



Painting of Le Coubusier (1955). Le Poème de l'Angle Droit, 1955. © FLC-ADAGP.

The new building components of the Modern Architecture

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Abstract: The invention of reinforced concrete in the second half of the 19th century represented a revolution in building design and construction. Its worldwide spread at the beginning of the last century was the origin of today's globalized way of building and living. The gradual abandonment of local building traditions and the contemporary debate on the sustainability of construction aimed at reconciling the sector's energy and material needs with the preservation of the natural environment date back to this period.

From the second decade of the last century until the 1960s, the invention of reinforced concrete also determined the emergence and dissemination of the theoretical principles of the Modern Movement. This movement was joined by numerous architects, each of whom interpreted in an original way the five points of Le Corbusier's rationalism (pilotis, free floor plan, free façade, ribbon windows, roof-garden-flat roof) and created masterpieces of architecture of the last century. This period was rich of cut-edging innovations in the building components. Through the critical study of archives and historical and technical sources, the work focuses on the innovation of the technological elements of façades to control the interaction between sunlight and the building, today referred to as passive energy systems. The study of some famous architectures of the Modern Movement demonstrates that architectural design is a continuous experimentation of materials and new technological solutions. Moreover, the control of the on-site behavior and effectiveness of innovations provides continuous lessons that presuppose the ability to seize opportunities for development and improvement from failed experiments.

Keywords: reinforced concrete, *cobogó*, double-skin facade, *brise-soleil*, passive systems.

1. The challenge of lighting in modern architecture

L'architecture est le jeu sage, correct et magnifique des volumes sous lumière.

Architecture is the wise, correct and beautiful play of volumes under light.

Le Corbusier, 1920

Light is the physical agent that allows objects to be visible. It is also directly related to well-being and health because natural lighting has great benefits and advantages for people. Well-lit spaces bring feelings of joy and satisfaction, even our spatial perception changes, seeing them as bigger. In architecture, lighting, partly due to the issues indicated above, requires a special attention to achieve the interior comfort solutions and, in a broader sense, the wellbeing of users.

Throughout history, the challenge of lighting contributed to create different types of vernacular constructions depending on the climate conditions. In the Mediterranean area, for example, the patio house was a strategy that allowed benefits in terms of cross ventilation and lighting depending on the solar path that can penetrate all the built spaces; the row houses also responded to the solar benefit, either as an external factor of thermal improvement of the envelope and natural lighting into the interior thanks to the natural sunlight of the front and back façades.

The invention of reinforced concrete in the second half of the 19th century was a true revolution in the design and construction of buildings. The good mechanical properties of this composite material, which combines the tensile strength of steel and the compressive strength of concrete, as well as the simplicity and speed of concrete's casting, also allowed the construction of the first skyscrapers at the beginning of the last century, symbolising the new way of building and living in the industrial age.

In the 20th century, the widespread use of reinforced concrete as a building material led to the functional and formal separation of the load-bearing structure and the enclosing walls of the building. The façades lost their load-bearing function and became simple closing and separating elements between the building's interior and exterior. Unlike the first skyscrapers, which used a mixed construction technique of reinforced concrete and stone or solid brick masonry, the façades were built with technological solutions involving minimal thicknesses to reduce the vertical loads of the structure and large window openings with metal frames and glazed surfaces.

With the abandonment of thick masonry in favour of lightweight envelopes, façades lost their important thermal insulation role (Bernardo, Palmero, 2022).

Within a few years, entire new neighbourhoods in the cities were built with intensive land use and real estate speculation began, which still creates profound inequalities today. Buildings lost their almost symbiotic link with the natural environment of the pre-industrial era and the use of energy-consuming artificial lighting and air conditioning systems (heating and cooling) became widespread. Furthermore, the early production processes of both Portland cement and primary steel metallurgy required large amounts of energy and non-renewable raw materials and generated polluting and greenhouse gases. The invention of reinforced concrete thus marked the beginning of the dramatic conflict between construction and environmental protection, which manifests itself today in stark relief in the form of climate change, pollution, and depletion of natural resources.

From the second decade of the last century until the 1960s, the invention of reinforced concrete also led to determined the emergence and dissemination of the theoretical principles of the Modern Movement. (Frampton, 2010). This movement was joined by numerous architects, each of whom interpreted in an original way the five points of Le Corbusier's rationalism (pilotis, green flat roofs, free floor plan, free façade, ribbon windows, free façaderooft-garden-flat roof) and created masterpieces of architecture of the last century.

