BUILDING WALLS OF LIGHT: THE DEVELOPMENT OF GLASS BLOCK AND ITS INFLUENCE ON AMERICAN ARCHITECTURE IN THE 1930s

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Arthur Brammer, Direct Oil Service Station, Minneapolis, MN, 1937 (photo from Hulton Archive/Getty Images)

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Abstract

Glass block, a widely used building material in American architecture during the 1930s, is made from two molded pieces of glass that have been annealed together and contain a hollow center. Glass block became a fixture in Streamline Moderne buildings, often comprising entire walls or dramatic curved corners, and also was used for planar, infill material in Modern buildings. The Owens-Illinois Glass Company was the first to begin mass production of glass block in the U.S. in 1932, and its competitor, Pittsburgh Corning Corporation, began large-scale production of glass blocks in 1938. The material was featured at the 1933-1934 Chicago Century of Progress International Exhibition, and later at the 1939 New York World's Fair. Glass block was a well-marketed product which boasted numerous qualities, including light transmissivity, multitude of patterns and styles, insulation properties, strength, and adaptability, to name a few. The thesis will discuss a history of glass block, how the material was used in buildings, and examine the influence of the material on architectural designs of the 1930s and later.

The purpose of this work is to expand upon an under-researched building material, and how its history fits into, and impacted, the larger history of American architecture. A chronological timeline of glass block development and some of the most influential buildings and events related to the material will provide the framework for the thesis. In addition to this chronological framework, a discussion of important themes, ideas, and trends in glass block will supplement the history. Some important themes include: glass block's ability to build walls of light; glass block as a symbol of progress and modernity; the two aesthetic paths of the glass block use in the 1930s; the illumination of glass block and its use as advertisement; and the material's rise and fall in popularity.

Acknowledgements

First and foremost, I would like to thank my advisor, Françoise Bollack, for her wonderful guidance and support throughout the research and writing of this thesis. I would also like to thank my readers, Mary Jablonski and Dietrich Neumann, for their valuable feedback and insight. In addition, sincere thanks to the librarians of the Rakow Library at the Corning Museum of Glass and the Ward M. Canaday Center for Special Collections at the University of Toledo – your expertise and assistance during my research was of great help. Also, thank you to the professionals in the field whom I contacted and generously offered their knowledge and advice: Thomas Jester, Theodore Prudon, and Jewel Stern. Finally, to my parents Doug and Joanne, to Luke and Simba, my friends, and my classmates – thank you for always lending an ear and providing words of encouragement, your support is invaluable.

Introduction

Glass block, a widely used building material in American architecture during the 1930s, is made from two molded pieces of glass that have been annealed together and contain a hollow center. Glass block became a fixture in Streamline Moderne style buildings, often comprising entire walls or dramatic curved corners. Production of glass block began in the country around 1932, and the material was featured at the 1933-1934 Chicago Century of Progress International Exhibition, and later at the 1939 New York World's Fair. Glass block was a well-marketed product which boasted numerous qualities, including light transmissivity, a multitude of patterns and styles, insulative properties, strength, and adaptability, to name a few.

The thesis will discuss the development of glass block, and how architects used the material in both Streamline Moderne and Modernist designs. The purpose of this work is to expand upon an under-researched building material, and how its history fits into, and impacted, the larger history of American architecture. Glass block rose in popularity in a short period of time, and the height of its use was from around 1937 to the early 1940s. In this short period, glass block was used for almost every building type.

The aesthetic use of the material took two different paths: the first path was the use of glass block for volumetric forms, walls, and curved shapes as part of the Streamline Moderne style. This aesthetic use was wholly innovative and reinterpreted the meaning of the wall, as it transformed it from a static plane into a wall with visual interest and illumination. The second aesthetic path was the use of glass block in planar surfaces, mostly as infill for buildings in the International and Modern Styles. Although this use of the material was certainly important, glass block used in this way was not crucial to the design, and could be replaced with plate glass without any major change in the building's overall aesthetic.

The "age" of glass block began to decline in the 1940s due to the popularity of Modernist styles. Although it was still used in large applications (many schools utilized glass block), it was mostly used for infill in middle-class American homes as a way to modernize one's dwelling. Although glass block sales increased steadily during the 1940s and 1950s, and new glass patterns and styles were introduced, the innovative use of this material was largely gone.

One of glass block's most significant contributions to architecture in the 1930s and early 1940s was its unique nighttime illumination potential. At night, glass blocks became masonry units of light. Walls were transformed with a tangible glow, and many commercial buildings used glass blocks as a way to attract customers and show themselves off as truly "modern" businesses. A number of Streamline Moderne style buildings used traditional, Classical forms in their designs - especially the use of a central, vertical tower anchoring long, horizontal wings. Yet, with the use of glass block, these forms which had typically used masonry materials were completely changed by the use of a new "translucent masonry". Forms that once had opacity and mass were now given translucency and light.

This thesis will examine the development of this innovative building material and its influence on architecture, focusing on the height of the use of glass block in the 1930s. Beginning with early precedent materials, such as vault lights and prism tiles, the chronological development of glass block will be studied. Alongside this chronological history, influential architectural projects will exemplify the many uses of this material. With an emphasis on glass block's ability to "build walls of light", the rise and fall of the material will be examined, culminating in a discussion of recent works using glass block.

Chapter 1: Historical Overview of Glass, Glass Block Precedents, and Early European Hollow Glass Blocks

A Very Short History of Glass:

Glass is a material that dates to ancient times. First appearing as glass beads in Egyptian tombs from the fourth millennium B.C., glass has been used in practically every culture for thousands of years. Often used for decorative arts and tools, glass also has an important place in the history of building and architecture. The Romans are believed to have first used glass for building purposes, and understood the applicability of glass for glazing windows. Remnants of glass pieces in windows frames dating to the early Imperial Period have been discovered in Pompeii and the Roman villas in England. It is believed that the Romans used glass for their baths and conservatories to help keep heat inside. Over time, with the expansion of the Roman Empire and trading with other groups, glassmaking expanded to Spain, Portugal, and along the Rhine. By the second century A.D., Cologne was a prominent glass-making center. Yet, the fall of the Roman Empire in the fifth century lead to a large decrease in glassmaking, since the Romans were the principal manufacturers in this industry. Later, during the Renaissance, glass was commonly used for windows and was an accessible material. It was during this time that glass truly flourished as an art form, most notably seen in the beautiful and detailed stained glass windows of medieval cathedrals across Europe.[1]

The first glassmaking in America began around 1607 in Jamestown, Virginia. Cited as one of the oldest American industries, glass was among the first products shipped to England from the New World. By 1620, Jamestown had two glass furnaces, but both were destroyed by 1622.[2] Around 1639, colonists in Salem, Massachusetts began producing glass on a larger scale, making bottles and other items. The glassmaking industry began to spread along the East Coast, and the first successful

[1] Harold Donaldson Eberlein, *Glass in Modern Construction* (New York: C. Scribner, 1937), 13.

[2] Macbeth-Evans Glass Company, *Fifty Years of Glass Making, 1869-1919* (Pittsburgh: Macbeth-Evans Glass Company, 1920), 19.

glass company was founded in New Jersey in 1739 by Caspar Wistar.[3] From the Revolutionary War onward, numerous glass companies would come and go, but the center of the glass industry would remain on the East Coast.

The primary method of glassmaking involves melting a mixture of around 72% silica, 15% sodium carbonate, and 10% lime. The mixture melts at around 1700 degrees Celsius.[4] Commonly referred to as soda-lime glass, this formula is still the most common mixture of ingredients for window and container glass. Until around 1825, glass was made by glassblowing, a process in which a worker would blow molten glass into a bubble using a blowpipe, and the glass could be worked into its desired shape. The molten glass could also be blown into molds, expediting the process of hand-working the glass; this was often used for utilitarian glass goods, instead of artistic ones where hand formed glass was desirable. To make plate glass, the glassmaker could use two methods: form the glass into a large cylinder, break the cylinder in half, and roll the glass out as a flat sheet before cooling; or, the molten glass can be poured into a large flat mold and spread evenly before cooling. Around the turn of the twentieth century, improvements were made in plate glass production, which in turn impacted architectural design and storefronts in particular, where large pieces of glass could now be used to better sell goods. In 1901, Belgian glassmaker Emile Fourcault invented a machine that could draw a sheet of glass five stories straight up from a vat of molten glass. This process was extremely influential, but the manufacturing process distorted and marred the surface of the glass.[5] By 1937, British glassmaker Pilkington Brothers partnered with Ford Motor Company to develop a fully mechanized process for making plate glass. In this process, molten glass was pressed between two rollers to form a thin sheet. After the glass cooled, the surface of the glass would undergo a

[3] "Glass in America," Corning Museum of Glass, accessed 5 April 2014, http://www.cmog.org/collection/galleries/glass-in-america.
[4] "How Glass Is Made," Toledo Museum of Art, accessed 5 April 2014, http://www.toledomuseum.org/kiosk/glass-study-interactive/exploring-glass/how-is-glass-made.
[5] "The Window Machines: Sheet and Plate Glass," Corning Museum of Glass, accessed 5 April 2014, http://www.cmog.org/article/window-machines-sheet-plate-glass.

grinding and polishing process on both sides simultaneously. This process would create a smooth, unmarked surface that was also free of distortion. The development of new methods for producing and refining plate glass process would continue for years, but by the late 1930s the material was easily manufactured and more accessible to consumers than ever before.

Precedents of Hollow Glass Block:

The creation of the hollow glass block grew out of two important precedents: vault lights and prismatic glass tiles. Both vault lights and prismatic glass tiles were developed in the late nineteenth century, at a time when cities were becoming crowded and dirty, due in part to the growth of manufacturing during the Industrial Revolution and the increased number of factories. In response to the squalor and disease that many cities faced, a Sanitary Movement came about, seeking to provide more light, air, and overall cleanliness. Vault lights and prismatic tiles, both constructed of solid glass, were used as an easy and efficient way to provide light to the interiors of buildings, and served as a response to society's need for daylight.

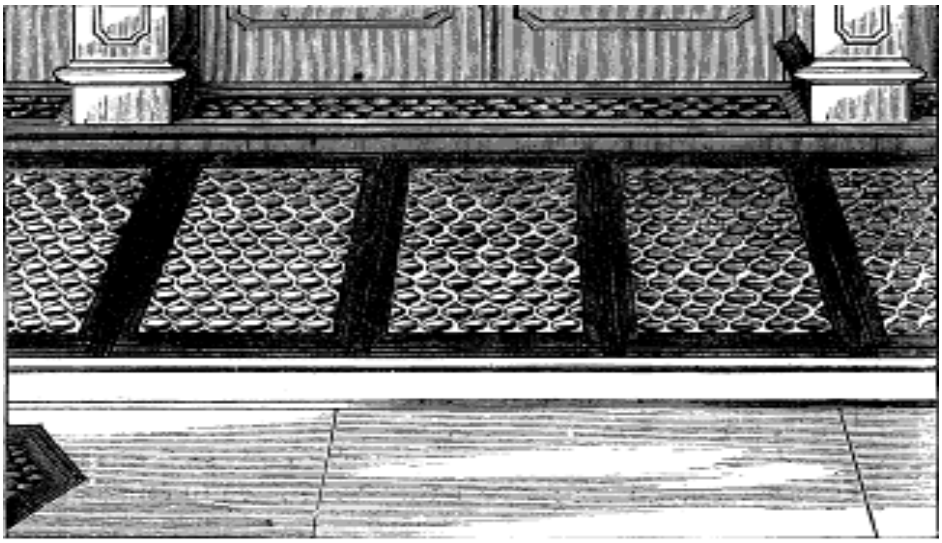

Fig. 1.—Perspective View of Front of Building, with Light.

