

ARCHITECT LE CORBUSIER AND HIS WORKS

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Le Corbusier was a Swiss-born French architect who belonged to the first generation of the so-called international school of architecture. In his architecture, he is chiefly built with steel and reinforced concrete and worked with elemental geometric forms. Le Corbusier's painting emphasized clear forms and structures, which corresponds to his architecture.

There, he fell under the tutelage of L'Eplattenier, whom Le Corbusier called "my master" and later referred to him as his only teacher.

After designing his first house, in 1907, at age 20, Le Corbusier took trips through Central Europe and Mediterranean, including Italy, Vienna, Munich and Paris. His travels included apprenticeships with various architects, most significantly with structural nationalist Auguste Perret, a pioneer of reinforced concrete construction, and later with renowned architect Peter Behrens, with whom Le Corbusier worked from October 1910 to March 1911, near Berlin.

1. Villa Savoye

Villa Savoye his theoretical studies soon advanced into several different single-family house models. The Villa Savoye is probably Le Corbusier's best-known building from the 1920s, it had enormous influence on international modernism. It was designed addressing his emblematic "five points", the basic tenets in his architecture.

- 1) Support of ground-level pilots, elevating the building from the earth and allowed an extended continuity of the gardens beneath.
- 2) functional roof, serving as a garden and terrace, reclaiming for nature the land occupied by the building.
- 3) free floor plan, relieved of load-bearing walls, allowing walls to be placed freely and only where aesthetically needed.
- 4) long horizontal windows, providing illumination and ventilation.

LE CORBUSIER IN INDIA

"Today I am accused of being a revolutionary. Yet I confess of having had only one master - the past; And only one discipline - the study of the past."

INTRODUCTION

- Since Punjab was divided into two parts, the capital was left in Pakistan therefore, Punjab in India required new capital.
- Le Corbusier was approached by Punjab Government and the Prime Minister of India.
- Maxwell Fry, Jane Drew and Pierre Jeanneret were also involved in the team of architects.
- When Le Corbusier assumed control of the Chandigarh Project in 1951, however, the design of the city had already been devised by the New York firm of Mayer, Whittlesey and Glass who received a contract for the Master Plan of Chandigarh in 1950.

Urban Design and mass housing

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- The Congress International d'Architecture Moderne (CIAM) would be a force in the shaping Modernist urban planning, and consequently the design of cities and structures within, from 1928 to 1959.
- In the Eastern Bloc, mass housing would take the form of prefabricated panel buildings, such as the Plattenbau of East Germany, Khrushchyorka of Russia and the Panelák of Czechoslovakia.

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 I-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.

Origins

- 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.

FRANK LLOYD WRIGHT

(20)

Frank Lloyd Wright was an American architect, interior designer, writer, and educator whose creative period spanned more than 70 years, designing more than 1,000 structures, of which 532 were completed.

BORN: 8 June 1867

DIED: 9 April 1959

With a career spanning over 70 years, American architect Frank Lloyd Wright changed the course of American architecture.

During his career, he designed more than 1,000 structures, with 532 being complete. As an architect, interior designer, writer, and educator, he was incredibly prolific.

In fact, in 1991, the American Institute of Architects named him 'the greatest American architect of all time' and many of his buildings have been placed for nomination as UNESCO World Heritage sites. Wright felt strongly that architecture was the great record of each civilization and that architects were the poets of their time, with a duty to capture their moment in history. He was able to break barriers as an innovator, moving from closed, restrictive Victorian architecture into a new American genre that favoured clean lines and open spaces. Inside and out, his buildings play off nature, and have left a legacy that still informs modern architecture and decorative arts. What are the characteristics of Frank Lloyd Wright architecture? We've all heard of Frank Lloyd Wright, but what is it

AUDITORIUM BUILDING (23)

- Location: 430 S. Michigan Avenue Chicago Illinois, United States
- Built: 1889
- Architect: Dankmar Adler, Louis Sullivan
- Architectural Style: Late 19th and Early 20th Century American Movements.
- Governing Body: Private Significant dates.
- The Auditorium Building in Chicago is one of the best-known designs of Dankmar Adler and Louis Sullivan.
- It was added to the National Register of Historic Places on April 17, 1970. It was declared National Historic Landmark in 1975, and was designated a Chicago landmark on Sept 5, 1976.
- Since 1947, the Auditorium Building has been the home of Roosevelt University.