In the 1920s, thanks to the progress of industry and the technological future that was just around the corner, architecture tries to free itself from environmental conditions, from the use of local raw materials. The dream of an easily buildable house within everyone's reach was born. The only environmental factor that remains in the foreground is light. The architects of the Modern Movement use light as an element of perception of volumes with straight lines devoid of ornamentation, built in reinforced concrete, steel and glass (Palmero Iglesias, 2018). The color white reflecting all the radiation of the visible spectrum becomes the iconic symbol of the new architecture.

In 1923, Le Corbusier describes principles and theories of the new languages and forms of modern architecture in the volume *Vers une architecture*, a collection of his essays on the Parisian avant-garde magazine *L'Esprit Nouveau*.

Finally, in certain areas, the technicians have spoken. Water and lighting services are evolving rapidly: central heating has considered the structure of the walls and windows - cooling surfaces - and, consequently, stone, good natural stone in walls a

meter thick, has been displaced by light double partitions of casting slag and so on. (Le Corbusier, *Vers une architecture*, 1923, p.192).

Le Corbusier explains his visions with an undeniable personality. He imagines a house based on technological functionalism, for which he also designs the furnishings that he transforms into the model of a *machine à habiter*. He proposed the isothermal building, effective against cold and heat, based on the *mur neutralisant*, a double-skinned glazed wall with air conditioning circulating inside the cavity to control the exchange of heat between inside and outside, and on the *respiration exacte*, a mechanical ventilation system to provide air conditioning to the interior spaces at a constant temperature of 18°C (Banham, 1975). These solutions responded to strategies by means of which users of any climate could always and everywhere have guaranteed comfort thanks to technology, an issue that marked the difference between traditional and the modern architecture.

2. The new globalized way of living and building

One of the most significant historical events for the affirmation of the ideas of the Modern Movement in architecture was the second Werkbund exhibition organized by Lilly Reich and Mies van der Rohe in Stuttgart in 1927. On this occasion the municipality of the city granted a plot of land to build an exhibition of the new way of living. Besides Le Corbusier and Mies van der Rohe himself, the Germans Walter Gropius, Hans Scharoun and Bruno Taut, the Dutch Mart Stam and J.J.P. Oud and the Belgian Victor Bourgeois participated to the exhibition.

The model quarter, of Weissenhof was built in less than five months,. It was an exceptional success and remains to this day one of the most important testimonies to the unity of purpose that animated the avant-garde architects of the time.

This exhibition shows how all the architects of the time tended to express themselves have the same line of thought about a house for the mass with the same characteristics, according to this concept of functionalism, with a certain type of cost and construction time (in theory a house for the masses), all. The convergence of these artists on the same line of thought. From these themes and interests and their common intentions came they were showed during the international congress of modern architecture, CIAM (Congrès Internationaux d'Architecture Moderne, International Congress of Modern Architecture), which showed the convergence of these artists on the same themes and interests.



Figure 1 | Detached-house. *Maisons de la Weissenhof-Siedlung, Stuttgart*, Le Corbusier and Pierre Jeanneret, 1927. Unknown author. www.pinimg.com.

Each of the Weissenhof's buildings is a prototype house, so it can be said to be a model of a city, as each of these dwellings can be reproduced on a large scale. Almost all the prototype dwellings were white. For this reason, the exhibition district was called Weissenhof, that in German means white village. The German architect Muthesius,¹ founder of the Werkbund, was very critical of the new ways of building and living of the Weissenhof. He stated that it was pure art because in his opinion people did not want to live on the roof and behind the kind of glass walls that make people freeze to death in the winter and destroy the intimacy of the house. The Weissenhof estate suffered tampering and damage during the Nazi regime and during the Second World War. In the post-war period, it has undergone several restoration and recovery operations.