Figure 1 - Vault lights set into a sidewalk (from *The Manufacturer and Builder*, Vol. 7, Iss. 8, August 1875)

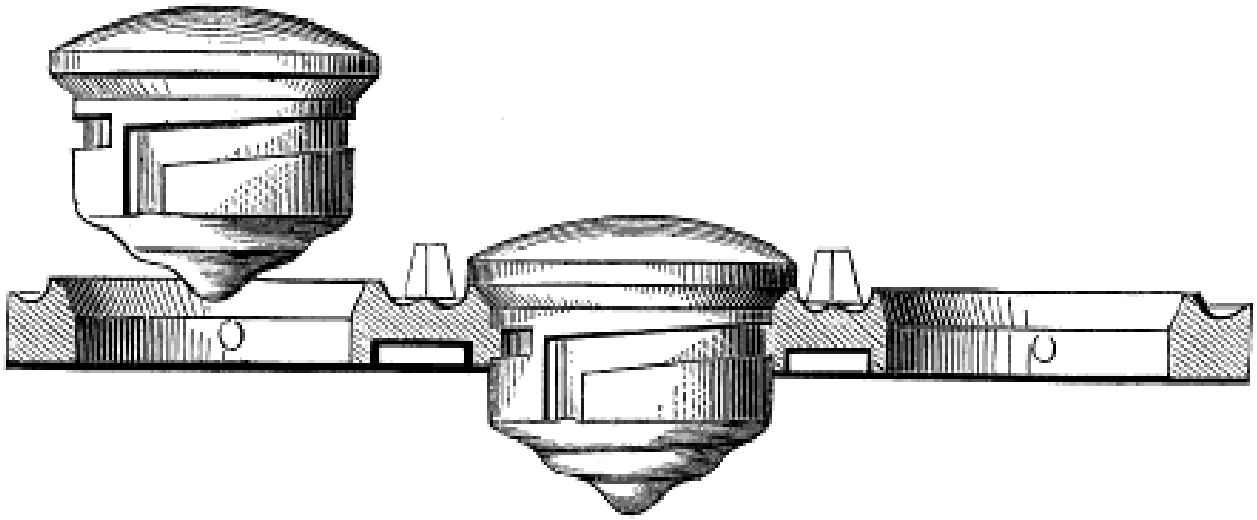

Fig. 2.—Sectional View of the Manner of Connecting the Glass.

Figure 2 - Section view of vault lights (from *The Manufacturer and Builder*, Vol. 7, Iss. 8, August 1875)

Vault lights, often used in sidewalk construction, were small, usually round pieces of solid glass set into a cast iron panel. These panels were set into sidewalks to allow light to reach the cellar. The vault lights were often seen in urban areas, such as New York City, and were popular for commercial and industrial buildings. By allowing light into the cellar, or "vaults", building owners could have more rentable and usable space.[6] The idea for vault lights grew out of the deck lights, which were common in ship construction in the eighteenth and nineteenth century. Deck lights were made from glass tiles set into the deck of a ship to allow light below. Deck lights, by utilizing natural daylight, decreased the need for candlelight as a light source, which in turn decreased the chance of fire on board, especially when the ships were carrying flammable materials such as gunpowder.[7] In 1845, Thaddeus Hyatt, a New Yorker, patented a system of round glass tiles set into a cast iron frame. Hyatt's patented system became increasingly popular in urban areas, and can still be seen in places like the SoHo neighborhood of Manhattan. By the late nineteenth century, improvements in concrete construction and the development of Portland cement allowed vault lights to be set into reinforced concrete, which was more durable than the cast iron system.

[6] Cas Stachelberg and Chad Randl, "Repair and Rehabilitation of Historic Sidewalk Vault Lights" in *Preservation Tech Notes* (Washington: National Park Service, 2003), 4.

[7] Ian Macky, "Deck Lights," Glassian, accessed 5 April 2014, http://www.glassian.org/Prism/Deck/index.html.

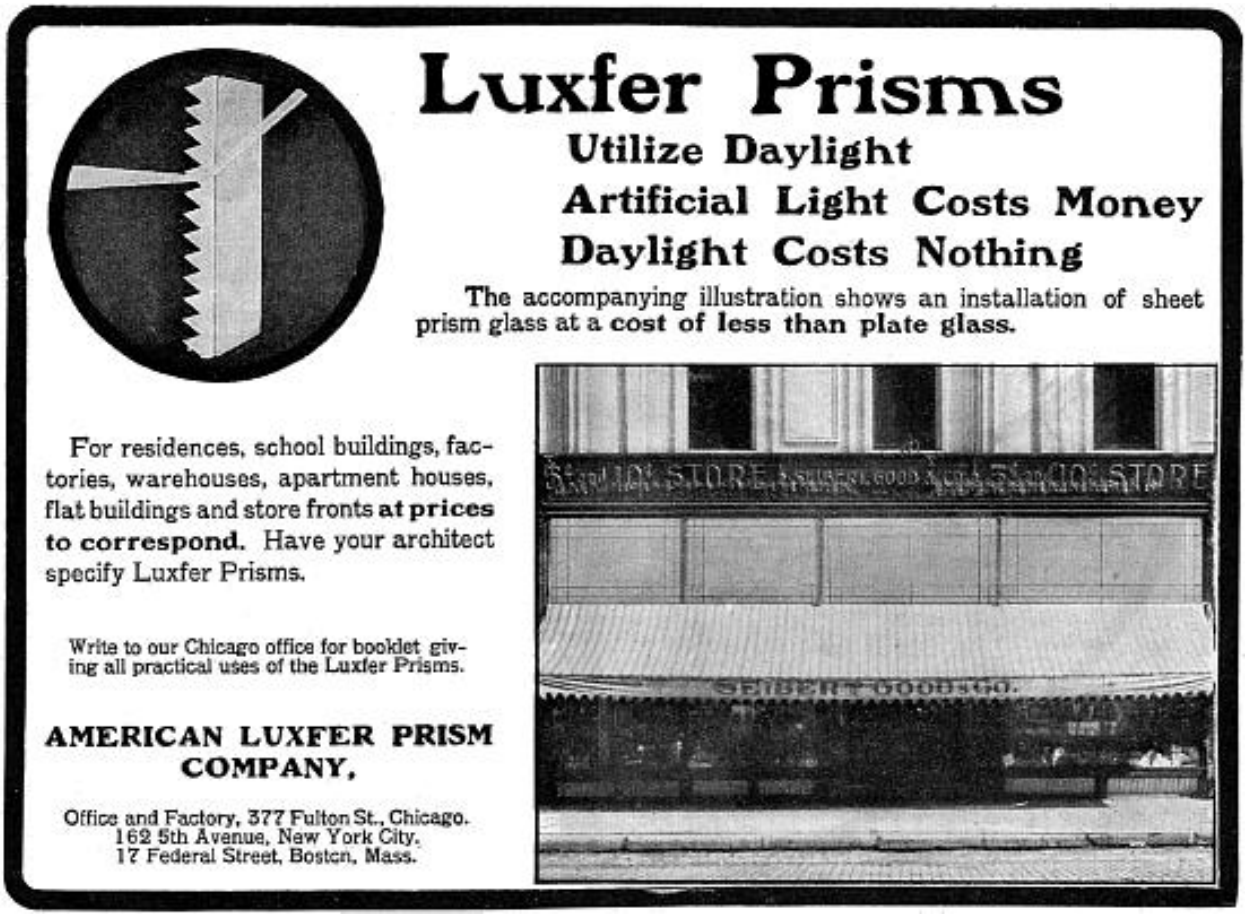

Figure 3 - American Luxfer Prism Company advertisement (from *Harper's Monthly*, July, 1901, photo from www.glassian.org)

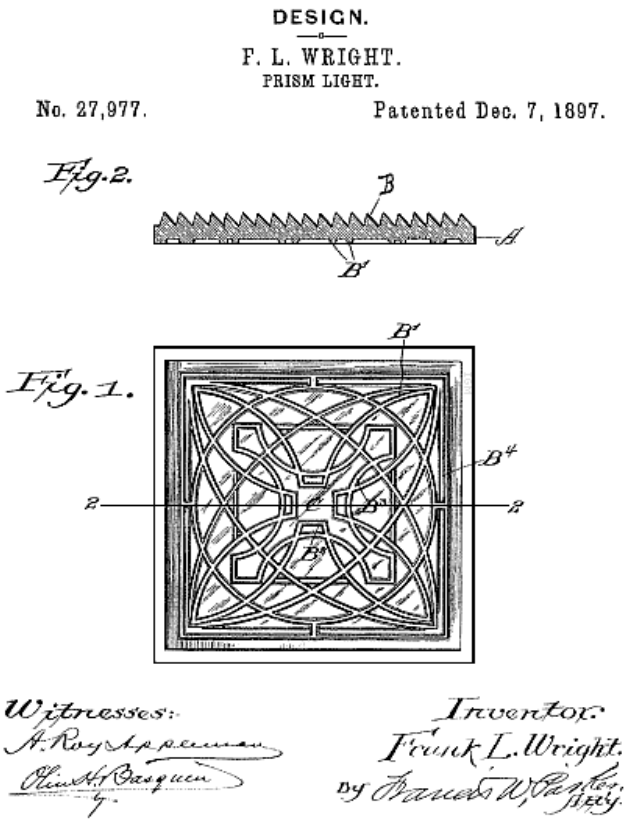

Figure 4 - "Flower" prism glass tile designed by Frank Lloyd Wright (U.S. Patent D27,977, patented December 7, 1897, image from United States Patent and Trademark Office)

Prismatic glass tiles were another popular method of daylighting in the late nineteenth and early twentieth centuries. This glass was usually manufactured as solid square tiles, and had prismatic ridges on its inside face to direct and diffuse light deep into a room.[8] Although similar products had been around for years, it was not until 1897 that true prism glass was introduced to the market by the Luxfer Prism Company. The Luxfer Prism Company started in Chicago, and soon achieved great success nationwide. As Dietrich Neumann states in his article "'The Century's Triumph in Lighting': The Luxfer Prism Companies and Their Contribution to Early Modern Architecture", the prisms

> appeared on the market at a moment when a widespread enthusiasm for the accomplishments of modem technologies was joined by a growing awareness for the values of a simple life in harmony with nature. Prismatic glass was praised as both a product of

[8] "Prism Glass and Its Uses," *American Jeweler* 31, no. 1 (1911): 18.

> scientific progress and a remedy for some of the negative effects of modem civilization, such as the disadvantages of artificial light or the darkening of streets due to skyscrapers and elevated railroads.[9]

Luxfer prism tiles were commonly used in urban storefronts, comprising long panels above doors and awnings. The manufacturers argued that the tiles, which were manufactured in different colors and patterns (including the "Flower" pattern designed by Frank Lloyd Wright), would provide architectural interest to a façade and were more aesthetically pleasing than plate glass, which some thought to be "garish". At a time when architecture was slowly moving away from ornamentation, prism tiles were a material that architects and building owners could use to gain daylight while still maintaining decorative interest. In addition, manufacturers argued that prism tiles would help the sale of goods in stores. Commercial buildings were the largest building type in which prism tiles were used, and manufacturers argued that "prismatic daylighting makes the selection of goods easier, the matching of colors exact, and the selection of goods faster…This is reflected to the owner in higher rentals and a constant call for his space."[10] This correlation between light, advertisement, and commerce will be an important theme in the later use of glass block during the 1930s.

[9] Dietrich Neumann, "'The Century's Triumph in Lighting': The Luxfer Prism Companies and Their Contribution to Early Modern Architecture," *Journal of the Society of Architectural Historians* 54, no. 1 (March 1995): 25.
[10] American 3 Way-Luxfer Prism Company, "Daylighting, Catalog 21" (American 3 Way Luxfer Prism Company: Chicago, c. 1920).

The Beginnings of Hollow Glass Block:

Figure 5 - Falconnier Glass Blocks, 1886 (photo from the Museum of Modern Art, Department of Architecture and Design)

The first hollow glass block was patented in France on November 11th, 1886 by Gustave Falconnier.[11] Known as "briques de verre", or "bricks of glass", these blocks were blown into a mold and had a hollow center with an open hole at the end where the glass was blown. Most blocks were sealed with a molten glass plug at the open end. These blocks came in various shapes, but usually were hexagonal or lozenge shaped. The blocks were made with silica that contained iron oxide, giving them a light blue-green color. The blocks, though, could also be manufactured in different colors, including amber, red, and dark green.[12] Falconnier's blocks were laid like bricks using staggered joints, and had recessed sides so that they could key into mortar more easily.

