

Chapter 13: HIGH-TECH ARCHITECTURE

13.1 HIGH- TECHNOLOGY

High-tech architecture, also known as **structural expressionism**, is a type of **late modernist architecture** that emerged in the 1970s, incorporating elements of high-tech industry and technology into building design. High-tech architecture grew from the modernist style, utilizing new advances in technology and building materials.

It emphasizes transparency in design and construction, seeking to communicate the underlying structure and function of a building throughout its interior and exterior. High-tech architecture makes extensive use of aluminium, steel, glass, and to a lesser extent concrete, as these materials were becoming more advanced and available in a wider variety of forms at the time the style was developing generally, advancements in a trend towards lightness of weight.¹

The first occurrence of the phrase "high technology" occurs in a 1957 story advocating "atomic energy" for Europe in "New York Times". In architecture, high tech design involves the use of the materials associated with high tech industries of the 1980's and 1990's, such as space frames, metal cladding and composite fabrics and materials. Use of hollow structural sections, pre-fabricated elements, glass walls and steel frames were prevailing.

It started with the emergence of New Modernism i.e. 1960 onwards which emphasises on:

- Technology as Stand Point of Design
- Ideas about Industrial Production
- High Priority on Flexibility of Use
- Sustainable and energy efficient designs
- Movable structures

CHARACTERISTICS:

Cutting –Edge design

High tech is technology that is at the cutting edge i.e the most advanced technology, Industrial-like style and advanced technology of the construction world. It is the collaboration of the art of power, urban living, minimalist concept and masculine feature.

Its use of materials is associated with high tech industries such as space frames, metal cladding and composite fabrics and materials. The buildings look



Roppongi hills, Tokyo²

¹ https://en.wikipedia.org/wiki/High-tech_architecture#cite_note-1

² https://en.wikipedia.org/wiki/Roppongi_Hills#/media/File:Roppongi_Hills_2013-12-01.jpg

expensive and have use of extensive straight lines and dramatic curves. It enables a direct view from the exterior.

Exo-skeleton (Machine Aesthetics) and Structural Expressionism

Notable works of **RICHARD ROGERS**

Centre George Pompidou in Paris, France, 1972 to 1976:

- A modern art museum designed by Rogers and Piano
- Massive structural expressionist cast exoskeleton, "exterior" support beams, duct work, and other functional elements placed on the exterior of the building.
- High-tech steel and glass technology used.



CENTRE POMPIDOU, FRANCE, 1976³

- Frame is stiffened laterally by cross bracing in the vertical plane
- Stiffening in the other vertical plane is added by diagonal braces between the lattice girders on both gable walls.
- The superstructure of the building consists of three zones.
- The middle zone contains the 157 foot (48 meter) clear span across the building interior between the main columns.
- The outside two zones make up structural wall frames to support and cantilever the main span lattice girders.
- The escalator serves only the mezzanine, level four, and level six. Public access to the museum areas is from doors located centrally at the lower edge of the plaza.
- Functional structural elements color-coded: green plumbing pipes, yellow electric wires, blue ducts at the back side of the building. Other elements mostly for aesthetic purpose.⁴



Back side of Centre Pompidou, France, 1976⁵

³ https://en.wikipedia.org/wiki/Centre_Pompidou#/media/File:Pompidou_center.jpg

⁴ https://en.wikipedia.org/wiki/Centre_Pompidou

⁵ https://en.wikipedia.org/wiki/Centre_Pompidou#/media/File:Pompidou_Centre_building_technology.jpg

88 WOOD STREET, ENGLAND, 2001

- Commercial office towers built on concrete frame with steel bracing and glass curtain walls
- Built on temperate urban context with high tech modern style
- Expressed structure as ornamental order
- Modern facade, concrete frame that is braced by gunmetal gray and stainless-steel rods
- Rendered stainless steel and exposed lift shafts
- The blue ducts take in fresh air, and the red one's exhaust used air. Coupled with the bright yellow steel stairs