Le Corbusier presented two houses that represented the new way of building and living: the single-family house with reinforced concrete structure (Fig. 1) and the two-family house with steel frame (Fig. 2). The single house in reinforced concrete is inspired to the Citrohan model, a reinterpretation on of the Mediterranean



Figure 2 | Semi-detached house. Le Corbusier and Pierre Jeanneret. *Maisons de la Weissenhof-Siedlung, Stuttgart*, Le Corbusier and Pierre Jeanneret, 1927. © Andreas Praefcke, CC BY 3.0, <https://commons.wikimedia.org/w/index.php?curid=11149752>

house, with the typical staircase outside the building. The space on the ground floor is occupied by pilotis, on the upper floors we find the kitchen and living room with large window of double height, overlooked by an attic where we have the master bedroom and bathroom, we go further up and arrive at the children's bedroom organized to give privacy to the two children. The windows are often ribbon windows and the same window module is composed in different ways to create small openings or large ribbon windows. Le Corbusier oriented the glazed façade to the south to provide views of the city and not condemn the users to a view of the adjacent building. This new orientation, which favors luminosity and good mood, will be a determining factor in the architect's future projects.

The semi-detached house was designed according to the transformable house model. The presence of movable elements allows great flexibility in the use of interior space and thus a maximum economy of space

in the plan. An internal spiral staircase gives access both to the upper floor, containing the living and service rooms, and to the roof terrace level, with the roof garden occupying the entire surface, apart from a small library. In addition to white prevailing as the dominant color, Le Corbusier also used blue and red to coloring the walls. Since 2006, it has housed the Museum of Architectural History and since 2016 has been a UNESCO heritage site as a masterpiece of architecture.

The International Style, another of the names given to Modern Movement, was born precisely with the intention of providing a global house with technological standard within everyone's reach. This democratic utopia of equity was frustrated by the economic crisis and the second world war of the late twenties that caused a general discouragement in pursuing ambitious goals in the absence of adequate economic resources and technological innovations. However, for Le Corbusier things did not go so bad even in this difficult period. Thanks



Figure 3 | Front façade oriented to the south. *Cité de Refuge*, Paris. Le Corbusier and Pierre Jeanneret, 1933. ©FLC-ADAGP. <https://lmdvlugtdml.wordpress.com/home/lmd-words/miscellaneous-writings-and-publications/le-corbusiers-cite-de-refuge-historical-technological-performance-of-the-air-exacte/>

to his resourcefulness and ability to market his image, his worldwide fame and his experimentation with a new architecture continued to increase over the time.

3. Paris. *La Cité de Refuge*. A lesson to learn

In December 1933, *La Cité de Refuge*, the reception center for homeless accommodation, meal distribution and social regeneration, designed by Le Corbusier and Pierre Jeanneret was inaugurated. In the intention of Le Corbusier, it was not simply social housing, but a healing machine. *La Cité de Refuge* would have to prove the superiority of modernity over academicism and the effectiveness of new architecture and reforming urban planning for the solutions of society's ills, as he will explain later with the publication, of the volume *La Ville radieuse* in 1935.

The building resembled to an ocean liner aground in a degraded area of Paris with the main entrance in the Rue Cantagrel, and secondary entrance in the Rue Chevaleret. The front façade oriented to the south was in bare reinforced concrete with glazed curtain wall completely exposed to the sun (Fig. 3).

Due to financial constraints, the curtain wall was constructed with a single layer of glass, *pan de verre*. The cutting-edge solution of *mur neutralisant* was abandoned and the *respiration exact* was relegated to a simple air heating system. When summer came, the intense cold of the city of Paris was gone and the surface of over a thousand square meters of this facade transformed the interior into an unbearable place due to the overheating caused by the direct sunny radiation and the high thermal transmittance of the single-layer glass. Despite the ambition that drove this experimental work, there were several faults (Ragot, 2015). The ventilation and heating system was also inefficiency and noisy.

On 25 August 1944, the day of Paris' liberation, a German bomb blasted almost all the glass of the façade. From 1948 to 1953, Le Corbusier and Pierre Jeanneret oversaw the first retrofitting that altered the building's image. Le Corbusier abandoned his brutalist aesthetic and accepted to reverse the building's original purist image, using also the Armée du Salut flag colors: dark red, dark blue and yellow ochre (Fig. 4).

The façade was protected by a *brise-soleil* drawn up by the engineer Bodiansky and the designer Xenakis (Fig. 5)



Figure 4 | Front façade oriented to the south after retrofitting. *Cité de Refuge*, Paris. © Olivier Martin-Gambier 2005© FLC/ADAGP.