Falconnier's blocks were typically used for greenhouse construction and as infill material in buildings. The blocks never really caught on for larger applications, likely due to their poor strength

[11] Gustave Falconnier, "Glass Building Block," French Patent 179595, November 11, 1886.
[12] Sophie Godfraind and Robyn Pender, eds, *Practical Building Conservation: Glass and Glazing* (Ashgate Publishing: England, 2011), 439.

and problems with condensation forming on the inside face of the blocks. Architects who did use Falconnier blocks include Hector Guimard, who used different colors and shapes to light the stairwells of his Castel Beranger, built in 1898, and Auguste Perret, who used them at his Rue Franklin apartments, built in 1902. A later use of these blocks can also be found at Le Corbusier's Villa Schwob, completed in 1916.

Falconnier's glass blocks were introduced in the United States in 1893 at the World's Columbian Exposition. The blocks were used to build two greenhouses, which were located on the rear lawn of the Horticultural Building. Falconnier's blocks were described as

> essentially bottles without an opening, and blown in such shapes that they fit well into the designs of a builder. As a rule, the interior hollow is about large enough to hold a quart of liquid. The bricks are generally flattened, but the two broad sides are usually raised into a cone-like shape, in order to present various surfaces to the incident rays of the sun and to break the force of hale and shocks. The narrower sides are two to three inches wide and are trough-shaped to hold the cement or mortar with which the bricks are joined. The bricks are laid by a mason in much the same manner as ordinary bricks are laid, and the entire arch of the greenhouse roof supports itself without posts, rafters, or braces. The roof and sides, therefore, are a continuous sheet of glass. These bricks have been well tested in parts of Europe, and they are found to conserve heat one-half, to render the temperature of the houses uniform, and to prevent all scalding of the plants. Considering the fact that no framework is required, a house can be built of this material about as cheaply as in the common fashion...It is the desire of the inventor to manufacture bricks in this country. They are recommended for skylights, porch roofs, photographers' studios, propagating pits, and the like...The prices quoted in France last year were twenty-four francs per 100, and about fifty are required for a square metre.[13]

These blocks were held together with a mortar mix of three parts sand, one part Portland cement, and enough white lime as deemed necessary for easy workability. In addition, special ventilator units could be purchased that could be added into the construction, since they were manufactured to conform to the shape of the blocks.[14]

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[13] L.H. Bailey, *Annals of Horticulture in North America for the Years 1889-1893*, Vol. 5 (Orange Judd Co: New York, 1893), 97-99.
"Glass Brick for Buildings", *Popular Science News* 31(1897): 44.
"Article No. 4", *American Architect and Building News* 19 (1896): 2.
[14]"Glass Paving and Building Bricks", *United States Congressional Serial Set* 4839 (1905): 223.

It does not appear that Falconnier blocks were used in America after their debut at the Columbian Exposition, although it seems that their value was understood by architects and engineers. In a 1906 publication, entitled *The Lighting of School-Rooms*, author Henry Stuart Rowe suggested that the glass blocks could be successfully used and adapted to American design for schools, although he knew of no manufacturer in the country who was making them. Rowe stated the blocks could be used for the artificial distribution of light, and "are said to be very practical, [and] to be capable of artistic treatment".[15] Rowe quotes the price of imported Falconnier block to be around three or four dollars for a square metres worth, around 45 to 60 blocks

By 1904, the use of Falconnier-type blocks was becoming more popular for exterior walls and roofs, interior partitions, verandas, kiosks, bathrooms, hospitals, dairies, butcheries, factories, and other places where light, cleanliness, and stable temperature were desired. Although the Falconnier blocks were being used in more and more buildings, the Consul-General of Hamburg remarked that the blocks' use was still "very limited and of little importance".[16] The sentiment, though, seems to have been similar in other areas of Europe, including the Netherlands, Switzerland, and Russia, where in 1904 the Consul Generals of these nations remarked that use of hollow glass blocks had been insignificant, and thus it was hard to draw conclusions about the material's practical value.[17]

[15] Stuart Henry Rowe, *The Lighting of School-Rooms* (New York: Longmans, 1906), 56.
[16] Ibid, 223.
[17] Ibid, 222-226.

Figure 6 - Falconnier Pavilion (lower right) at the World's Columbian Exposition, 1893 (engraving by Rand, McNally & Co., published in *Art and Handicraft of the Woman's Building of the Columbian Exposition, Chicago, 1893,* edited by Maude Howe Elliott, 1894)

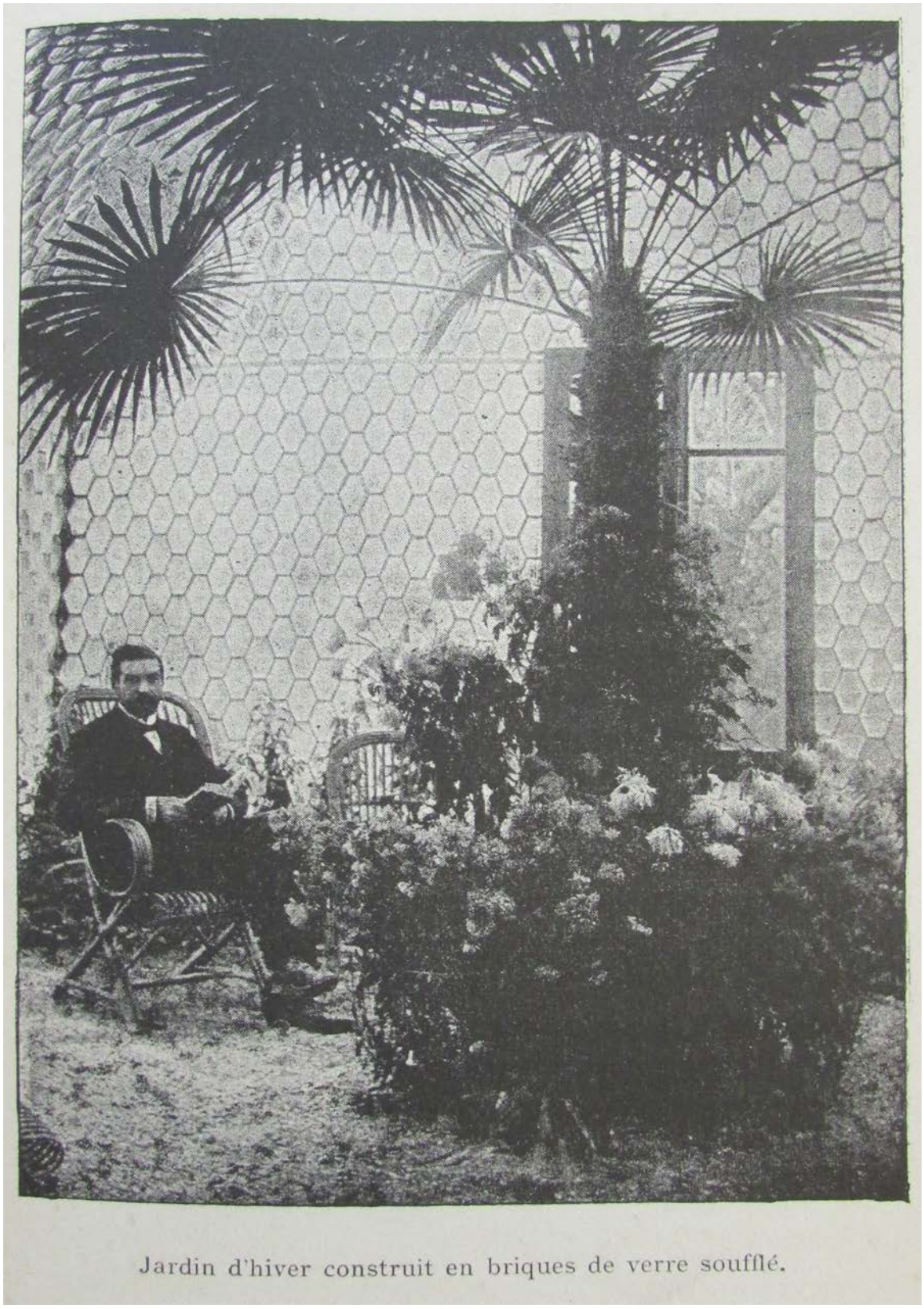

Figure 7 - "Conservatory built in blown glass bricks" (from *Les Artes et L'Industrie du Verre* by Henry D'Ancy, 1899)

After Falconnier's invention, German manufacturers soon took up their own production of similar blocks. In 1901, an exposition of fire-extinguishing and fire-preventing devices was held in Berlin, where glass blocks, manufactured by the Actiengesellschaft für Glasindustrie of Dresden, were used in the construction of a small villa in order to demonstrate their fire-proofing qualities.[18] In 1903, the Siemens Company of Dresden, Germany, made improvements to the manufacture of glass blocks, and introduced a design for rectangular glass blocks that were hollow and open on the bottom end. In addition, other manufacturers including the Deubener Glaswerke and the Deutsche Luxfer Prismen Gesellschaft were producing similar blocks.

By 1910, the hollow glass block industry in Europe had expanded: yet, while not a large, thriving industry, it was now producing three different types of hollow glass blocks. In 1910, *The Bricklayer, Mason and Plasterer* journal published a report written by Consul-General Robert P. Skinner after his recent trip to Hamburg. In his report, Skinner noted that in addition to the Falconnier-type block and the rectangular-shape block, a letter "U" shape block, open on one end, was also being manufactured in Europe.[19] At this time in Germany, the rectangular blocks had surpassed the Falconnier blocks in popularity. These blocks were thicker and were more fireproof, a main concern of the time, albeit a bit more expensive than the Falconnier blocks. Skinner goes on to remark that one of the most important reasons why the material had not taken off in Europe was its inability to support its own weight. He mentioned the possibility that the blocks could have a more successful run in America due to the ever-increasing amount of steel construction used there, since walls carry little load with a steel frame.

[18] Ibid, 221.
[19] "Glass and Porcelain Bricks", *The Bricklayer and Mason* 13 (1910): 211.

A Desire for Light:

The late nineteenth and early twentieth century developments of vault light, prism tiles, and glass blocks arose out of society's fascination with, and desire for, light. Both Europe and America were on the cusp of widespread electrification, but for most cities and towns, gas lighting, oil lamps, and candlelight were the only available forms of nighttime illumination. Even during the day, especially in urban environments, many buildings were dark and dreary. In addition, the popular Victorian style of architecture, with its dark building materials and interior decoration, did not usually lend itself to a bright, cheerful environment.

By end of the nineteenth century, a change in styles and sensibilities was occurring. The Beaux-Arts style, popularized by the World's Columbia Exposition in 1893, brought light-colored masonry materials to popular taste. The Exhibition was nicknamed "The White City" for its swath of white stucco buildings. The fair also emphasized illumination, and featured large number of streetlights, which lit up the fair at night and gave the buildings a sense of optimism and beauty. As a result of the fair, America saw the introduction of a new City Beautiful movement, which emphasized the use of Classical architecture and formal landscape design in urban areas to improve public welfare and the appearance of the country's often dark, gritty cities.

Although both daylight and nighttime illumination have always been prized and sought after, in the nineteenth century the artistic expression of light began to develop and change from years past. New developments in artificial lighting, glass technology, and daylighting methods gave architects, designers, and building owners more possibilities – light became a part of architectural design in news ways. Now, light could be manipulated by using glass to direct daylight in specific ways, or to provide texture or color. Nineteenth century Impressionist artists, such as Monet and his Rouen Cathedral series, understood the transient effects of light and how different types of light would produce different colors and effects on buildings and landscapes.

By the turn of the century, architects began to capitalize on the use of glass and its ability to transmit and shape light. Bruno Taut, the leading figure in the German Expressionist movement of architecture, understood these valuable properties. In 1914, Taut designed a Glass Pavilion at the Cologne Deutscher Werkbund Exhibition. The Glass Pavilion was an innovative structure – a temple to glass and its architectural possibilities. The Pavilion, though, was partly a promotional work, as it was commissioned by the Deutsche Luxfer Prismen Syndikat, makers of glass tiles and glass blocks. This connection to a glass manufacturer, though, does not detract from its architectural value and influence on glass design.

