

MODERN ARCHITECTURE

①

Introduction:

- Modern architecture is architecture that emerged in the 1920 in Europe and the United States.
- It began as a response by architects to rapid technological advances and greater urbanization of society at the turn of the century.
- It is the very dominant style which came during the 19th century.
- It symbolized the ideal public virtues of democracy, liberty and reason.
- It is the architecture of simple forms (rectangles) enclosed with flat opaque (solid) or transparent (glass) walls.
- Modern Architecture is considered progressive rather than regressive (backwards looking).
- Modern architecture express volume, balance, and elimination of ornaments.
- Modern styles and concepts, by contrast, took root more quickly in commercial, industrial, and residential architecture.

Technologies:

- As the 20th century began modern architects believed it was necessary to invent an architecture that expressed the spirit of a new age and would surpass the styles, materials and technologies of earlier architecture.
- By 1920s there was an increasingly wide understanding that building forms must be determined by their functions and materials if they were to achieve beauty in contemporary terms.

Material used:-

- With the continuous progress in the field of Iron and Glass, these material became the most common and important.
- Apart from these, ceramic hollow tiles and concrete block were also used.
- Steel framing and reinforced concrete serve as the primary structural materials of large-scale architecture.
- Iron could be used to span for larger spaces.
- In 1892 French engineer Francois Hennebique combined the strengths of both in a new system of construction based on concrete reinforced with steel.

Characteristics:- Common themes of modern architecture include:

- The notion that "Form follows function", a dictum originally expressed by Frank Lloyd Wright's.
- Simplicity and clarity of forms and elimination of "unnecessary detail".
- Visual impression of structure (as opposed to the hiding of structural elements).
- The related concept of "Truth to materials."
- Use of industrially-produced materials; adoption of the machine aesthetic.
- Particularly in international style modernism, a visual emphasis on horizontal and vertical lines.
- Modernism is characterized by simplification of form and subtraction of ornamentation from the structure and theme of the building.

(3)

Art Nouveau: It is a style of art and architecture that was most popular during 1890 - 1910, primarily in Europe. This style was inspired by natural forms and structures, not only in flowers and plants, but also in curved lines.

Probably the most famous person to work in this style was Antoni Gaudi, a Catalan architect whose work can be seen in many places in Barcelona, Spain.

Architects of Modern Architecture:

Notable architects important to the history and development of the modernist movement include

1. Le Corbusier
2. Ludwig Mies van der Rohe
3. Walter Gropius
4. Frank Lloyd Wright
5. Louis Sullivan
6. C.R. Mackintosh
7. Edwin Lutyens
8. Antoni Gaudi

Architect: Frank Lloyd Wright

- Frank Lloyd Wright was born in Richland Center, Wisconsin, on June 8, 1867.
- Died in Phoenix, Arizona, on April 9, 1959, at the age of 91.
- Frank Lloyd Wright described vernacular architecture as folk building growing in response to actual needs, fitted into environment by people who knew no better than to fit them with native feeling.

①

ope

- Crystal Palace — in London.
- Skyscrapers — a new building.

f

Origins: Modern architecture emerged in many western countries in the decade after World War I.

- There are multiple lenses through which the evolution of modern architecture may be viewed.
- Some historians see it as a social matter, closely tied to the project of Modernity and thus the Enlightenment.
- Modern architecture developed, in their opinion, as a result of social and political revolutions.
- Others see Modern architecture as primarily driven by technological and engineering developments.
- Still other historians regard Modernism as a matter of taste, the lavish stylistic excesses of architecture.

ith

of

Advances in building technology:

- With the Industrial Revolution, the availability of newly available building materials such as iron, steel, and sheet glass drove the invention of new building techniques.
- It was not until the early 1830s that Eaton Hodgkinson introduced the section beam, leading to widespread use of iron construction.
- A further development was that of the steel-framed skyscraper in Chicago around 1890 by William Le Baron Jenney and Louis Sullivan.

necess-
of a
ologies

t

②

5

- The dimensions of the Modular unit are limited only by transportation.
- Open-sided units can be placed together to form larger spaces.
- Modular construction product ranges include modular panel and floor cassette systems in which the benefits of mixed construction technologies may be realised for a range of building forms.