GUARANTY BUILDING

- Year of Construction: 1895-1896
- Height: 46m
- Floors: 13
- Location: 28 Church Street, Buffalo, New York, United States
- Location: Owatonna, Minnesota
- Date: 1907 to 1908 timeline
- Building Type: Bank
- Construction system: bearing masonry
- Climate: temperate
- Context: Urban, small city
- Style: Early Modern

- 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.

CHARACTERISTICS

- Common themes of modern architecture include:
 - "Form follows function", meaning that the result of design should derive directly from its purpose.
 - Simplicity and clarity of forms and elimination of "unnecessary detail".
 - Visual expression of structure (as opposed to the hiding of structural elements)
 - Use of industrially-produced materials; adoption of machine aesthetic.

MODERN ARCHITECTURE

- Modern architecture is a term applied to an period in architectural history during the 20th Century, with its exact definition and scope varying widely.
- Modern architecture began at the turn of the 20th Century with advancement and the modernization of efforts to reconcile the principles underlying architectural design with rapid technological society.
- When compared to that which preceded it, modernism in architecture is broadly characterized by simplification of form and subtraction of ornament from the structure and theme of the building.

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- "Picturesque"

- Wright's design a single elements.

- BASIC PRINC
- Organic colour

- Simple geomet
- Integration o

FRANK LLOYD WRIGHT

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- 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.
- Young Frank spent much time playing with the blocks. They were geometrically-shaped and could be assembled in various combinations to form three-dimensional compositions. Many of his buildings are notable for the geometrical clarity they exhibit.
- Wright attended a Madison High school but there is no evidence he ever graduated. He was admitted to the University of Wisconsin-Madison as a special student in 1886.
- 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.
- For Wright, Design and form acquired a symbolic meaning. Architecture can embody "Picturesque" Qualities that Harmonize with the Environment.
- Wright'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 Colours.
- Simple geometric shapes
- Integration of Building with natural surroundings.

- Strong Horizontal lines.
- Hidden entries.

CONSTRUCTION MATERIALS.

- STONE
- TIMBER
- CONCRETE
- MUD
- STEEL
- FABRIC
- BRICK
- GLASS

STEEL - INTRODUCTION

- There are many types of metals used for Building: Steel is a metal alloy where 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.
- The Various uses of Metals in Construction industry include: Architectural Cladding, Handrails and Balustrading, Roofing, drainage and Rainwater Gutter, wall supports products and structural Applications.

STRUCTURAL APPLICATIONS:-

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

MODULAR STEEL CONSTRUCTION

- Modular Construction uses light steel framing as its Basic component. Walls, Floors and Ceilings are constructed as 3-dimensional units, which are fully fitted out before delivery to the site.

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- The dimensions of the Modular unit are limited only by transportation (width^⑤ of 3 to 4m are typical).
- 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 utilised for a range of Building forms.

STEEL - ROOFING AND WALL CLADDING SYSTEMS

ROOFING SYSTEMS

There can be of the following types:

- Single roof metal cladding
- Roof decking
- Insulated panels, Composite or Sandwich panels.

WALL CLADDING SYSTEMS:-

There can be of the following types:-

- Wall cladding
- Double skin cladding
- Insulated panels: Composite or Sandwich
- Clay finishes

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STEEL - EXAMPLES: 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 (6.6ft) concrete slabs, one for each of the principal girders of each leg but the other two, being closer to the river side, were more complicated: Each slab needed two steel pipes installed by using compressed-Air caissons 15m (49ft) long and 6m (20ft) in diameter driven to a depth of 22m (72ft) to support the concrete slabs, which were 6m (20ft) thick. Each of these slabs supported a block built of limestone each with an inclined top of a bearing supporting shoe for the ironwork. Each shoe was anchored into the stonework by a pair of bolts 10cm (4in) in diameter and 7.5m (25ft) long.

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GLASS - INTRODUCTION

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- Glass performs a significant function in space divisions and heat and light control.
- It has been known since early times so it fully justifies being confused 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, cables structures, fixing devices and systems as well as of elastic and elasto-plastic sealant changed this and resulted in a number of innovative solutions and systems.
- 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. The glass pyramid at the Louvre, Paris is an example.