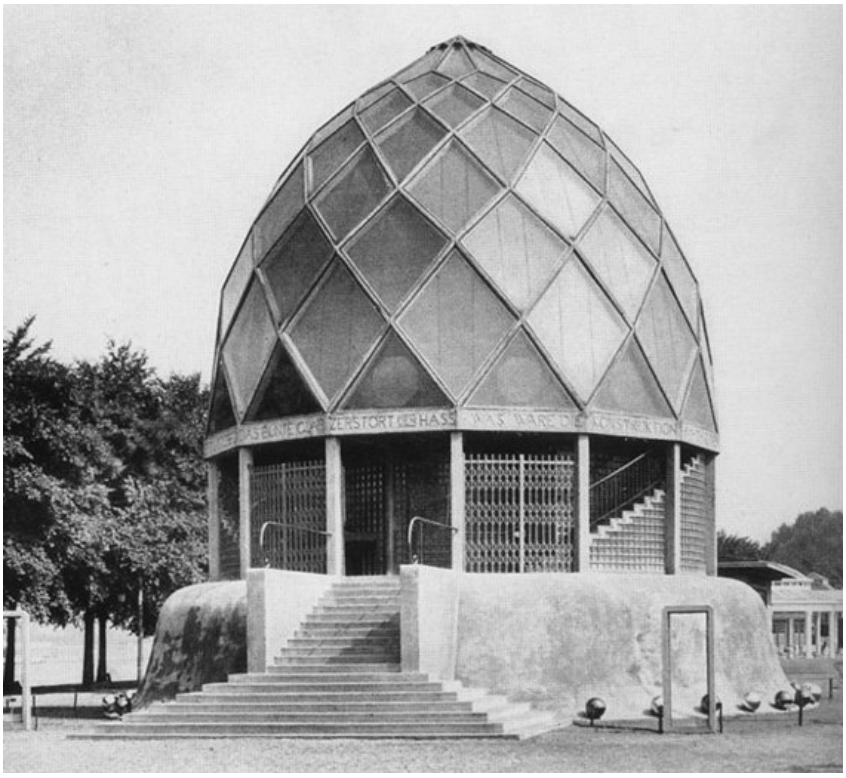

Figure 8 - The Glass Pavilion, 1914 (photo from Wikimedia Commons)

A multifaceted dome, the Glass Pavilion utilized multicolored glass to evoke the image of a crystal, giving off a spectrum of colors. The concept of the crystal was a central theme in Expressionist work. To the Expressionist architects and artists, the crystal symbolized a "utopian spiritual construction". The Expressionist movement was largely comprised of members of the

Arbeitsrat für Kunst, who had welcomed the overthrow of the Prussian Empire. In the post-World War I years there were few architectural commissions, but the Expressionists were optimistic about the architectural experimentation they believed would be possible under the new regime. Members of the new movement were uninhibited and innovative in their designs, and believed that they were designing for a wholly "new society". To the Expressionists, the crystal symbolized metamorphosis and transcendence.

Figure 9 - Interior staircase of the Glass Pavilion, 1914 (photo from Wikimedia Commons)

Glass, a viscous material that can be molded into any shape, seemed to closely align with the Expressionist vision, and therefore was likely chosen for Expressionist designs for this very reason. Glass is both transparent and shimmering, and can reflect the full spectrum of colors against its surface just as a crystal does. Crystals, which form out of molten rock that has been cooled, arise from a lowly material and form into something of beauty and richness. The same can be said of glass, which comes from a simple mixture, mostly comprised of sand, and can be transformed into brilliant architectural forms and materials.

The Panama Pacific Exhibition, held in 1915 in San Francisco, marked an important time in the relationship between American architecture, glass, and illumination. For the Exhibition, Walter D'Arcy Ryan, head lighting designer of General Electric, planned a comprehensive lighting scheme that would emphasize the architecture and also be a symbol of new thought and progress in American design and culture. Ryan, following ideas from prominent architectural professor C. Howard Walker, felt that the buildings at the Exhibition should not be lit with strips of outline lights, as was common in Europe at the time, but instead should be lit with floodlights. This would enable the buildings to be fully shown in the light, rather than just specific outlines or elements. One of the most visually stunning buildings to utilize the floodlights was Thomas Hastings' Tower of Jewels. The central building of the fair, the Tower of Jewels consisted of triumphal arch with a large tower on top of it. The building was covered in over 100,000 Novagems, which were small, faceted pieces of cut glass in various colors. The Tower of Jewels stands as an important structure in architectural history, especially the history of architectural lighting, because it was one of the first buildings in the country to incorporate glass into its design for the purpose of emitting light from within. This use of glass to create a building as a type of lantern that would glow from within will be an important theme in the later history of glass block.

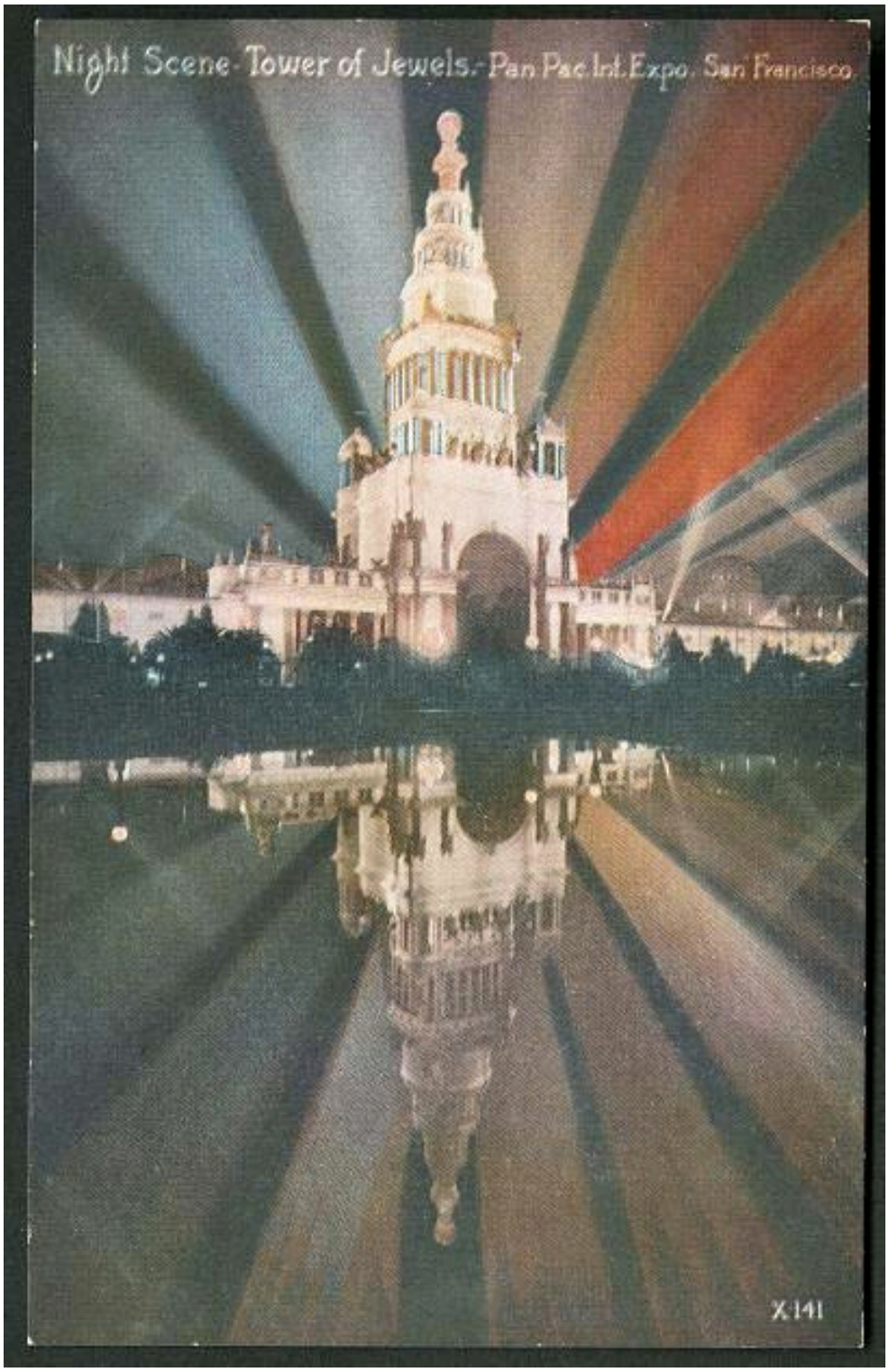

Figure 10 - Postcard of the Tower of Jewels at the Panama-Pacific International Exposition, 1915 (postcard by the Pacific Novelty Co., image from the Smithsonian Institution Archives)

Arguably one of the most influential glass buildings of the early twentieth century is the Maison de Verre, located at 31 Rue Saint-Guillaume in Paris. Built from 1928 to 1931, the Maison de Verre is an addition to an eighteenth-century building, located in a small courtyard. Architects Pierre Chareau and Bernard Bijvoet designed the house for Dr. Jean Dalsace, a gynecologist, and his wife, both of whom were progressive intellectuals who often held meetings with Marxists intellectuals and Surrealist artists. The building served as both a residence and an office for Dr. Dalsace.

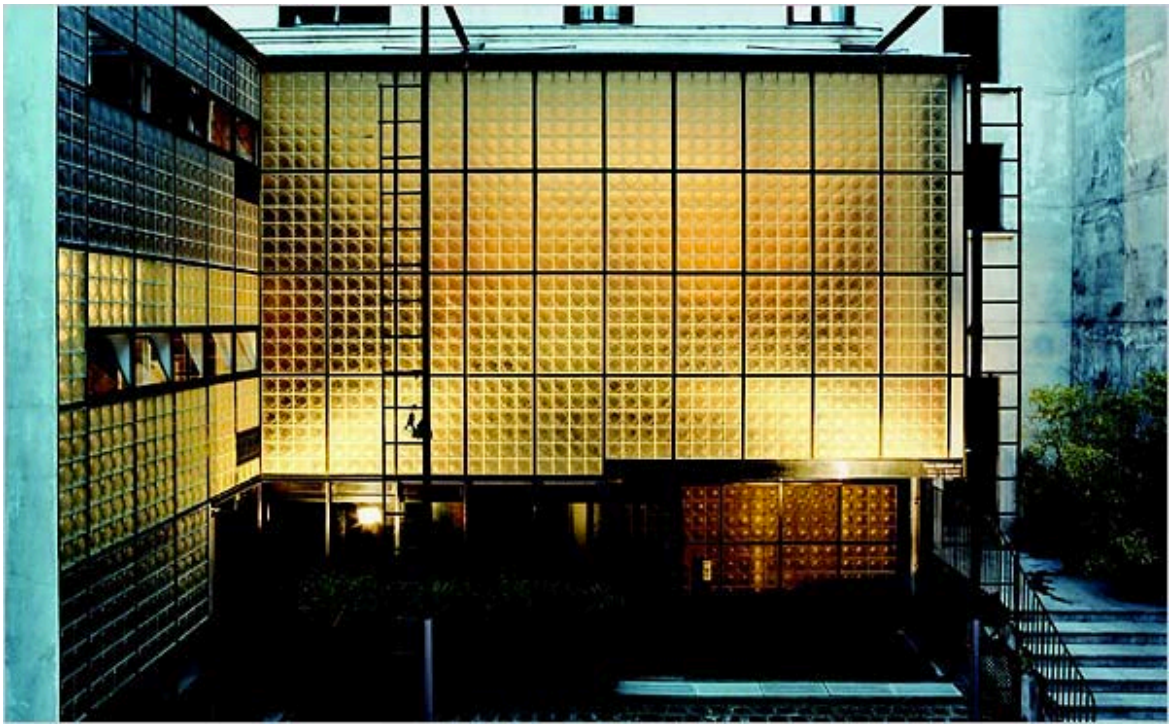

Figure 11 - Le Maison de Verre (Photo by Mark Leon, www.untappedcities.com)

The Maison de Verre was built using sold glass blocks designed by the Saint Gobain Company, French manufacturers of glass products. In 1928, the company introduced the "Nevada" glass block, a square unit measuring approximately 7.8 inches square and 1.5 inches thick. The blocks, which were set into a steel framework, featured a mottled pattern reminiscent of dried earth on the exterior face, and a circular concave interior face to reduce the weight of the solid blocks.

