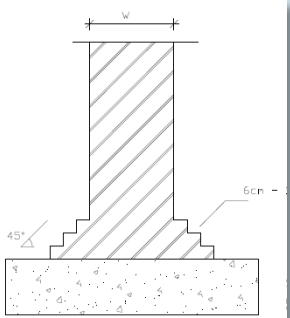
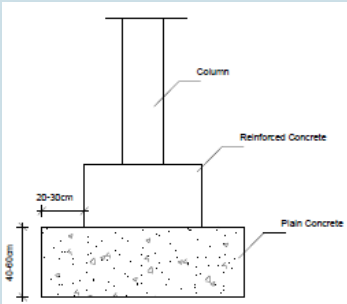
Types Of Structures Comparison

Comparison		Bearing Wall Construction	Skeleton Construction
Definition		<p>Wall will support all loads before transforming them to foundation</p> 	<p>Are structures having combination of beam, column & slab to resist the loads</p> 
Design		<ul style="list-style-type: none"> - It is not flexible in design as you can't remove or shift walls. - Room dimension can't be changed. Cantilever is a difficult task. 	<ul style="list-style-type: none"> - More flexible & can be changed any time. - more stable in earthquake. - Cantilever can be easily included. 
Loads	Distribution	<p>Slab → Wall → Foundation →</p> 	<p>Slab → Beam → Column → Foundation →</p> 
	Caring member	Walls	Beams & Columns
Span		Large span areas are not possible	Large span areas are possible