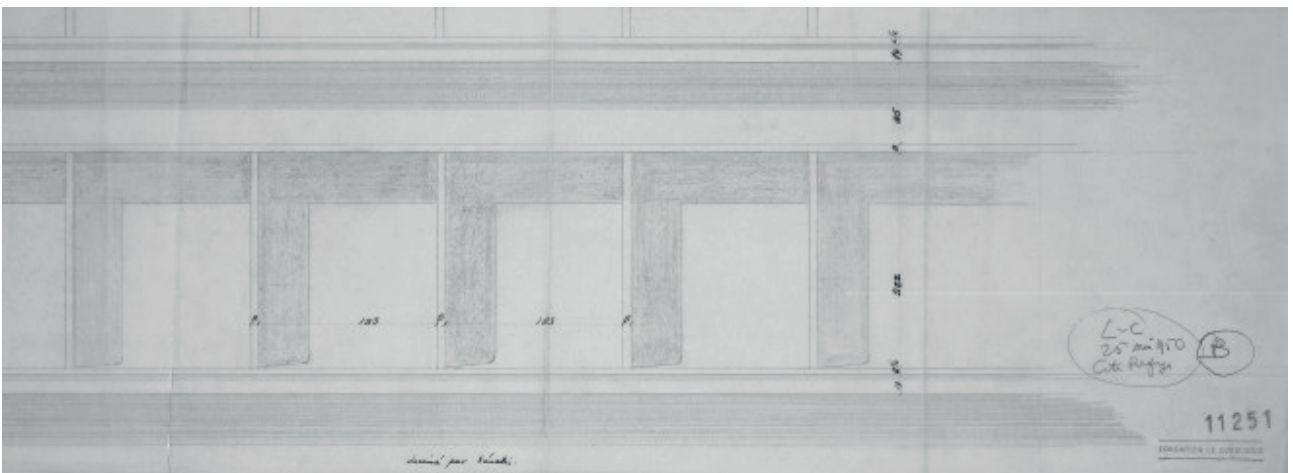


Figure 5 | Drawing of *brise-soleil* by Xenakis, from Brooks, *Le Corbusier Archive*. 32 vols. ©FLC-ADAGP. H. Allen (1982). Garland Publishing, New York – Fondation Le Corbusier, Paris.

and the bottom third at each level was made opaque. The *brise-soleil* is nothing more than an external shading device that limits the range of incident solar angles that can penetrate a building, usually allowing winter daytime solar penetration whilst limiting high summer sun penetration. It can be considered part of a passive solar design methodology.

Hence, from a resounding mistake came the idea of the double-skin facade, with a windowed facade and an outer skin in which the predominant element is the *brise-soleil* with different and varied shapes, arrangements, and orientations.

After the failure of *La Cité de Refuge*, Le Corbusier focused his attention on the study of natural lighting and shading and used the *brise-soleil* extensively in his works.

He also realizes the benefits of lightening and shading, choosing east-facing that receive sun in the mornings for the bedrooms and west-facing with sunny afternoons for the living rooms in the *Unité d'Habitation* at Marseille (1947-52).

Le Corbusier encoded the heliotherapeutic principles in the Athens Charter, the larger agenda of modern architecture and planning of which he was one of the main authors. The document was written following the 4th International Congress of Modern Architecture held in 1933 on the *Patris II* steamer of shipowning company Neptos, travelling from Marseille to Athens.

Science, in its studies of solar radiation, has disclosed those that are indispensable to human health and those that, in certain cases, could be harmful to it. The sun is the master of life. Medicine has shown that tuberculosis establishes itself wherever the sun fails to penetrate; it demands that the individual be returned, as much as possible, to "conditions of nature". The sun must penetrate every dwelling several hours a day even during the season when sunlight is most scarce. Society will no longer tolerate a situation where entire families are cut off from the sun and thus doomed to declining health. Any housing design in which even a single dwelling is exclusively oriented to the north or is deprived of the sun because it is cast in shadow, will be harshly condemned. Builders must be required to submit a diagram showing that the sun will penetrate each dwelling for a minimum of two hours on the day of the winter solstice, failing which, the building permit will be denied. To introduce the sun is the new and most imperative duty of the architect. (Le Corbusier, *Athens Charter*, Article 26, 1933).

Le Corbusier therefore stated "a right to the sun" for all and as a design rule prohibits the exclusively orientation of dwellings to the north. He also defines the requirement of a minimum of two hours of sunlight penetration into houses, even during the winter season.