Although the blocks in the Maison de Verre were solid, not hollow glass blocks, this building was an extremely important precedent structure to the history of hollow glass blocks. The Maison de Verre helped to spark the popularity of glass blocks, as it was one of the first buildings to use this new material for most of its façade. The dramatic appearance of the building, especially at night, introduced the idea that glass could replace the traditional masonry wall, and this idea would be incorporated into American architecture shortly after the completion of the Maison de Verre.

Chapter 2: The Development and Early Use of Hollow Glass Block in America

The Early American Glass Block Buildings:

When discussing the earliest use of hollow glass block in America, most scholars cite two important structures: The Owens-Illinois Glass Block Building at the Chicago Century of Progress Exhibition, constructed in 1933, and the William Lescaze House & Office in Manhattan, constructed from 1933 to 1934. While these were certainly defining moments in the early history of glass block in America, these were not the "first" examples of the material's use, as many claim. The first use of hollow glass block in the U.S. dates as early as the construction of the Barbizon Plaza Hotel in 1928.

The Barbizon Plaza Hotel, located at 106 Central Park South, was designed by architect Laurence Emmons. It is likely to have been the first building in the United States to use hollow glass block, aside from the Falconnier pavilion at the World's Columbian Exposition. Constructed from 1928 to 1930, the Barbizon Plaza featured a glass atrium roof that was four stories tall, constructed of both structural glass tiles and hollow glass blocks. These blocks measured 9 ¾" by 4 ½" by 3 ¼", with vertical ribs on the side, open at the bottom, and "lugs" on the top. Reports state that the hollow blocks used for this building were imported from Germany, so it is likely that Siemens was the manufacturer.

The Barbizon Plaza Hotel is said to have been America's first glass-pinnacled skyscraper.[20] Also cited as the first building in the country to use glass blocks as a wall material, the blocks were used for the vertical side walls which formed the base of the roof, and smaller round glass tiles were used to complete the upper portion the roof. The glass tiles were set into diamond-shaped panels, held together with a metal frame and placed upon the glass block base. The glass blocks were laid

[20] "A New Beacon," *The Architect* 14 (June 1930), 243.

with staggered joints, just as bricks are laid, also marking the first time in the country that glass was used as if it were a masonry material.

In his design, Emmons tested various lighting arrangements for the illumination of the roof. Using interior floodlights, Emmons was able to produce a mellow glow that was said to imitate the texture of moonlight. The floodlights would reflect against glass mirrors placed inside the tower and shine outward through the glass tiles and glass blocks, the rays diffused in the process. This lighting scheme could also be produced in various colors, bringing the possibility of new interests and appearances to the building. These lighting effects, when used together, created what was once described as a "crown of light" for the building.[21]

The Barbizon Plaza, while boasting these "firsts", was part of a larger movement in the late 1920s and early 1930s towards the illumination of city skylines. Yet, most other illuminated skyscrapers of this time were lit with external floodlights, shining upon their exterior facades. The Barbizon Plaza was unique because it was illuminated from *within*. Other contemporary Art Deco skyscrapers, such as Raymond Hood's American Radiator Building, featured externally-illuminated towers and did not experiment with glass the way that Emmons did at the Barbizon Plaza. Emmons was revolutionary in his use of both glass tiles and glass blocks to create a fully-glass rooftop structure. Inside, the rooftop was used as an indoor fitness center and "sun-tan" roof for hotel guests.[22] Similar to the Falconnier glass block garden pavilions, the Barbizon Plaza's rooftop was evocative of a jewel-like garden folly set atop the New York City skyline. At a time when many architects built skyscrapers along Central Park with whimsical rooftops above the Park's treetops, the Barbizon Plaza's shimmering glass lantern stood out amongst the others.

The Barbizon Plaza Hotel was the also first building in America to use glass block for the

[21] "Steel Work Finished: Barbizon Plaza Building Due to be Opened in March," *New York Times*, November 17, 1929, RE1.
[22] "Barbizon-Plaza Hotel," *Columbia Daily Spectator*, May 19, 1931, 4.

purpose of advertisement. The hotel's glass block pinnacle roof was regarded as a "mark of revolutionary changes in decorative light for great buildings". The blocks' prismatic ridges would reflect sunlight during the day, and at night would "produce a dazzling brilliance that can be seen far at sea".[23] The Barbizon Plaza, in addition to being a hotel, was also used as the headquarters, meeting, and event space for many of the city's top art and musical organizations. Today, the roof of the building has been altered, removing all of the glass and replacing it with a gold-painted metal. This altered rooftop, designed by Frank Williams, is Postmodern in style and does not do justice to the magnificent rooftop that once existed. This is a great architectural loss, especially due to the Barbizon Plaza Hotel's importance to the history of glass block in the United States.

The artificial lighting used in the Barbizon Plaza gave the top of the building a fanciful glow - an embodiment of the Roaring Twenties zeitgeist. Although the Barbizon Plaza was completed just after the Depression, its design was still a product of the pre-Depression years of glamour and excitement. Before the Depression, the country was filled with jazz age glamour and optimism. Cities were growing rapidly, and each skyscraper seemed to one-up its neighbor. Even Fritz Lang, creator of the groundbreaking, futuristic science fiction film *Metropolis*, stated that "the film was born from my first sight of the skyscrapers in New York in October 1924…I looked into the streets – the glaring lights and the tall buildings – and there I conceived *Metropolis.*"[24] The film captured the optimism of the decade, including its forward-thinking architecture.

[23] "New Beacon This Week on Night Skyline of City," *New York Herald Tribune*, May 25, 1930, E2.
[24] Michael Minden and Holger Bachmann, *Fritz Lang's Metropolis: Cinematic Visions of Technology and Fear* (Rochester: Camden House, 2000), 4.

Figure 12 - The Barbizon Plaza Hotel, 1939 (photo by Samuel H. Gottscho, from the Samuel H. Gottscho Collection at the Museum of the City of New York)

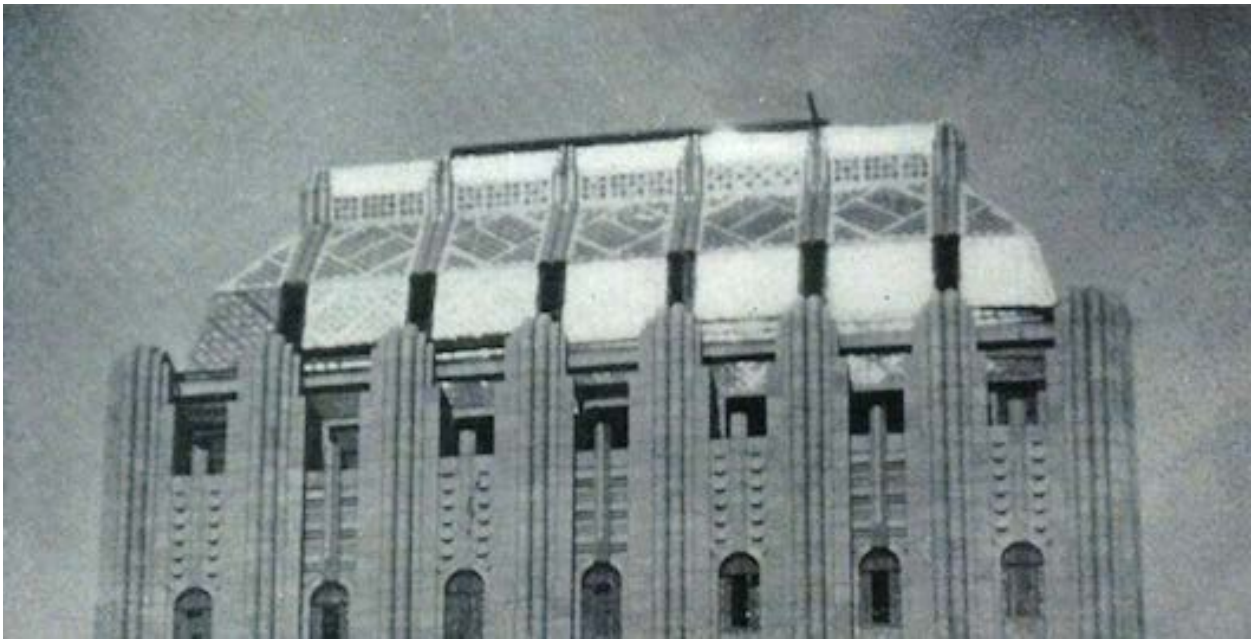

Figure 13 - Detail of the Barbizon Plaza Hotel roof (from Eugene Clute, "Designing for Construction in Glass", *Pencil Points*, 1932)

Figure 14 - Installation of glass blocks at the roof of the Barbizon Plaza Hotel (published in "Glass Walls Now Used in Building", *Popular Science*, June, 1930)

Figure 15 - Roof of the former Barbizon Plaza Hotel, now the Trump Parc, 2009 (photo by www.carnegierocks.com)

In addition to the Barbizon Plaza, another skyscraper building in New York City was experimenting with early glass block. The Towne House apartment building, located at 108 East 38th Street, featured large, rectangular panels of glass block at the top of its tower. This block, reportedly imported from Holland, was illuminated at night to show off its deep amethyst color. Designed by Russell & Bowden, this Art Deco building is twenty-five stories tall and features a brick facade with rainbow-colored terracotta at the top. The brick facade gradually changes in color, from darker brick at the bottom to lighter brick at the top, culminating in the tower. Here, rectangular glass blocks were used in large rectangular panels on all four sides of the tower. The purple-red amethyst color of the blocks made them blend in with the brick façade during the day, but shone

brightly at night - an unexpected surprise. In one description of this building in the *New York Herald Tribune*, glass block was heralded as the "building material of the future".[25] Similar to the Barbizon Plaza Hotel, the glass blocks were laid with staggered joints, creating a recessed wall panel within the tower.

[25] "Glass Brick Construction Used in new Town House," *New York Herald Tribune,* August 24, 1930, E1.

Figure 16 - The Towne House Apartments, 1930 (photo by the Wurts Bros., from Collection of the Museum of the City of New York)

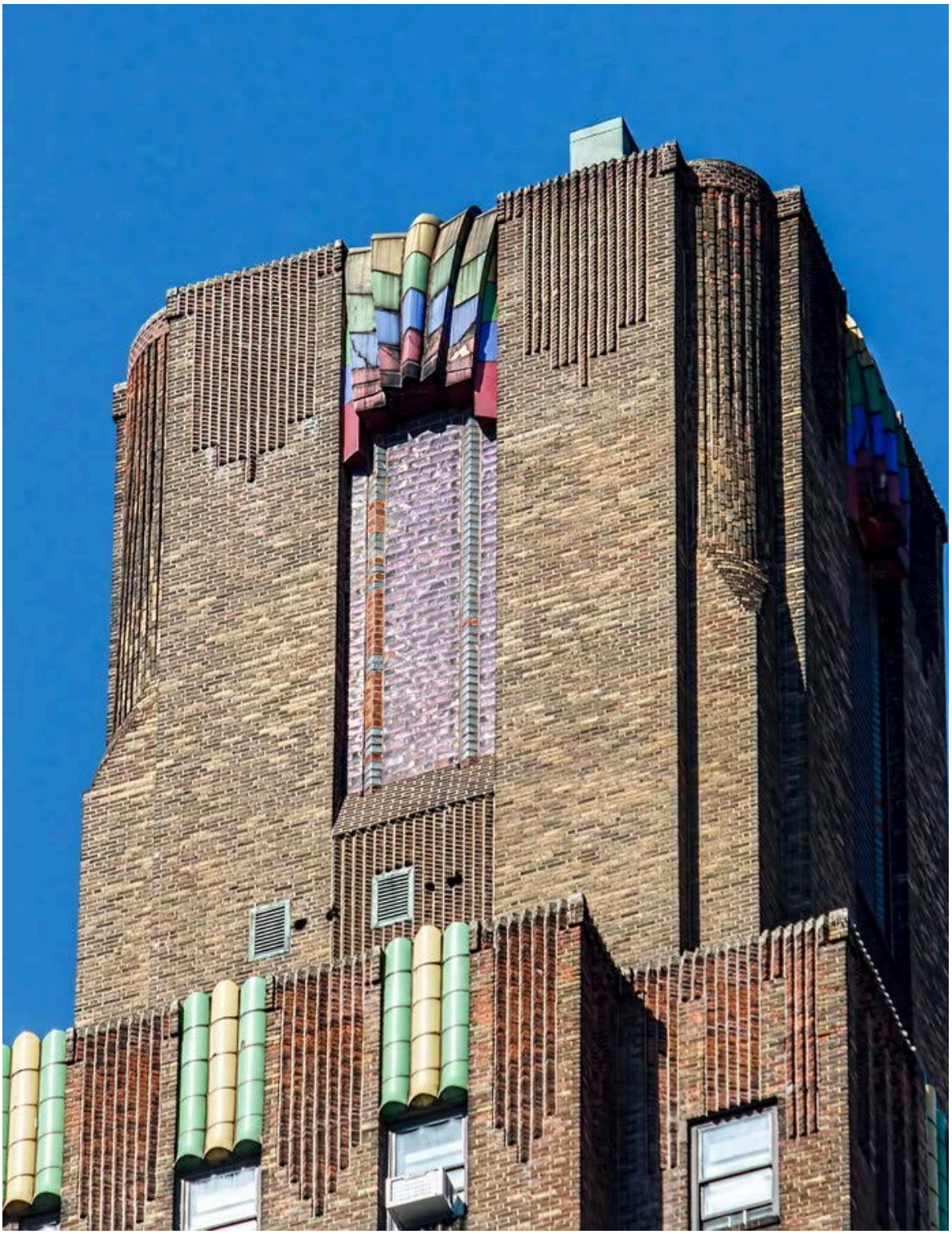

Figure 17- Amethyst glass blocks at of the Towne House, 2015 (photo from www.newyorkitecture.com)