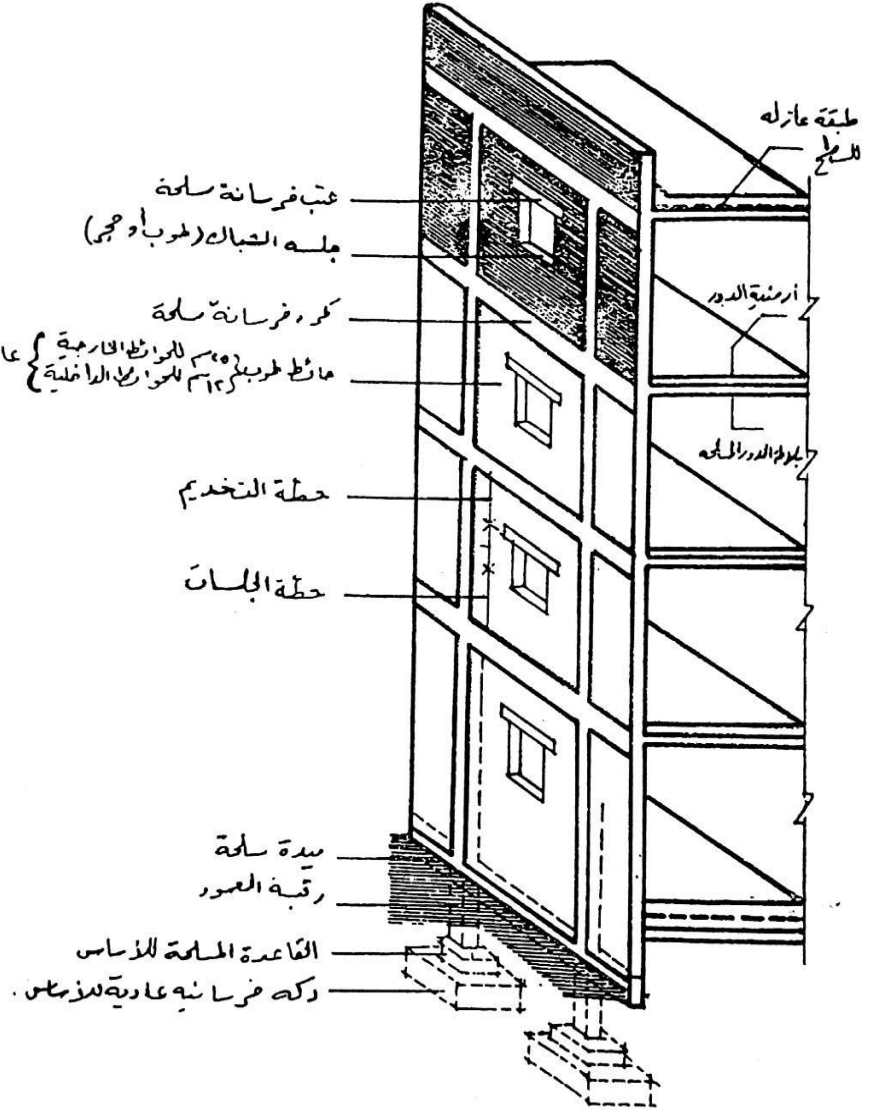
Types Of Structures Comparison

Comparison		Bearing Wall Construction	Skeleton Construction
Max. height		<ul style="list-style-type: none"> – Low buildings – Limited story buildings can be constructed (5–6 stories) 	<ul style="list-style-type: none"> – Multi-story buildings can be constructed.
			
Materials		Concrete block, brick or stone	– R.C. (Composite material which is consisting of concrete and steel bars.)
			
Walls	Function	Serve as structural element as well as purpose of enclosure for protection.	Serve only the purpose of enclosure for creation rooms & protection
	Thickness	Increase with increase in height (not less one brick 25 cm)	Remains same with increase in height (external wall=25 cm & internal wall=12cm)
	Openings	Small openings	Large openings