88 WOOD STREET, ENGLAND, 2001⁶

LLOYDS BUILDING (LONDON), 1984

- The building is a leading example of radical Bowellism architecture in which the services for the building, such as ducts and elevators, are located on the exterior to maximise space in the interior.
- The building was innovative in having its services such as staircases, lifts, ductwork, electrical power conduits and water pipes on the outside, leaving an uncluttered space inside.⁷
- The main twelve -storey structure is a simple rectangle circumvented by six service towers. Inside, it allows maximum flexibility with a central atrium and series of concentric balconies. Twelve glazed lifts give a vital and dynamic visual presence. (Sharp D. p390)



Lloyds Building (London), 1984⁸

⁶ https://upload.wikimedia.org/wikipedia/commons/1/18/88_Wood_St%2C_London.jpg

⁷ https://en.wikipedia.org/wiki/Lloyd%27s_building

⁸ https://en.wikipedia.org/wiki/High-tech_architecture#/media/File:Lloyd's_Building,_London.jpg

Another architect associated with High-Tech is **Sir Norman Foster** and his building **HONGKONG AND SHANGHAI BANK, HONG KONG, 1979-86**

This commercial office tower uses dramatic exoskeleton steel trusses with vast exterior glazing to express the sensation of high technological era.

With huge atrium decorated with escalators and glass walls, it uses natural light for lighting inside the grand atrium in daylight reducing huge amount of costs in energy consumption.



Hongkong And Shanghai Bank⁹

A diagrid is a framework of diagonally intersecting metal, concrete, or wooden beams that is used in the construction of buildings and roofs. It requires less structural steel than a conventional steel frame. Hearst Tower in New York City, designed by Norman Foster, uses 21 percent less steel than a standard design. The diagrid obviates the need for columns and can be used to make large column-free expanses of roofing. Another iconic building designed by Foster, 30 St Mary Axe, in London, UK, known as "The Gherkin", also uses the diagrid system.¹⁰



Diagrid system in "The Gherkin"¹¹

Extreme Repetition

Extreme repetition is just another Late-Modern exaggeration of an existing rhetorical device. Modern architecture justified repetition as a productive device. **Philip Johnson's IDS Center** staggers steel set-backs in ziggurat profiles.

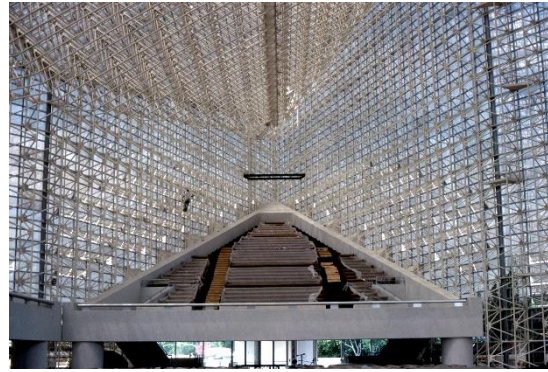
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https://en.wikipedia.org/wiki/Norman_Foster,_Baron_Foster_of_Thames_Bank#/media/File:HK_HSBC_Main_Building_2008.jpg

¹⁰ <https://en.wikipedia.org/wiki/Diagrid>

¹¹ <https://en.wikipedia.org/wiki/Diagrid#/media/File:Swiss.re.arp.750pix.jpg>

This central court is covered by veritable orgy of ice-cube holders buzzing away in perspective overhead and reflecting. The buildings which use this structure or space frame all over their surface elide the distinction between wall and roof. (Jencks C. p62-65)



Interior of the Crystal Cathedral, 1980¹²

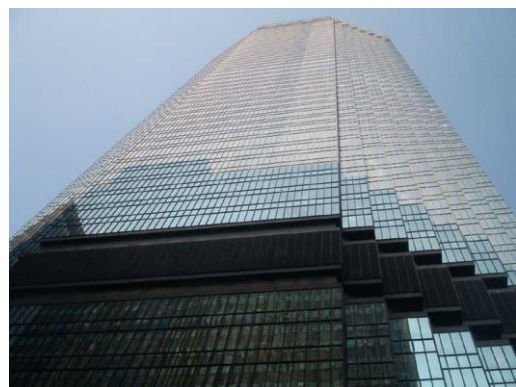
Designed by the architect I. M. Pei, **John F. Kennedy Presidential Library and Museum**, 1977-79 is a simple geometric structure with a large glass pavilion. The concrete tower stands 125 feet (38 m) tall and houses offices and archives. A circular section contains two theaters and is connected to the tower by the 115-foot (35 m) grey-glass pavilion.

