

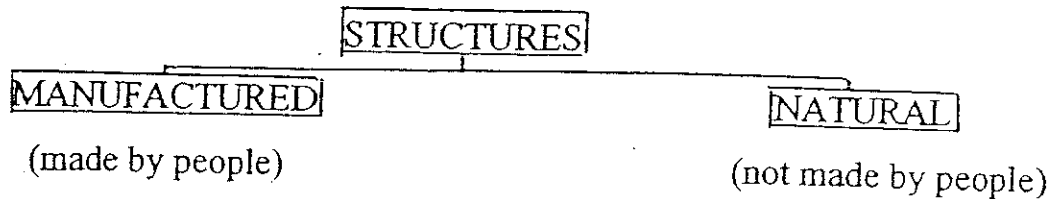
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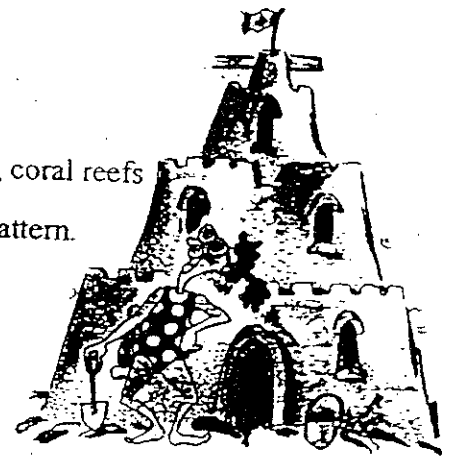
## TYPES OF STRUCTURES



There are three main types of structures:

1) MASS STRUCTURES:

- built by piling up materials.
- Examples: sand castles, dams, brick walls, mountains, coral reefs
- Sometimes made from carefully arranged pieces in a pattern.



“Running Bond” brick pattern used for extra strength

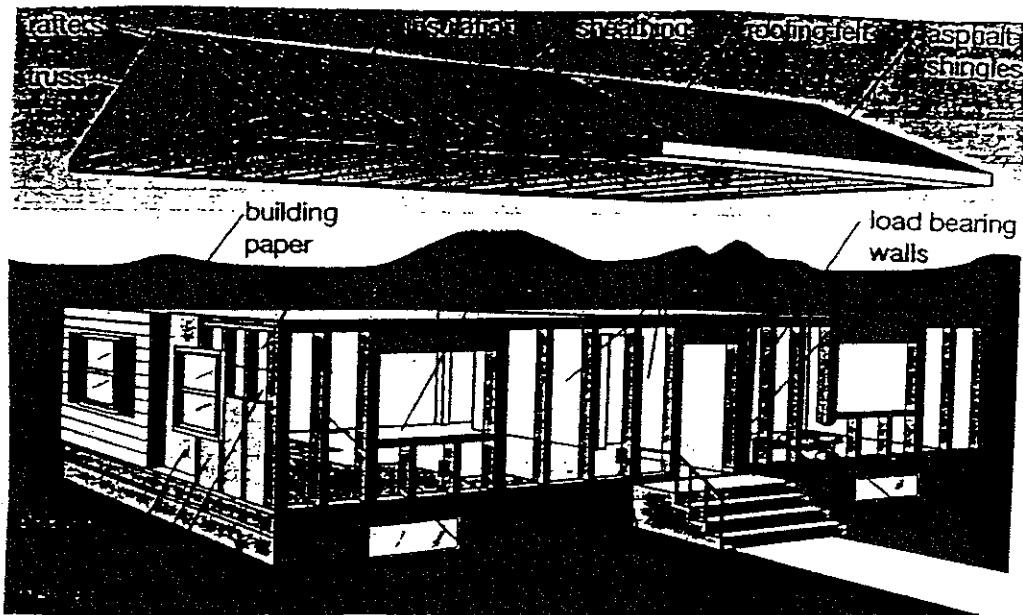
- not always solid ( for example inside power dams are enormous rooms that hold generators and other large machines.)

Four reasons why a mass structure (like a dam) might fail or collapse:

- The wall might not be heavy enough to stay in place – the force of the water pushes the dam out of place:
- The wall is so heavy that the earth beneath it is pressed down unevenly. Then the dam becomes unstable and tips over or falls apart.
- The wall may not be thick enough or fastened tightly enough together so parts are pushed out of place and then the dam collapses.
- The wall is not anchored to the ground so the force of the water at the top of the dam tips it over and causes it to collapse.

## 2) FRAME STRUCTURES:

- a "skeleton" of very strong materials which supports the coverings on the top and sides of it.
- A very common form of building and is used in many different ways
- Examples of frame structures are: ladders, snowshoes, spider webs, bicycle frame, umbrellas, boats, homes and other buildings.
- The most common example of a frame structure is a house.