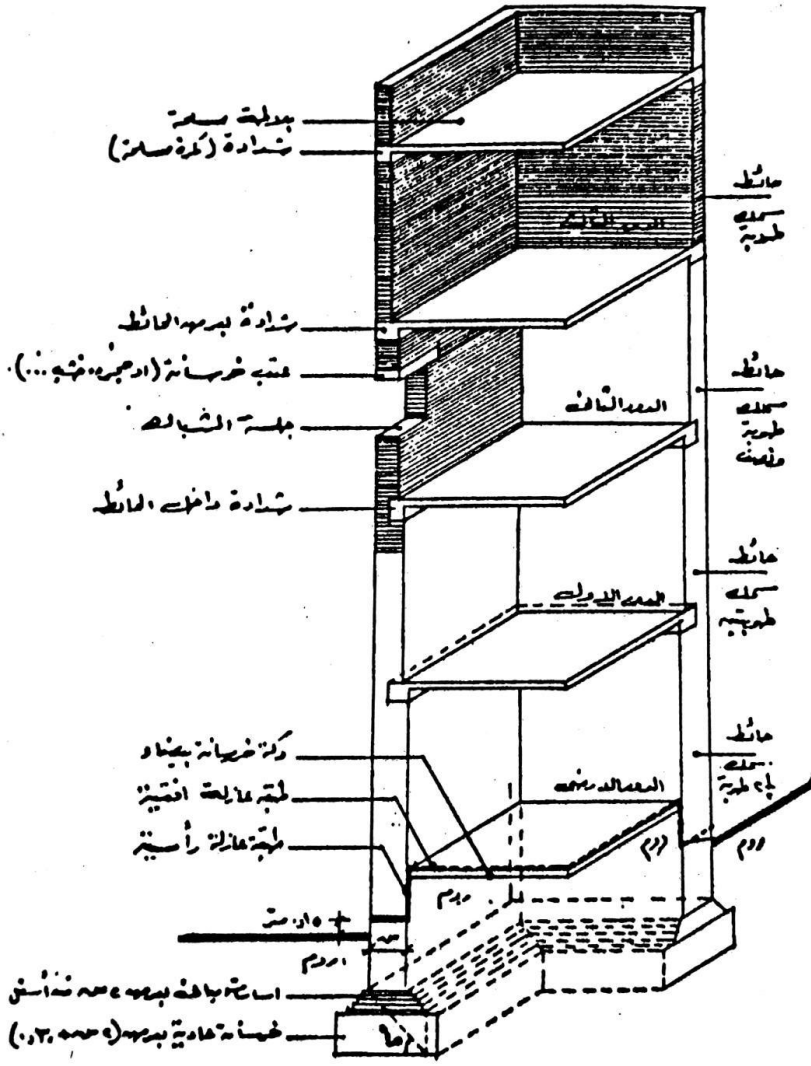
Types Of Structures Comparison

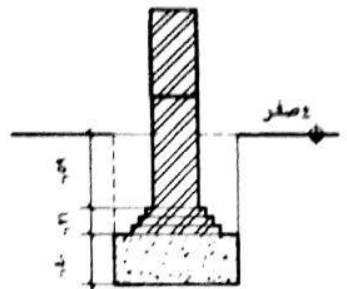
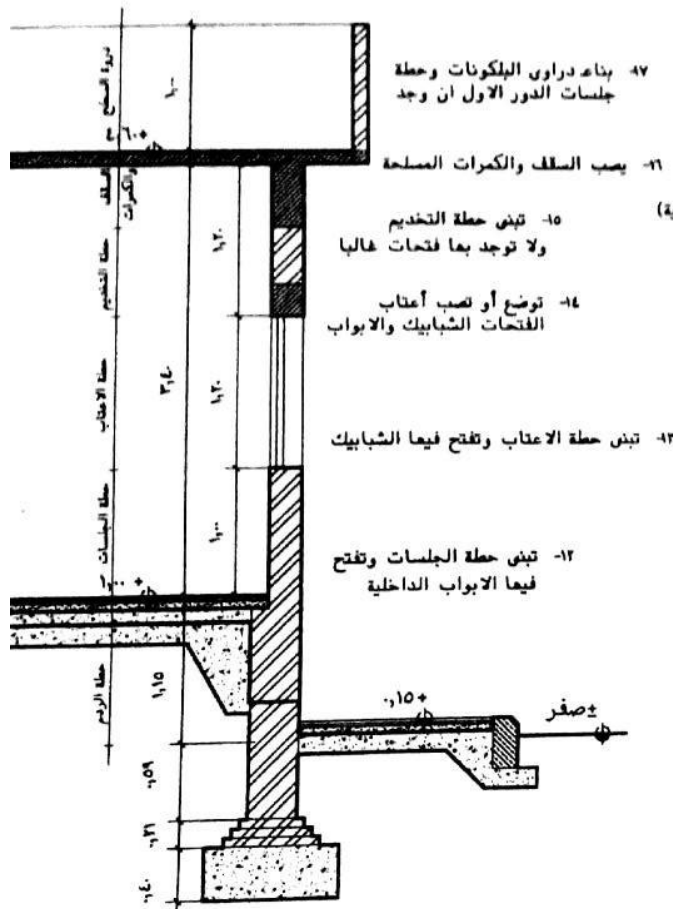
Comparison		Bearing Wall Construction	Skeleton Construction
Foundation	Type	Strip foundations	Isolated foundations
	Materials	Made with masonry or stones	Plain and reinforcement concrete
			

قطاع رأسى لمبنى منشأ بطريقة الانشاء الهيكلى

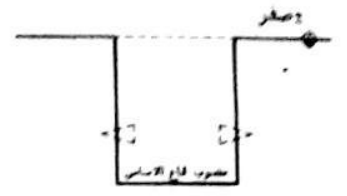


قطاع رأسى لمبنى منشأ بطريقة الانشاء الحوائط الحاملة

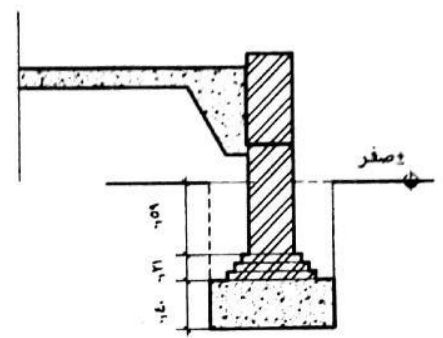




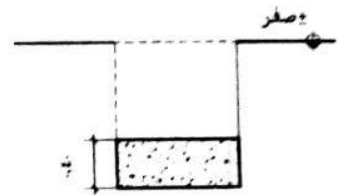
١- بناء الحوايط حتى منسوب حطة الردم الداخلي للمبنى
٢- دهان السطح الداخلي للحوايط بوجهين بتومين ساخن (الطبقة العازلة الرأسية)