However, the architects of the Barbizon Plaza Hotel and the Towne House Apartments were not the first to think about using glass block in these early years. In 1928, Ely Jacques Kahn was in the process of designing an addition to his Pinaud Company Factory building, located at 214-220 East 21st Street in Manhattan, which he had designed with Albert Buchman in 1926.[26] The addition was to stand at three stories tall, and be constructed entirely of glass "brick". This would be, as newspapers stated, the first "glass house" in America. The glass bricks were to be made of two square pieces of glass that had slightly concave inner sides, creating a hollow center, and were sealed together with metal. The bricks would measure six inches square, but would only be 1⅞ inches thick, and were much thinner than later glass blocks. They were to be held in place with "narrow tubes of reinforced concrete and connecting rods of iron" and would have ridged, prismatic faces to diffuse light.[27]

Kahn's addition, though, was never built. New York City Department of Building records do not have any information pertaining to a glass addition to the building, and there is no photographic evidence which shows this "glass house". Kahn scholar Jewel Stern also believes that this structure was never built. It is likely that the Great Depression caused this potentially history-making project to remain on the drawing boards. Yet, Kahn was instrumental in helping to popularize glass block and the growth of the structural glass industry. An interview with Kahn in *Plastics* magazine, dating to 1935, explains Kahn's interest in the material. In 1926, "Mr. Kahn discovered structural glass being used in Berlin, proceeded to investigate its use both in France and Germany and upon returning to America was instrumental in organizing a company to produce it."[28] This statement suggests that Kahn may have been involved with the creation of the Structural Glass Company, a branch of Siemens Glass in Germany.

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[26] "3-Story Glass Building Will Be Erected in 21st St," *New York Herald Tribune,* February 17, 1929, D2.
[27] "The Talk of the Town," *New Yorker* December 8, 1928, 24.
[28] "Interview with Ely Jacques Kahn", *Plastics* 12 (1935): 13.

Another glass block project that was highly publicized, though never constructed, was the Palais de France, designed by Irwin S. Chanin. In 1929, Chanin announced his plans for a new, ambitious all-glass block tower, to be located on the block bounded by Broadway, Central Park West, Sixty-Second and Sixty-Third streets. The Palais de France was to be the "French commercial capital in America", rising at sixty-five stories tall. At the time, Chanin had just returned from Paris and gained inspiration for the design from his visits there (Chanin had also attended the 1925 Paris Exposition). In a *New York Times* article, Chanin was said to have investigated new building materials during his time there. One of these new was glass block, and he planned to use both glass block and plate glass for the entire facade of the building. Chanin, who had been performing laboratory and weathering tests on the material at the time of the article, stated that if the tests were successful he "would use this glass...in the manner in which we have used brick, terra cotta and stone in the past."[29] The Palais de France was planned to house the offices of the French Consulate, Commercial Attache, and Tourist Bureau. In addition, it would serve as "headquarters for all French commercial, industrial, educational and artistic interests in the United States."[30] Plans also included: shops on the first two floors; three floors for the permanent exhibition on French products where consumers could make purchases; three floors dedicated to an exhibit of international automobiles; an "Academie des Beaux Arts" where meetings could be held on music, art, history, and language; 27 floors for a hotel, and the remaining 30 stories to be dedicated to French offices.[31]

The Palais de France was never built due to a "lapsed contract with the Palais de France Corporation…[and] failure to carry out the plan was attributed to the tariff law and general economic conditions, as well as to changes in the French Ministry which resulted in delays not

[29] "Chanin Explains Special Features For French Commercial Skyscraper," *New York Times*, September 22, 1929, RE1.
[30] "France to Build 65-Story Center On Century Site," *New York Herald*. August 13. 1929, 1.
[31] New York City Landmarks Preservation Commission, *Century Apartments Designation Report* (LP-1517), prepared by Andrew Dolkart (New York: City of New York, 1985), 4.

anticipated by the French interest."[32] Clearly, the economic troubles of the Depression were felt not just in America, but in France and across the globe. Chanin, though, owned the lot for the project and still decided to build a new project, citing President Hoover's call for the creation a jobs as one factor in his decision to build. The building that resulted was a brand new design, and Chanin abandoned the idea of using glass blocks. Instead, he designed a thirty-story, twin-towered Art Deco brick apartment building. Known as the Century Apartments, the building was constructed from 1930 to 1931, and although it did not utilize glass block, it was still an experimental project because Chanin was trying to see if the Art Deco style would be accepted for a residential building.[33]

The Early American Manufacture of Glass Blocks:

Shortly after the completion of the Barbizon Plaza Hotel and Towne House Apartments, only one American manufacturer began to sell glass blocks stateside. As mentioned, both the Barbizon Plaza and the Town House used blocks reportedly from Germany and Holland, and it does not appear that any American companies were selling the product at the start of construction of these buildings. The earliest known company to sell hollow glass blocks was the Structural Glass Corporation, based in New York City. The Structural Glass Corporation grew out of the Keppler Glass Construction Company, which was founded in New York City in 1912 by Frederick L. Keppler. Keppler, born in 1862 in Stuttgart, Germany, moved to the United States in the 1880s and worked as an architect in Chicago. In the 1890s, Keppler became a representative of the American Luxfer Prism Company in Germany. When the Luxfer Prism Company began in 1897, it also opened branches abroad, many of which were located in Europe. One of the most successful branches was the Deutsches Luxfer Prismen Syndikat, located in Berlin and directed by Keppler. Keppler expanded the branch's product line to include architectural glass, and in 1909 introduced

[32] "$6,500,000 Loan on Century Site," *New York Times,* October 24, 1930, 43.
[33] *Century Apartments Designation Report,* 3.

the "Keppler-System": heavy, non-prismatic glass tiles held in place with reinforced concrete bars. This is the system that was used in Bruno Taut's Glass Pavilion.[34]

Keppler opened his own glass factories in Germany, England, France, Austria, and Russia, but these endeavors did not survive past World War I, and Keppler returned to the United States in 1914. His Keppler Glass Construction Company in New York, though, thrived.[35] The Keppler Company specialized in structural glass tiles, including his "Keppler-System". This system was an important precedent to the creation of hollow glass block: glass tiles were set into reinforced concrete, and one side of the glass tile was concave to allow for more strength and better light diffusion and reflection. These tiles are essentially one half of a full hollow glass block, so it makes sense that the Keppler Company went on to produce hollow blocks.

The Keppler Glass Construction Company was renamed the Structural Glass Corporation in 1928 and kept offices at 101 Park Avenue.[36] Although blocks made by the Structural Glass Corporation were some of the first to be used in early American glass block buildings, the history of this company is still relatively uncertain. The company is said to have started producing glass blocks in 1929, although the company is not listed in Sweet's Catalogue until 1931.[37] Rene G. Le Brosi served as the Corporation's president from 1928 until his death in 1935, and was known to have worked on many construction projects including the William Lescaze House and Office and the buildings at the Chicago Century of Progress Exposition.[38] It is not clear, though, whether the Structural Glass Corporation actually manufactured its own glass blocks. In an article from the *Chicago Daily Tribune* in 1931, a Chicago representative of the Corporation mentioned that the

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[34] Neumann, "A Century's Triumph in Lighting,",43.
[35] "F.L. Keppler, Leader in Structural Glass, " *New York Times*, August 1, 1940, 21.
[36] Dietrich Neumann, Bruce S. Kaskel, and Jerry G. Stockbridge, ed. Thomas Jester, "Glass Block" in *Twentieth Century Building Materials* (Los Angeles: Getty Publications,1995), 163-167.
[37] Ibid, 196. (Important note: The author has not found evidence which supports this claim that glass blocks were introduced by the Structural Glass Corp. in 1929. The Neumann, Kaskel, and Stockbridge article does not cite where this date came from.)
[38] "Rene G. Le Brosi: President of Structural Glass," *New York Times*, November 2, 1935.

company was a "sales agent of the Siemens Glass Works Ltd., Dresden, Germany", so their blocks may have been produced by Siemens and imported.[39] In addition, the Structural Glass Corporation noted that it was having its glass blocks manufactured for them by the Macbeth-Evans Company, as noted in 1934's *Architectural Forum.*[40] This was the first of a series of co-relationships and mergers of companies in the glass block industry. It is not known when the Structural Glass Corporation ceased to exist, but it at least survived until 1939, for it is listed that year as a supplier of glass blocks in a hospital supply directory in 1939.[41]

The Macbeth-Evans Glass Company, another early glass block manufacturer, was headquartered in Charleroi, Pennsylvania. Founded by George Alexander Macbeth in 1872, the company merged with the Thomas Evans Company in 1899, forming the Macbeth-Evans Glass Company. By the early 1930s, the company was known as a leader in the manufacture of glass for lighting purposes, including glass shades and reflectors, street lights, and automobile lenses. Little information is known about the Macbeth-Evans' production of glass blocks, especially the date which they started production. The Macbeth-Evans blocks were used in the William Lescaze House & Office and the Morris B. Sanders House, which will be discussed in the next chapter. The company was purchased by the Pittsburgh Corning Corporation 1936.[42]

The Rise of the Modern Glass Block:

In March of 1932, *Glass Digest* magazine announced that Owens-Illinois Glass Company, a large and successful glass manufacturer, would start production on its own glass block.[43] Owens-

[39] "Business Shows Gains Over the Same Period of 1930," *Chicago Tribune*, September 20, 1931.
[40] *Architectural Forum*, Vol. 61(December 1934)
[41] "The Hospital Purchasing File," *Journal of the American Medical Association* 112, no. 22 (1939): 74.
[42] **"**Macbeth-Evans Concern Acquired By Corning Glass: Industrial Leaders," *Christian Science Monitor,* November 13, 1936, 17.
[43] Samuel Cochrane, "Building Block," U.S. Patent 1, 949, 898, January 1, 1931, https://www.google.us/patents/US1949898.
"Architects Inspect First Glass Structure," *Glass Digest* (December 1932), 9

Illinois, the article claimed, was inspired by the recent popularity and promise of glass as a building material. With its foray into glass block production, Owens-Illinois hoped that their product could compete with other, more traditional building materials. The Owens-Illinois Glass Company was incorporated in 1929, but the complicated history of the company started over 100 years earlier. The company began in 1818 as the New England Glass Company, formed by Deming Jarves in East Cambridge, Massachusetts. In 1878, the company's factory was leased to William L. Libbey and his son, Edward Drummond Libbey, who took it over when his father died in 1883. Around the same time, in Toledo, Ohio, city officials were looking to attract new businesses to the area after a recent discovery of large and plentiful natural gas resources. In turn, Libbey was offered a great deal of money and land to move his business to Toledo, and in 1888 the newly-named Libbey Glass Company made the move. Soon after, Libbey met Michael J. Owens, to whom he offered a job supervising the Libbey Toledo factory. The company's first "big break" came from an exhibition of a working glass furnace at the World's Columbian Exposition in 1893, which propelled the Libbey Glass Company into the spotlight.