4. Rio de Janeiro. The building of Ministry of Education and Health (M.E.S.)

In 1929 Le Corbusier made his first trip to Rio de Janeiro in Brazil. There he had the opportunity to see the use of the construction technology of wall called *cobogó*. The building system patented in the city of Recife by

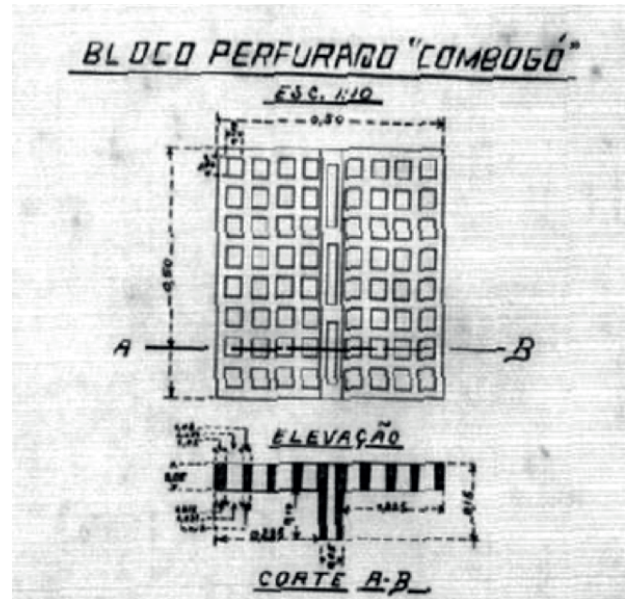


Figure 6 | Drawing of the perforated block *cobogó* and its application. Copy of patent documents, 1929. Drawing author unknown.



Figure 7 | Balcony railing in *cobogó* Bristol building, Parque Guinle complex, Rio de Janeiro, Lucio Costa, 1950. © Mara Eskinazi, 2020, with authorization.

engineers Amadeu Oliveira Coimbra (CO), Ernest Agosto Boeckmann (BO) and Antonio de Gois (GO) just that year (Fig. 6). The *cobogó* refers to the Arab *muxarabis*,² a kind of dense and generally light wooden structure that served to provide privacy for houses' interior by allowing ventilation and indirect lighting inside the dwellings. It consisted of bricks with large cavities that were



Figures 8 and 9 | (Left) Front façade. Building of Ministry of Education and Health, M.E.S., Rio de Janeiro, Brazil, 1937-1943. Unknown author. (Right) Detail of double-skin façade with movable sunshade louvers in blue fibrocement. Building of Ministry of Education and Health, M.E.S., Rio de Janeiro, Brazil, 1937-1943 © Francisco J. Martinez.

assembled in place either dry or with bedding mortar in the construction of perforated walls that allowed protection from sunlight and ventilation (Campusano, 2014). The construction system of the delicately crafted and light perforated wall was widely used in Brazil and in other countries (Fig.7).

In the following years, Brazilian modernist architecture underwent an extraordinary and unique development characterized by a special attention on climate and environmental conditions as well as on social needs and cultural traditions (Costa, 1952). Among the masterpieces of modernist architecture, the building of Ministry of Education and Health (Ministério da Educação e Saúde) M.E.S., in Rio de Janeiro, deserves a special mention. It was designed by Lucio Costa and a team that also included Oscar Niemeyer and Le Corbusier as consultant. The M.E.S. is an icon building of modern Brazilian architecture that brings together in one block all the concepts of modern architecture, including the prominence of art in architecture through colorful ceramic mosaics of Portuguese origins, paintings, and sculptures, in a set of superb and revolutionary workmanship (Almodovar Melero, 2017). Moreover, the use of *brise-mobiles* appears for the first time in its façade. Thin movable sunshade louvers in blue fibrocement are arranged in a thick reinforced concrete frame of the double-skin façade (Figs. 8 and 9). The mechanism devised consisted of a rod connected to a small wheel that allowed the thin slats to move horizontally or at a -45° or $+45^\circ$ to the horizontal axis clockwise and counterclockwise (Fig.10).