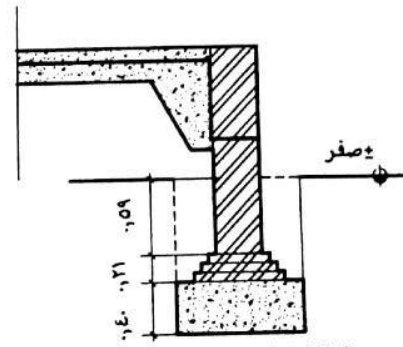
١- تخطيط المبنى
٢- الحفر أو منسوب قاع الأساس ووضع خوابير على جوانب الحفر وعلى منسوب السطح العلوي لخرسات الأساس



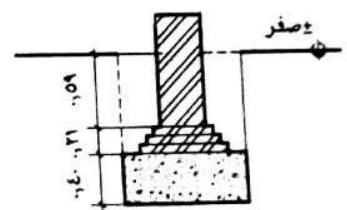
٣- الردم الداخلي حتى منسوب دكة الأرضية (طبقة الخرسانة العادية)
٤- رمى دكة الأرضية (الخرسانة العادية)



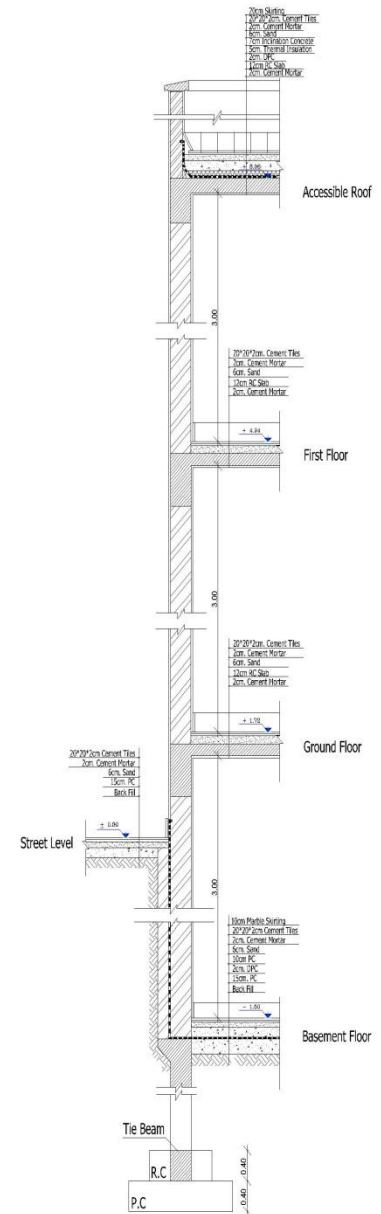
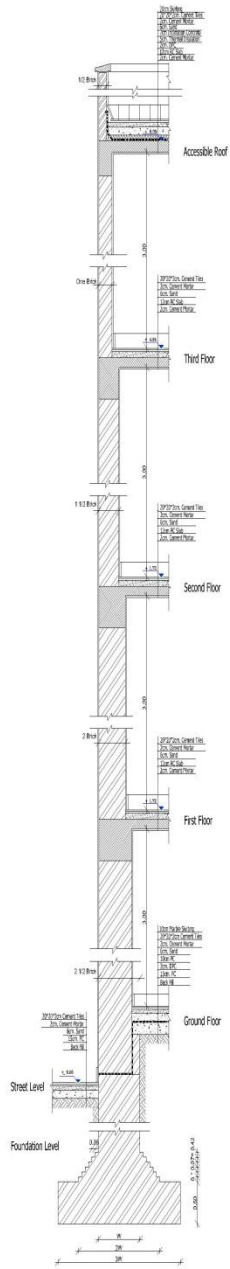
٣- صب خرسانة الأساس



٥- عمل الطبقة العازلة الأفقية فوق دكة الخرسانة العادية
٦- رمى الخرسانة الفينو فوق الطبقة العازلة الأفقية



٥- بناء حوايط الأساس حتى منسوب الطبقة العازلة الأفقية والردم حول الأساس
٥- وضع الطبقة العازلة الأفقية



THANKS