Slick Skin effects

As curtain wall gave the opportunity for “less & less”; there was an exclusion of Bones from the Skin hence pure glass skin building emerged. This diminishes the role of four facades and the frontality inherent in most buildings. Furthermore, it decreases the mass and weight while enhancing the mass and contour. All these aesthetic effects are made possible by developments in stronger glass walls and thinner gaskets. They led to Late-Modern curtain wall, the slick skin membrane which is different than modern one with strong vertical divisions. (Jencks C. p66)

Enclosed Skin Volumes

The slick skin membrane allows, as we’ve seen, a greater scope for volumetric articulation than the previous curtain wall, as aspect which these skyscrapers share. Breaking down the apparent mass, density, weight of a fifty storey building is part of the motive. One way this is done is by destroying the four-square morphology, by adding extra facades by making a façade at the corner and a broken one done by **Philip Johnson in IDS Center, Minneapolis, 1972-75** or by fragmenting the facades vertically or in both planes. (Jencks C. p70)



IDS Center, Minneapolis, 1972-75¹³

¹² https://en.wikipedia.org/wiki/Philip_Johnson#/media/File:Crystal_Cathedral_01-15Aug80.jpg

¹³ https://en.wikipedia.org/wiki/IDS_Center#/media/File:IDSTower.jpeg

Ornament swallowing the building

In the large span projects, constructional parts cover most of the building and roof plane is where the structural forces have the most freedom of expression; architects designed wall structures developing into roof structures as well. (Jencks C. p44) Need to cover large ground spans such as for Stadiums, Airports etc.; huge roof structural members acted as an ornament of the building. Also, they were termed as "Ground scrapers"



Palazzetto Dello Sport¹⁴



Millennium Dome, at London, England, 1999¹⁵

Sculptural Form and Hyperbole

During the 60s and 70s reinforced concrete was used in a very expressive way often making hyperboles and extravagant forms. One such example is **Dallas city hall by I.M Pei, 1978.**

Another example is **Olympic Sports Hall, Yoyogi, Tokyo, Japan, 1964** by Kenzo Tange is a very exciting project. Both buildings are developed from the circle and the ellipse in plan and section. They are linked by a promenade on top of a single storey structure. Both have concave suspension roofs. The two main cables of the roof are anchored in concrete foundation and suspended from pylons at either end of buildings, while convex main girders on either side support the concavely suspended secondary cables which carry the steel sheeted roof. (Sharp D. p 261)



Yoyogi National Gymnasium (1964)¹⁶

¹⁴ https://en.wikipedia.org/wiki/Palazzetto_dello_Sport#/media/File:Palazzetto_Dello_Sport_-_panoramio.jpg

¹⁵ https://en.wikipedia.org/wiki/Millennium_Dome#/media/File:Millennium_Dome_1.jpg

¹⁶ https://en.wikipedia.org/wiki/Kenz%C5%8D_Tange#/media/File:Kokuritsu_Yoyogi_Ky%C5%8Dgij%C5%8D_1.jpg

Reference Books:

1. Jencks C, 1980, Late-Modern Architecture, Architecture and Morality, Rizzoli International Publications, NC, p (44,62-66,70)
2. Sharp D. 1991. Twentieth Century Architecture A Visual History, Decade 1950, The Bath Press, Great Britain, p390
3. Sharp D. 1991. Twentieth Century Architecture A Visual History, Decade 1960, The Bath Press, Great Britain, p261