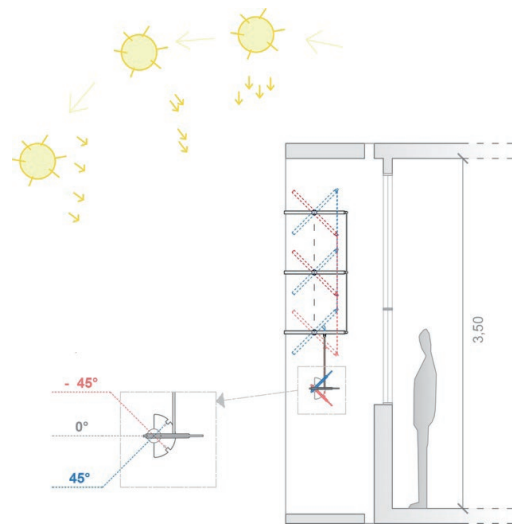


Figure 10 | Drawing of the mobile *brise-soleil* system. Building of Ministry of Education and Health, M.E.S., Rio de Janeiro, Brazil, 1937-1943 © Bernardo, Palmero, and Angileri, 2023.

5. Algiers. The office tower of the La Marine business district

From 1930 to 1942 Le Corbusier designed the Algiers plan, which he called Obus Plan. In French *obus* means bullet splinter. The name of the plan expresses his revolutionary and disruptive proposal for Algiers. He wanted to breathe new life into a poor and underdeveloped city, long colonized by the French, by means the unarmed revolution of modern architecture. New ways of building and living might turn the North African city into a modern capital of the Mediterranean area, on par of European cities, such as with Marseille or Barcelona. The Plan Obus envisaged three main elements: the construction of the new commercial district of La Marine at the end of the Casbah along the coast of the Cape of Algiers, a residential area in the hilly part of the city accessible by a bridge spanning the Casbah, and finally, an elevated urban highway containing fourteen residential levels below it with houses for the working class that would accommodate up to 180,000 people (Requena Ruiz, 2011). The plan was never realized. However, it was the occasion for a long experimentation of Le Corbusier that shifted him away from the angular brutalism of his machine-age ideology toward the more plastic and poetic forms of his later work inspired by nature and vernacular architecture (Rodríguez-Lora *et al.*, 2022).

The office tower of the La Marine coastal business district, included in the Obus Plan (Fig. 11), is an outstanding example of the countless possibilities



Figure 11 | Skyscraper in the business district of La Marine. Opus Plan of Algiers. Le Corbusier, 1938. © FLC/ADAGP.

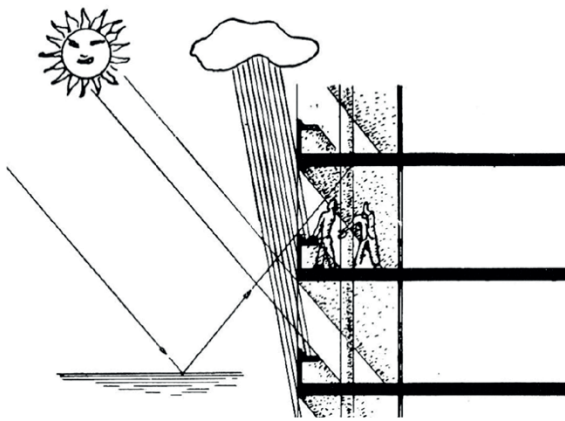


Figure 12 | Two-dimensional lighting/shading diagram. Le Corbusier, 1938. Le Corbusier (1995). *Œuvre complète* Volume 5: 1946-1952, Willy Boesiger, Birkhauser

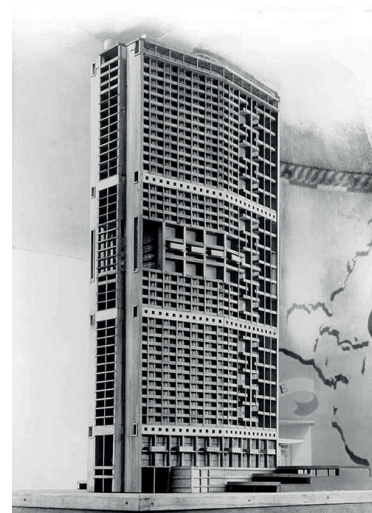


Figure 13 | Wooden model of the skyscraper in the La Marine business district. Author unknown. <http://pinimg.com>.

offered by reinforced concrete technology in the design of multi-functional commercial buildings (Requena Ruiz, 2012). In this case, Le Corbusier for the first time carried out a careful study of solar lighting conditions and designed the facades with repetitive modules equipped with movable brise-soleil and balcony loggias (Figs. 12 and 13) (Le Corbusier, 1946; Le Corbusier, 1952).