TYPES AND USES

- Gradient progress in materials and systems achieved the objective to develop "All-glass facades" with uninterrupted glass surfaces.
- The basic glazing material used for external envelopes is the glass pane, which may be clear white, body tinted, photosensitive, or photochromatic.
- Glass coated by one or by several thin coating layers may be heat and light absorbent and/or reflective.

CONCRETE :- INTRODUCTION

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- Concrete as a building material has been used in range of casting methods due to the variety of ways of working with the material.
- Concrete is a composite material composed of loose granular material that fills the space among the aggregate particles and glues them together.
- famous concrete structures include the Hoover DAM, The PANAMA CANAL and the ROMAN PANTHEON.

INTRODUCTION OF CEMENT

- A cement is a binder, a substance that sets and hardens independently, and can bind other materials together.
- The volcanic ash and pulverized brick additives that were added to the burnt lime to obtain a hydraulic binder were referred to as cement.
- Portland cement (often referred to as OPC, from ordinary portland cement) is the most common type of cement in general use around the world, used as a basic ingredient of concrete, mortar, stucco, and most non-speciality grout. It usually originates from limestone.

PROPERTIES OF CONCRETE

Typical Properties of normal strength

Portland Cement Concrete are indicated Below:-

- Density: $2240 - 2400 \text{ Kg/m}^3$
- Compressive STRENGTH: $20 - 40 \text{ MPA}$
- FLEXURAL STRENGTH: $3 - 5 \text{ MPA}$
- TENSILE STRENGTH: $2 - 5 \text{ MPA}$
- MODULUS OF ELASTICITY: $14000 - 41000 \text{ MPA}$
- The initial setting time of concrete is 30 Minutes and final setting time is 600 Minutes.
- Grades of concrete.
 - M-15 = 1:2:4 (Cement: stone: sand)
 - M-20 = 1:1.5:3 (Cement: stone: sand)
 - M-25 = 1:1:2 (Cement: stone: sand)

CONCRETE - CONSTRUCTION TECHNIQUES

TILT UP CONSTRUCTION AND FINISHING (1940)

Tilt-up construction involves site-casting the concrete walls of a building on its floor slab or on a separate casting bed, and then tilting and lifting them into position by crane. The result is rapid construction arising from a well-planned process more akin to a factory production line, but retaining the flexibility of in-situ concrete work.

MODERN METHODS OF CONSTRUCTION

• PRECAST FLAT PANEL SYSTEM

Floor and wall units are produced off-site in a factory and erected on-site to form robust structures, ideal for all repetitive cellular projects.

• 3D VOLUMETRIC CONSTRUCTION

3D Volumetric Construction involves the production of 3-dimensional units in controlled factory conditions prior to transportation to site.

• Tunnel form

Tunnel form is a formwork system that allows the contractor to build monolithic walls and slabs in one operation on a day cycle.

PUMPING METHOD:-

A concrete pump is a machine used for transferring liquid concrete by pumping. There are two types of concrete pumps.

- The first type of concrete pump is attached to a truck. It is known as a trailer-mounted beam concrete pump.
- The second main type of concrete pump is either mounted on a truck and known as a truck-mounted concrete pump or placed on a trailer, and it is commonly referred to as a line pump or trailer-mounted concrete pump.

UNDER WATER CONSTRUCTION

for underwater concrete, workability can be interpreted as 3 basic performance requirements as follows.

- Flowability: concrete must be able to flow out easily underwater and completely fill the placement area without trapping water inside, it works well with concrete with slump up to 150 mm.
- Self-consolidation: Since it is impractical to consolidate concrete underwater by mechanical vibration, the concrete must consolidate itself by the primary driving force which is its own weight, which is subsequently

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Reduced by the Buoyancy in water.

- COHESION:- The concrete is required to remain cohesive underwater. The primary objective is to ensure the homogeneity and strength of underwater concrete by minimizing cement washout, segregation, and laitance.

CONCRETE SHELL STRUCTURES

- Concrete shell structures, often referred to as 'thin shells', have been around since the 1930's
- The design of these thin shells was stimulated by the desire to cover wide spans in an economically attractive manner. Typically, the thickness of concrete shells is relatively small compared to the curvature and span.
- The main reason for concrete shells to be economically feasible, is that shells are structurally efficient in carrying loads acting perpendicular to their surface by inplane membrane stresses.