Between 1893 and 1929, the original Libbey Glass Company expanded and created a number of sister companies, including the Toledo Glass Company in 1895 and Owens Bottle Machine Company in 1903, which grew from Owen's own invention of an automatic glass bottle-making machine. In 1916, the Toledo Glass Company purchased a company owned by Irving W. Colburn, who created an innovative sheet glass drawing machine, which would allow for the mass production of plate glass. A new company was formed, this time named the Libbey-Owens Sheet Glass Company. Later, in 1929, the still-thriving Owens Bottle Company purchased the Illinois Glass Company, located in Alton, Illinois. The company's Alton factory was the largest individual bottle manufacturing factory in the world, and the company owned multiple factories in addition to the

"Owens-Illinois Glass Able To Enlarge Profit in 1931," *Christian Science Monitor*, February 27, 1932.

one in action. The merger of Libbey-Owens Sheet Glass and Illinois Glass Company remains the largest glass merger in history, and included 16 factories and over $48 million in revenue. Renamed the Owens-Illinois Glass Company, the company continued to produce glass containers, as well as glass for building purposes. In addition, the Libbey-Owens Sheet Glass Company partnered with the Edward Ford Plate Glass Company in 1930, creating the Libbey-Owens-Ford Glass Company, which specialized in laminated plate glass and produced the glass used in the Empire State Building.

From this long history of producing glass bottles, containers, and plate glass, the Owens-Illinois diversified its products in 1931, and by 1932 jumped into the glass block industry. The earliest Owens-Illinois blocks manufactured in 1932 were about the same shape as regular clay brick, but were a bit larger. In cubic dimensions, two of these blocks were equal in size to three clay bricks. The blocks were not load-bearing, and were open on one side. They were described as being "counter-sunk", and likely had indentations on one side to make for an easier key with the mortar and ensure stability. In addition, the glass sides had prismatic ridges to diffuse light and provide privacy. It is likely that those were the blocks mentioned by *Glass Digest* in March 1932 were those in that were filed for patent by Owens-Illinois in 1931.[44]

[44] "Architects Inspect First Glass Structure," *Glass Digest* (December 1932), 9.

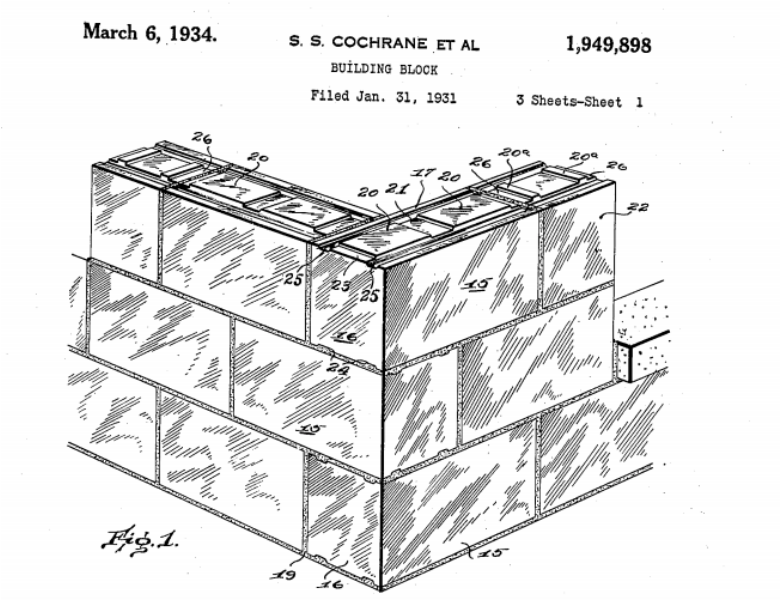


Figure 18 - Glass Building Block patent by Samuel Cochrane for Owens-Illinois (U.S. Patent 1949898 A, filed January 31, 1931, image from United States Patent and Trademark Office)

Owens-Illinois seemed confident in the future of glass block, and in 1932 the company also constructed a house entirely of glass block. This house was designed for use as a testing facility, where researchers could test the various attributes of the material.[45] This building used glass block to demonstrate the many different ways in which the material could be used. First, the building used glass blocks in both a staggered and gridded joint pattern – showing the freedom, both structurally and aesthetically, of the material. In addition, the block is used to create an entire wall, complete with a window opening, to show that glass blocks could be used just like a traditional masonry wall. This reinterpretation of traditional masonry walls using glass block will be an important trend in future glass block buildings.

Numerous sources that mention this test house also mention that a number of oil companies had become interested in the material. As early as 1932, oil companies saw the potential of glass blocks as a new, unique material which could provide its own advertising through nighttime

[45] "Studying a House Built Entirely of Glass Brick," *Wall Street Journal*, February 17, 1932, 1.

illumination. As an article in the Christian Science Monitor states, "It is thought that filling stations and retail stores might be made entirely of glass block in solid or mixed colors, which will be especially attractive at night when lighted."[46] Within a few years, this prediction had come true. Below is an image of an Ohio Oil Company gas station in Columbus, Ohio, built in 1933. While the architect is not known, it is clear that the design of the station was highly innovative and gleamed with light to attract customers. By 1933, many well-off Americans owned their own cars, and the increase in the number of automobiles on the road had changed the country's landscape. Now, businesses had to work to attract customers whizzing by at high speeds. The use of glass block, especially when illuminated, caught the attention of most, as it was a new, exciting, and still somewhat-unknown material to many.

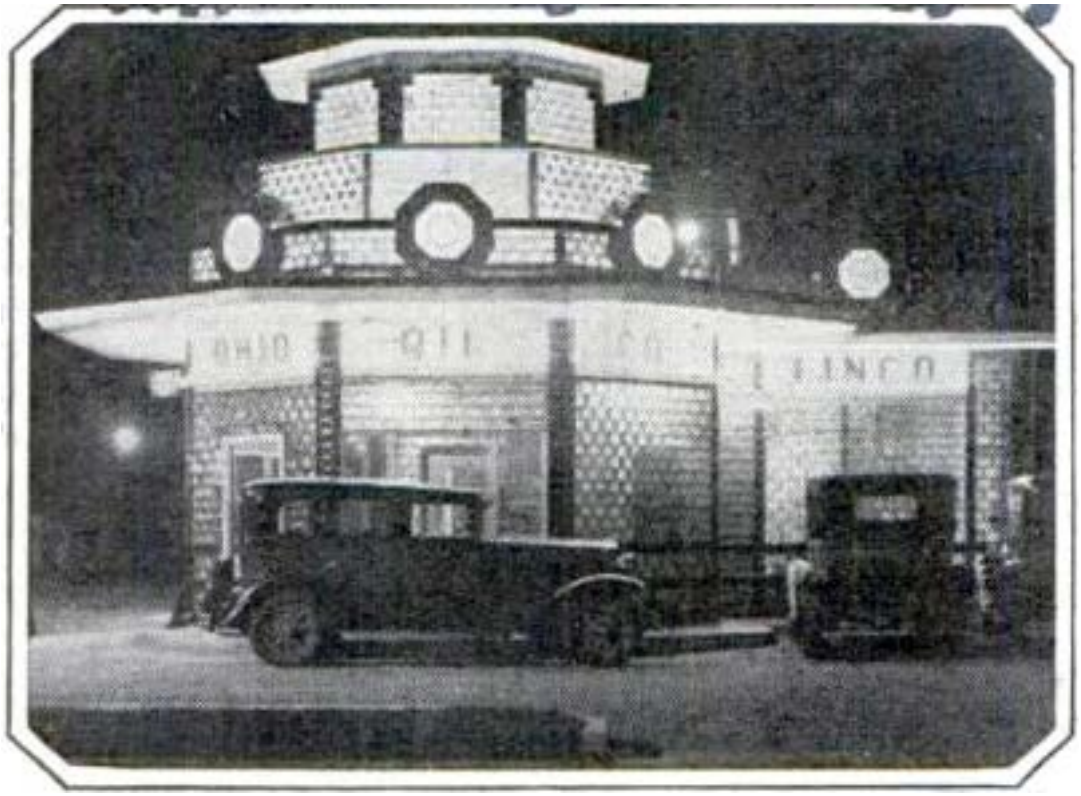


Figure 20 - Ohio Oil Company Gas Station (from "Glass Brick for Buildings", *Popular Science,* September, 1933)

[46] "Owens-Illinois Glass Able To Enlarge Profit in 1931"
"Glass Bricks to Be Used in Factory Walls," *Los Angeles Times*, December 2, 1932, A12.
"Progress of Science: Applied Research Offers Improvements in Living Conditions," *New York Herald*, May 22, 1932.

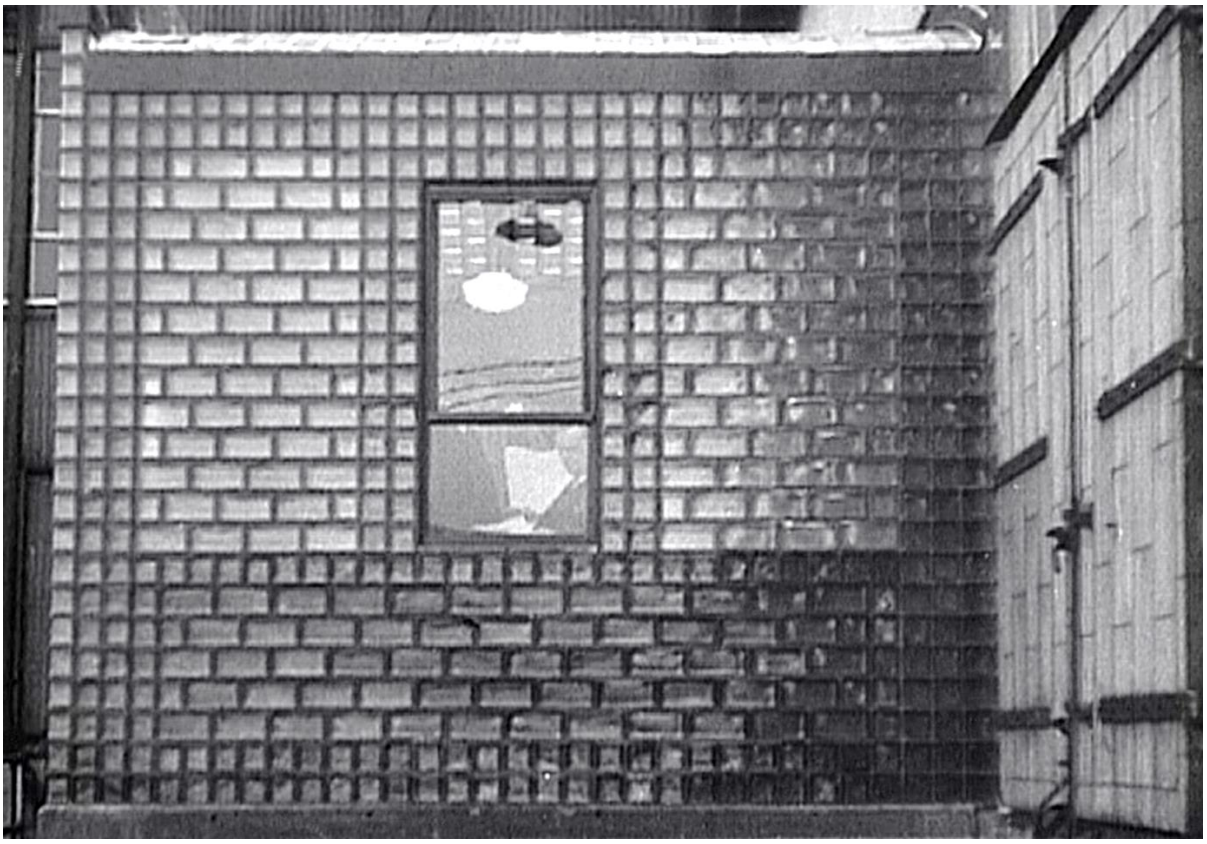


Figure 19 - Owens-Illinois glass block research house, 1932 (image from Universal Newspaper Newsreel, from the Critical Past archives)

The Chicago Century of Progress Exhibition:

It was not until the spring of 1933 that hollow glass block was introduced to the public. The introduction of this new material occurred at the Chicago Century of Progress Exhibition, held from 1933 to 1934, which celebrated the centennial anniversary of the founding of the city of Chicago. The Exhibition's goal was to "attempt to demonstrate to an international audience the nature and significance of scientific discoveries, the methods of achieving them, and the changes which their application has wrought in industry and in living conditions."[47] With an emphasis on progress and the future, the fair featured a number of new and innovative consumer products, one of which was glass block. The fair was also an introduction of the Streamline Moderne style of architecture to the public, and this style would prove to be closely tied with the use of glass block in the future.