Repetitive modules vary in some cases with double heights that coincide with areas of representative building, maintaining the depth of the brise-soleil. This composition and arrangement of curtain walls equipped with movable brise-soleil allows sun protection and

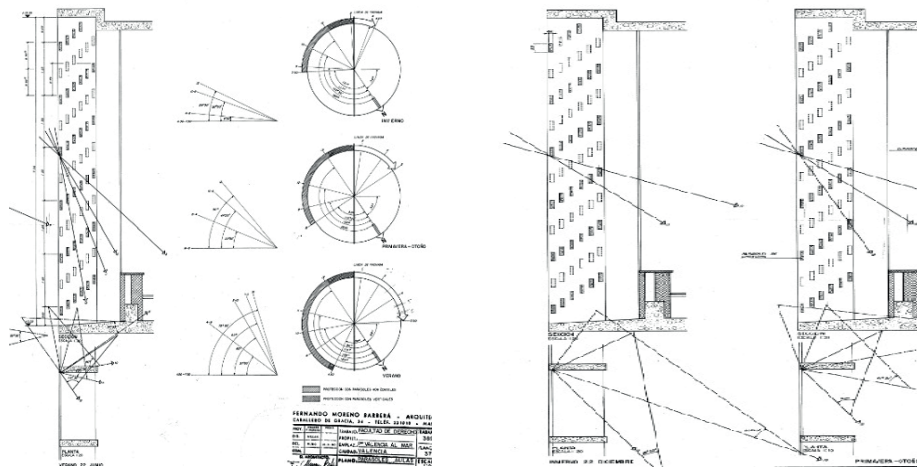


Figure 14 | Drawings on details of the analysis for the solar orientation. From Archive of the College of Architects of Valencia. Source: ICARO-CTAV.

natural lighting, indoor comfort conditions as well as the enjoyment of the seascape.

6 Valencia. The former Law School building

Fernando Moreno Barberá (Ceuta, 1913-Madrid 1998) was a Spanish modernist architect who distinguished himself with his own style in which functionalism and the correct use of materials and construction techniques are enriched by a series of nuances that make the building one with its surroundings. He learned about the new trends in Modern Movement architecture during his travels throughout Europe, especially in Germany. In the 1950s, the small openings of the Franco government, aware of European progress, allowed for an improvement in industrial production, as well as the use of materials such as reinforced concrete. These innovations will allow the Spanish architects of the period to make technological design proposals with a tendency towards abstraction and formal lightness as priority objectives of their design.

Moreno Barberà carried out several educational building projects for the Spanish Ministry of Education that can be considered iconic constructions of modern architecture (Palmero Iglesias, 2016). Despite the exceptional value of his numerous works. Moreno Barberà was certainly forgotten until the end of the last century, when, thanks to a series of publications and doctoral theses, as well as to professors very interested in his architecture and his figure, the importance of his work a work has been rediscovered in the panorama of the history of architecture of the second half of the last century.

In the design of the former Law School building of the University of Valencia, Moreno Barberà reinterpreted, without resorting to imitation, the style of Le Corbusier and

Mies van der Rohe with the use of bare reinforced concrete, steel structure, glazed walls and double skin façade with *brise-soleil*.

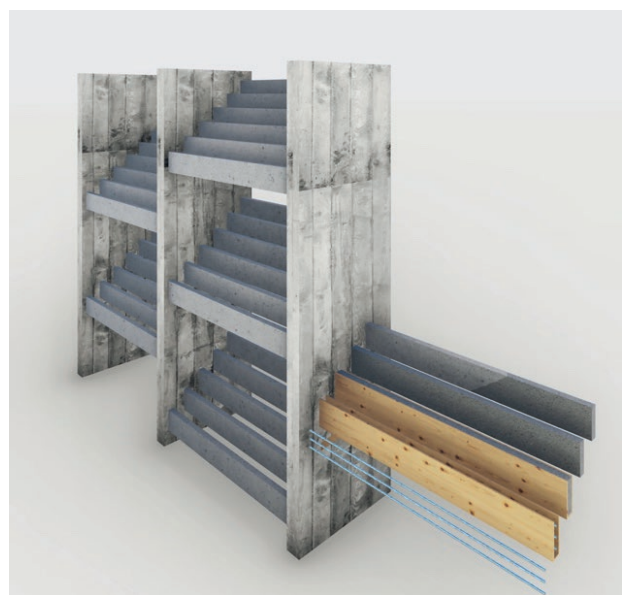
He conducted a careful study in the designing of the double skin of the south-east façade of the building. He designed a double skin with stepped horizontal *brise-soleil* in reinforced concrete for natural room lighting and protection from excessive radiation due to the city's very hot climate (Figs. 14, 15, 16 and 17).