STABILITY CORES

- Most buildings need a stiff core to provide stability and ensure that, under lateral loads, sway movements are minimised.
- For low rise dwellings cross bracing is usually the most cost efficient. The braces can be placed in between fenestration constraints or between columns within walls.
- These modules are relatively light in weight for their size. This makes it possible to erect the structure using standard site equipment.

ROOFING AND WALL CLADDING SYSTEMS

Roofing systems:- These can be of the following types:

- Single Roof metal cladding
- Roof decking
- Insulated Panels, composite or sandwich panels.

Wall cladding systems:- These can be of the following types:

- wall cladding
- Double skin cladding
- Insulated Panels: Composite or sandwich
- clay finishes.

⑤ For weight, design and form acquired a symbolic meaning, architecture can embody "picturesque" qualities that harmonize with the environment.

Right's design solution was to view all details of a structure as the product of a single independent mind including all major and minor ornamental and symbolic elements.

Basic Principles:

- organic colors
- Simple geometric shapes
- Integration of building with natural surroundings
- strong horizontal lines
- Hidden entries.

Construction Materials:

- | | |
|----------|------------|
| • stone | • steel |
| • Mud | • Glass |
| • Brick | • Concrete |
| • Timber | • Fabric |

STEEL • There are many types of metals used for building. It is metal alloy whose major component is iron and is the usual choice for metal structural building materials. It is strong, flexible, and if refined well and/or treated lasts a long time.

Other metals include Aluminium alloys, Tin, Brass, Chrome, Titanium, Gold and silver.

• Structurally a building can either be a steel building or a steel framed building.

MODULAR CONSTRUCTION

• Modular construction uses light steel framing as its basic component, walls, floors and ceilings are constructed as 3-x units, which are fully fitted out before delivery to the site.

①

GLASS - Introduction

⑧

- Glass performs a significant function in space divisions and heat and light control.
- It has been known since ancient times so it fully justifies being considered as a traditional material. Glass, however, was expensive and so enjoyed only restricted use up to the nineteenth century.
- Mass production of sheet glass, the development of steel frames, cable structures, fixing devices and systems as well as of elastic and elasto-plastic sealant changed this and resulted in a number of innovative solutions.
- During the twentieth century the curtain wall emerged with new types of glazing, however, on the facades of the skyscrapers. Linear glass fixing components were still present.

Concrete - Introduction

- Concrete as a building material has been used in range of casting methods due to the variety of ways of working with the material.
- Famous concrete structures include the Hoover Dam, The Panama Canal and the Roman Pantheon.

Properties :- Density : 2240 - 2400 kg/m³

- Compression strength : 20 - 40 MPA
- Flexural strength : 3 - 5 MPA
- Tensile strength : 2 - 5 MPA
- Modulus of elasticity : 14000 - 41000 MPA.

- The initial setting time of concrete is 30 min and the final setting time is 600 min.

Example:- Eiffel Tower

- The Eiffel tower, is an iron lattice tower located on the champ de Mars in Paris, Named after the engineer Gustave Eiffel, whose company designed and built the Tower.
- Erected in 1889 as the entrance arch to the 1889 world's fair.
- The tower shows two different exponentials, The lower section overdesigned to ensure resistance to wind forces.
- Work on the foundations started in January 1887.
- Those for the east and south legs were straight forward, each leg resting on four 2M concrete slabs,

Example:- Statue of Liberty

- Designed by Frederic Bartholdi in collaboration with the french engineer Gustave Eiffel and dedicated on October 28, 1886.
- The statue of liberty is a large neoclassical sculpture on Liberty island in New York Harbor. The statue was a gift to the United States from the people of France.
- The statue of Liberty stands at a height of 151 feet 1 inch. From ground to torch it is 305 feet 1 inch 193 tall.
- Eiffel produced a 94-ft-high wrought-iron square skeleton whose chief structural members are four posts that work in compression.
- The skeleton supports a secondary iron frame that, in turn carries a system of flat wrought iron bars. These members carry the copper plates that form the statue's exterior skin.
- Extending from the main frame are a smaller frame supporting the head and a slim 47-ft, 7-in. skeleton carrying the arm that holds the torch.