DESIGN - BASED CLASSIFICATION OF SHELL STRUCTURES

- THE Diversity of shell structures is vast. any surface that is curved in one or more directions can be considered a shell surface.
- Shell surface may be defined by the classification of their curvature, expressed in terms of Gaussian curvature.

LES MANANTIALES RESTAURANT IN MEXICO CITY BY FELIX CANDELA (13)

A blooming period of widespread concrete shell construction took place from the 1930's, where engineers like Felix Candela, EDUARDO TORROJO, ANTON TEDESKO AND PIER LUIGI NERVI.

Managed by To Design, calculate and construction extremely elegant concrete shells.

INDUSTRIAL REVOLUTION

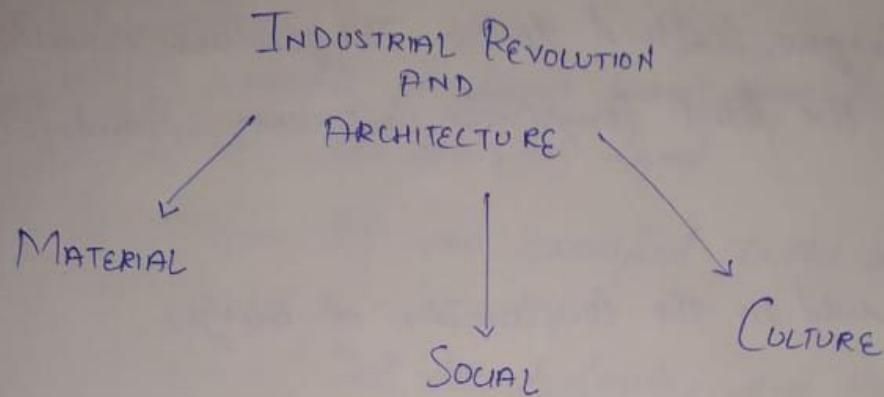
The process of change from an agrarian, handicraft economy to one dominated by industry and machine manufacture.

- The Industrial Revolution began in England about 1760.
- radical changes at every level of civilization throughout the world.
- The revolution in human thought



INDUSTRIAL REVOLUTION AND ARCHITECTURE

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CONSTRUCTION MATERIAL

Growth of heavy Industry brought a flood of new building materials.

eg:- Cast iron
steel
glass.

Cast iron :-

for a long time before the industrial revolution the most used metal was pig iron, this is a very brittle metal and to be structural solid required large quantities. The only practical application was in pots, pans and occasionally fireplaces.

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However with the industrial revolution the price of cast iron decreased considerably and by 1850 intricate facades were being made of cast iron that can still be seen in Glasgow, Scotland today. The gardens warehouse that was constructed in 1856 was the first completely cast iron fronted commercial building in Britain.

WROUGHT IRON:- Mostly used in the construction of bridges.

SOCIAL AND CULTURAL

NEOCLASSICAL ARCHITECTURE:-

- produced by the neoclassical movement began in the mid-18th century, manifested both in its details as a reaction against the rococo style of naturalistic ornament, and in its architectural formulas as an outgrowth of some classicizing features of late Baroque.
- Intellectually Neoclassicism was symptomatic of a desire to return to the perceived "purity" of the arts of Rome, Greece, and renaissance classicism.
- In the second half of the 19th century dislocations brought about by the Industrial revolution became overwhelming.
- Many were shocked by the hideous new urban districts of factories and working housing and by the deterioration of public taste among the newly rich.

INDUSTRIAL REVOLUTION AND CITY

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CITY AND FACTORY TOWN

- The steam railroad extended its rails from raw products to the factory, and to the cities of consumers all over the land.
- Every amenity of urban life was sacrificed to the requirements of industrial production.
- Railroads and ships joined at the factories, and the waterfront became the industrial core of the city.

PUBLIC AND SAFETY IN CITY

- The heavy buildings lower on the land reduced the natural drainage of the city.
- But extensive street paving permitted effective cleaning and strong sewers augmented the sanitary equipment.
- Common use in city street lamps. Electricity began to replace gas for street lighting.