The consultation of the archives of the professional associations in Valencia did not reveal executive details of the double skin in reinforced concrete frame and horizontal stepped *brise-soleil*. Probably, as was the practice at the time, the complexity of the works was faced and resolved on site in the executive phase rather than in the design phase, with verbal orders given by the designer to a highly experienced and prepared workforce, also capable of suggesting valid executive solutions. The vertical element of the reinforced concrete structure, with a 1.70 m spacing, were made with a wooden formwork, which left the imprint of the material as a final texture engraved and visible in the concrete once it was dismantled.

The stepped horizontal *brise-soleil* were cast in place with wooden shuttering and, after stripping, were coated with a finishing layer that made the surfaces smooth and highly reflective (Fig. 18). The reinforcing bars of the horizontal *brise-soleil* were anchored to load-bearing vertical elements through specially designed hollowed-out parts with mortar. The different appearance of the concrete surfaces (smooth for the horizontal elements, rough for the vertical ones), a fact that goes unnoticed by the public, shows the attention to technological detail in the construction of the double skin of the façade in its dual functional and formal meaning as the exterior surface of the building.



Figures 15 and 16 | (Left) East façade in reinforced concrete with the stepped pattern of the horizontal *brise-soleil*. The former Law School building. University of Valencia, Moreno Barberà, 1959. (Right) Detail of filtered light into the interior by the outer breathable and perforated skin that overlaps the inner glazed façade. The former Law School building. University of Valencia, Moreno Barberà, 1959. © Photo: Bernardo, Palmero, 2022.



Figures 17 and 18 | (Left) View from the interior of the double-skin façade. The former Law School building. University of Valencia, Moreno Barberà, 1959. © Photo: Bernardo, Palmero, 2022. (Right) Virtual simulation of the constructive hypothesis of the stepped horizontal *brise soleil*. The former Law School of Valencia, Moreno Barberà, 1959. © Virtual simulation by Bernardo, Palmero, and Angileri, 2023.

7. Conclusions

The architecture of the modern movement has the great merit of having introduced innovative technological solutions for solar shading and natural lighting, the so-called *brise-soleil*, as well as for ventilation and non-mechanized building solutions. These systems are now called passive energy systems as opposed to active ones that are energy-consuming systems to achieve comfort conditions inside the building.

After overheating problems in the front glazed façade facing south of the Cité de Refuge in 1933, Le Corbusier abandoned the use of energy-intensive and expensive solutions for the maintenance of internal comfort and gave up its original ideas of a functional technicality. He also had the ability to draw an opportunity from their continuous experimentations and to seek new housing solutions for an ideal city that will serve for a new reformulation, compositional and formal design (Le Corbusier, 1946; Le Corbusier, 1952). He thus initiated a new worldwide path of great formal and scenic expressiveness of buildings.

Solar energy is unlimited. We just must learn how to use it for sustainable architectural design. In 1955, Le Corbusier in the volume *Le Poème de l'Angle Droit* recognized the value of the *brise-soleil* as an unavoidable passive system. He painted a tall, narrow building overlaid with the tall parabolic path of summer sun and the lower one of winter sun (Fig. 19). In the same volume, he wrote poems and maxims summarizing his lucid and visionary convictions.

The solar clock and calendar brought to the architecture the “*brise-soleil*” installed in front of the windows of modern buildings.

.....

The two rhythms which regulate our destiny.

A sun rises

A sun sets

A sun rises again

Notes

- ¹ Hermann Muthesius (Großneuhausen, April 20, 1861 - Berlin, October 26, 1927) was a German architect. He founded the Deutscher Werkbund in 1907, whose program was centered on the desire to create a center for gathering the best forces of art, industry, handicrafts and commerce, especially with the aim of linking art with industry to make it an economic resource that could make Germany compete with the United States and England. Muthesius would always be an advocate of the standardization of the industrial product, opposing instead the ideas of Henry van de Velde who advocated the creative freedom of the artist even in industry.
- ² The *muxarabis* was a wooden element with small openings that was put at windows or other openings, mainly so that people could see through it without being seen. It also allowed air and light to enter. In Spanish, the term *celosía* recalls the origin of the Latin *zelus*. RAE Real Academia Española. author's own wording.

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