INDUSTRIAL REVOLUTION

- The industrial revolution was a period in the late 18th and early 19th centuries when major changes in agriculture, manufacturing, production, and transportation had a profound effect on the socioeconomic and cultural conditions in Britain.
- The changes subsequently spread throughout Europe, North America, and eventually the world.
- The industrial revolution began an era of per-capita economic growth in capitalist economies.
- Historians agree that the industrial revolution was one of the most important events in history.
- The most significant inventions had their origins in the western world, primarily Europe and the United States.

CAUSES: • Some historians believe that the revolution was an outgrowth of social and institutional changes brought after English civil war in the 17th century.

- The spread of diseases was lessened, thereby preventing the epidemics common in previous times.
- The British Agriculture Revolution made food production more efficient and less labour-intensive, forcing the surplus population who could no longer find employment in agriculture into cottage industry.
- For example:- weaving, and in the longer term into the cities and the newly developed factories.

CHANGES THAT TOOK PLACE:

- Manual-labour-based economy changed towards machine-based manufacturing.

- ②
- It started with the mechanization of the textile industries.
 - The development of iron-making techniques and the increased use of refined coal.
 - Trade expansion was enabled by the introduction of canals, improved roads and railways.
 - The development of all-metal machine tools in the first two decades of the 19th century facilitated the manufacture of more production machines for manufacturing in other industries.
 - The impact of this change on society was enormous.

INNOVATIONS:

- The commencement of the Industrial Revolution is closely linked to a small number of innovations, made in the second half of the 18th century.
- The three 'leading sectors', in which there were key innovations which allowed the economic take off by which the Industrial Revolution is usually defined are:
 - Textiles - cotton spinning followed by the erection of many cotton mills.
 - Similar technology was subsequently applied to spinning yarn for various textiles and flax for linen.
- The only surviving example of a spinning Mule built by the inventor Samuel Crompton.
 - Steam power - The improved steam engine invented by James Watt was initially mainly used for pumping out mines, but from the 1780s was applied to power machines.
 - Iron founding - In the iron industry, coke was finally applied to all stages of iron smelting, replacing charcoal.

Machine Tools:

- The industrial Revolution could not have developed without machine tools, for they enabled manufacturing machines to be made.
- They have their origins in the tools developed in the 18th century by makers of clocks and watches and scientific instrument makers to enable them to batch-produce small mechanisms.
- The manufacture of textile machines drew craftsmen from these trades and is the origin of the modern engineering industry.

TRANSPORT IN BRITAIN:

- At the beginning of the industrial Revolution, inland transport was by navigable rivers and roads, with coastal vessels employed to move heavy goods by sea. Railways or wagon ways were used for conveying coal to rivers for further shipment, but canals had not yet been constructed.
- The industrial revolution improved Britain's transport infrastructure with an improved road network, a canal, and waterway network, and a railway network.

COASTAL SAILS:

- Sailing vessels had long been used for moving goods round the British coast.
- The trade transporting coal to London from Newcastle had already begun by this time.
- The major international seaports such as London, Bristol, and Liverpool, were the means by which raw materials such as cotton might be imported and finished goods exported.

METALLURGY:

- The Reverberatory Furnace could produce wrought iron using mined coal.
- The burning coal remained separate from the iron ore and so did not contaminate the iron with impurities like sulphur.
- The major change in the metal industries during the era of the Industrial Revolution was the replacement of organic fuels based on wood with fossil fuels based on coal.
- Since iron was becoming cheaper and more plentiful, it also became a major structural material following the building of the innovative Iron Bridge in 1778 by Abraham Darby.
- The cheaper iron and steel aided the development of boilers and steam engines, and eventually railways.

TRANSFER OF KNOWLEDGE:

- Periodical publications about manufacturing and technology began to appear in the last decade of the 18th century, and many regularly included notice of the latest patents.
- Foreign periodicals, published accounts of travels made by French engineers who observed British methods on study tours.

GLASS MAKING: • The 1851 Great Exhibition in Hyde Park.

- A new method of producing glass, known as the cylinder process, was developed in Europe during the early 19th century.
- In 1832, this process was used by the to create sheet glass. Then came window and plate glass.
- The Crystal Palace is the supreme example of the use of sheet glass in a new and innovative structure.