### Problems that frame structures might have:

- lightweight structures such as tents do not have enough mass to stay in place without some type of anchor to hold them securely to the ground
- very tall frame structures, such as communication towers, can easily become unstable unless they are braced.
- Large, complicated frame projects, such as buildings and bridges, have many parts that have to fit together perfectly when they are assemble, therefore the design details have to be carefully calculated in advance.

### 3) SHELL STRUCTURES:

- objects that use a thin, carefully shaped outer layer of material to provide their strength and rigidity.
- They are completely empty, so they make great containers.
- They have only a thin, outside layer, so they use very little building material.
- The shape of the shell spreads forces through the whole structure, each part of the structure supports only a small part of the load.
- Examples of shell structures are: igloos, cardboard boxes, pipes, parachutes, balloons, canoes, the Taj Mahal in India.

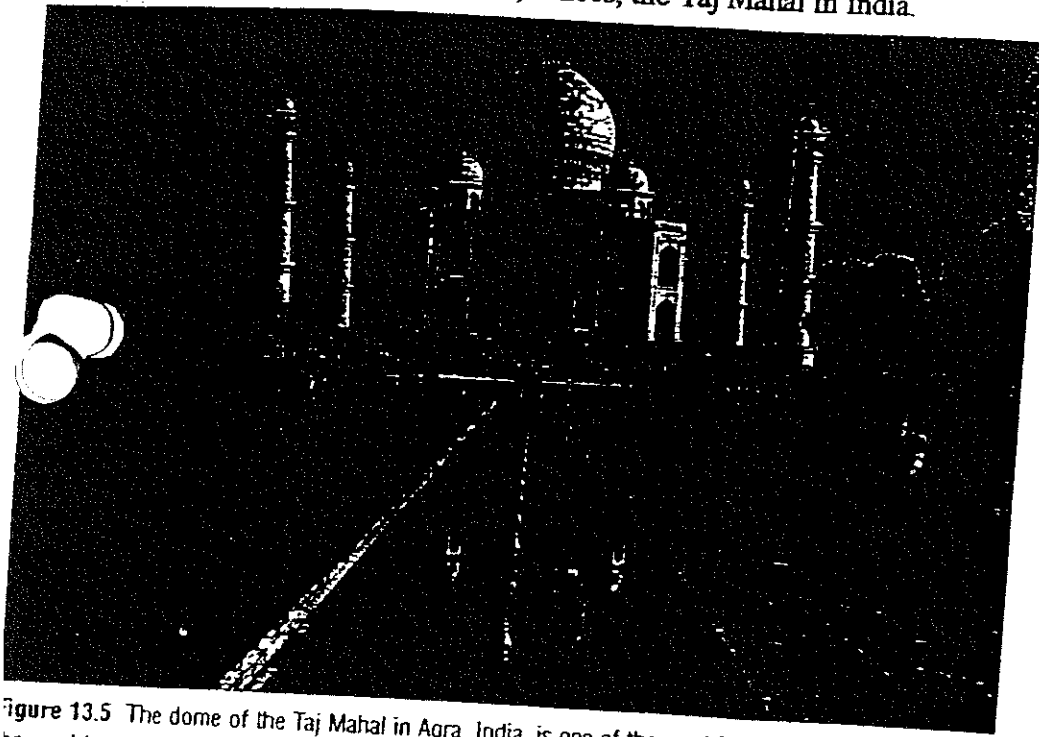


Figure 13.5 The dome of the Taj Mahal in Agra, India, is one of the most famous shell structures in the world.

#### Problems encountered when building shell structures:

- tiny weaknesses or flaws can cause the whole structure to fail.
- Uneven cooling or drying can cause some areas to push and pull on nearby sections. Strong stresses build up inside the shell, and the stress points may break causing the shell to collapse.
- Flat materials, such as plywood, are not easily tuned into the rounded shape of a shell structure, this makes construction slow and expensive.

## Types of Structures

### Poster Rubric

<b>Types of Structures</b>		
<b>Mass</b>	<b>Frame</b>	<b>Shell</b>
(picture)	(picture)	(picture)
-Definition	-Definition	-Definition
-Examples	-Examples	-Examples
-Problems	-Problems	-Problems

	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>Pictures</b>	There are no pictures that accurately reflect the type of structures	One picture accurately reflects the type of structure	Two pictures accurately reflect the type of structures	All three pictures accurately reflect the type of structures
<b>Definitions</b>	There are no definitions that accurately define the type of structures	One definition accurately defines the type of structure	Two definitions accurately define the type of structures	All three definitions accurately define the type of structures
<b>Examples</b>	No examples are provided	1-5 examples are present in total	6-8 examples are present in total	Nine examples are present (3 for each type of structure)
<b>Problems</b>	No problems are described	1-2 problems are described in total	3-5 problems are described in total	At least 6 problems are described in total (2 per type of structure)

Comments