Figure 21 - The Owens-Illinois Glass Block Building (from the SAIC Collections)

[47] "A Century of Progress," Chicago Historical Society, accessed 5 April 2015, http://www.chicagohs.org/history/century.html.

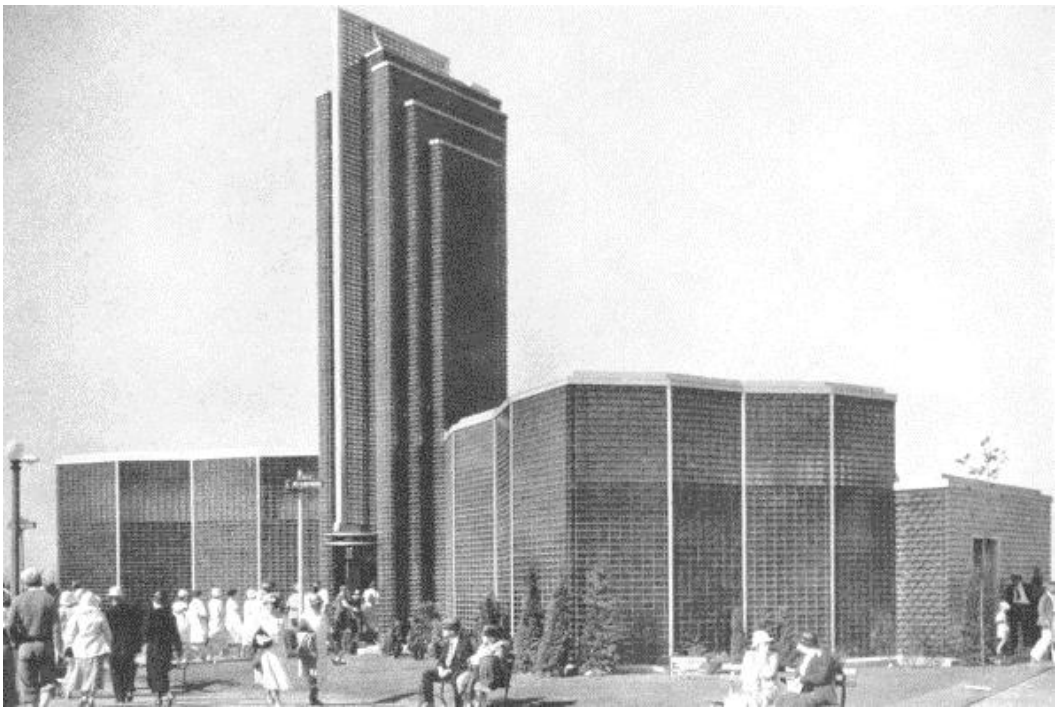


Figure 22- The Owens-Illinois Glass Block Building, 1933 (photo originally appeared in "Official Pictures of a Century of Progress Exposition" published by the Reuben H. Donnelley Corporation, photo taken from the Museum of Science and Industry, Chicago/Getty Images)

Owens-Illinois introduced their glass block to the public at the Exhibition with their Owens-Illinois Glass Block Building, a revolutionary structure that would set the course for the use of glass block for years to come. For the Exhibition, Owens-Illinois constructed a large building entirely out of their glass blocks for the Horticultural Exhibition. The building, built with around 25,000 blocks, measured 100 feet long by 60 feet wide with a 50 foot tower.[48] The structure was used as the landscape pavilion for the James W. Owen Nurseries and housed garden equipment and furniture, flowers, and a display of the Owens-Illinois Glass Company and their products.[49] The Glass Block building was the first full-size building constructed of glass blocks in the country.

The design of the Glass Block building was Classical in its composition, but its use of a new, modern material makes it a fine example of innovation. The building is anchored by a tall, vertical tower at its center, with low, stout, horizontal wings extending out from either side. Although the

[48] "Glass Block - A New Building Material," *Scientific American* 149, iss. 3(1933): 128.
[49] Century of Progress International Exposition, *Official Guide, Book of the Fair* (Chicago: 1933), 70.

building was small in size, as it was only meant as a sort of "garden folly", it was nevertheless evocative of impressive city skyscrapers, with its central tower, reminiscent of the RCA Building at Rockefeller Center and its slender, rhythmic setbacks. The building's form is closely tied to Classical architecture because of its symmetrical design and focus on a main central axis. Yet, the building's use of a new architectural material and simple, stylized forms makes it entirely innovative. The building was also illuminated at night and the blocks were painted in a multitude of colors.

As for the glass blocks themselves, they consisted of a molded, five-sided glass unit that was sealed on its sixth side with a flat piece of glass. The glass was hermetically sealed, leaving an air-tight and hollow center. The blocks were about twice the side as regular clay brick, and the sides were painted with a cement paint to help the mortar adhere to the glass. Color was applied to five sides of the block, leaving the exterior face bare. According to reports, "any color in the entire gamut of the spectrum is applied to these blocks, giving an immense range to their decorative possibilities."[50] The building utilized the company's early prototype Insulux blocks, which were not available for sale to the public. Although the Owens-Illinois blocks wouldn't become available to the public until 1935, this Glass Block Building was instrumental in introducing this new product to the public.

The Glass Block Building at the Chicago Century of Progress Exhibition was arguably one of the most important early glass block buildings which showcased the dynamic relationship between glass block and lighting. The multicolored appearance of the block helped to advertise Owens-Illinois' product as a material which offered new possibilities in form (since the blocks could be used to build a building in any shape or plan), and in aesthetics (since the level of illumination could be changed, and there was also an ability to add colors). Although the Glass Block Building was only a temporary structure, it helped to set a precedent for the future of glass block.

[50] "Glass Block Building Built for World's Fair," *National Glass Budget* 48, no. 50 (1933): 3.

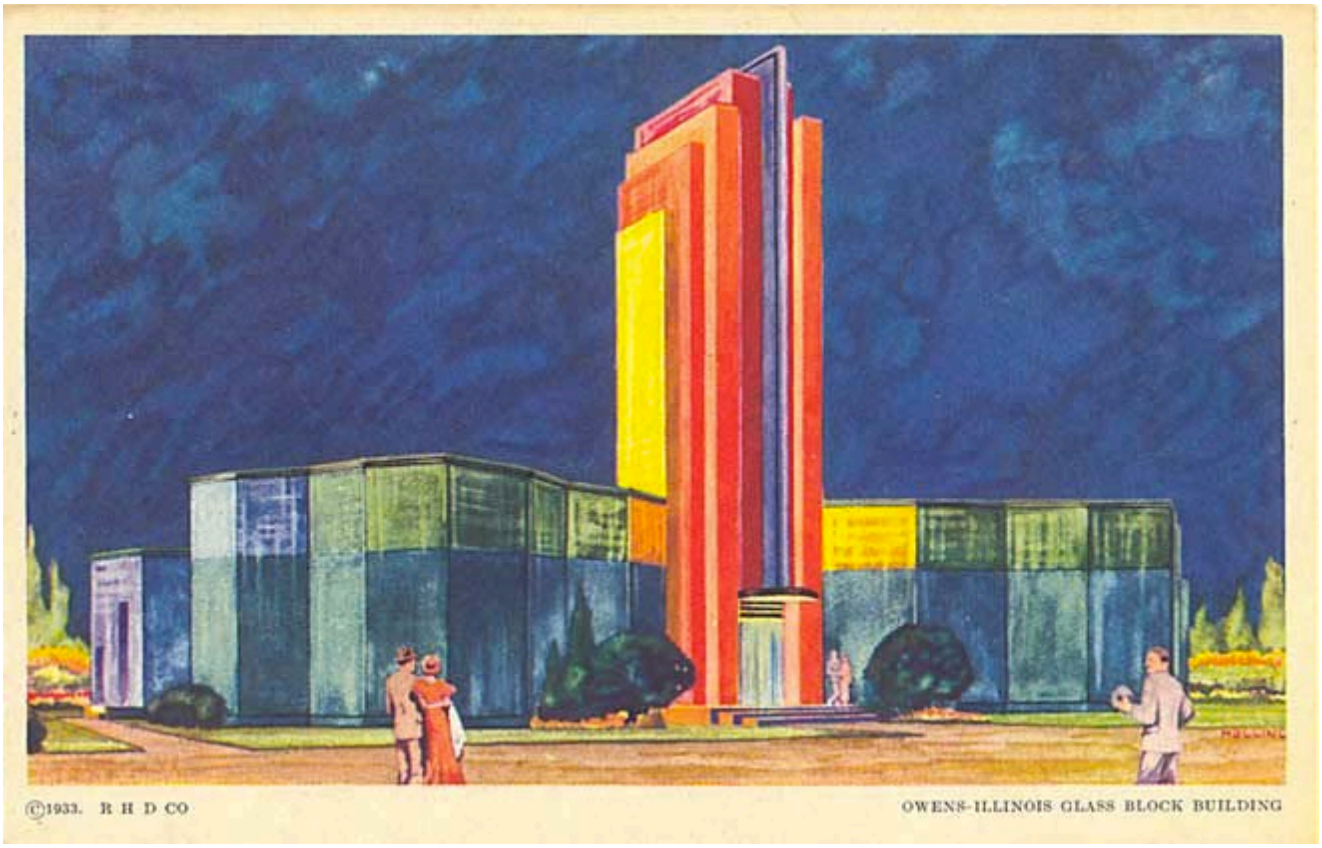


Figure 23 - Postcard of the Glass Block Building at Night, 1933 (postcard by the R.R. Donnelly Century of Progress Color Postcard Series, image taken from www.postcardy.com)

The William Lescaze House and Office:

Figure 24 - The William Lescaze House, 1934 (photo by the Wurts Bros, from the Collection of the Museum of the City of New York)

Figure 25 - The William Lescaze House, 1934 (photo by the Wurts Bros., from the Collection of the Museum of the City of New York)

While the Glass Block Building was on a large scale, promotional use of glass block, the material also began to be picked up for use by architects for smaller-scale projects around the same time as the Chicago Century of Progress Exhibition. The most notable early residential use of glass block is found at the William Lescaze House & Office at 211 East 48th Street in Manhattan. Designed by William Lescaze himself, the building was constructed from 1933 to 1934. One of the first Modern style residences in the city, the building had a great impact on the popularity of glass block.

The Lescaze House was a dramatic departure from the nineteenth century brownstones that surrounded it. The facade, with its simple, flat forms, showed that glass block was part of a new movement of architecture - away from the Art Deco movement into a new style that emphasized angular lines, planar surfaces, functionalism, and little to no ornamentation. The Lescaze House featured an off-white stucco facade with a rectilinear design. Glass block is featured prominently in the facade, comprising two large rectangular infill panels on the third and fourth floors, taking up almost the entire width of the building. Another smaller wall of solid blocks is used on the ground floor, where Lescaze's office was located. Because this was likely the first time in New York where glass block was to be used for the majority of a building facade, the Department of Buildings had some reservations. Lescaze stated,

> When we built our house in 1934, glass bricks had not been used in this country. Unbelievable but true. I had seen a few of them in Europe, and they seemed to me an excellent new material to do a job which I was anxious to have done. They added to the amount of daylight without adding to the fuel bill, they let daylight through yet obscured the uninteresting view of the nine-story apartment house across the street, and they deadened street noises. An enterprising manufacturer agreed to make the first American glass blocks for us in his plant in Illinois. But what an epic battle we had with the Code! It lasted at least three months, back and forth. Three months of agony. Don't say: What of it, a pioneer must take a pioneer's tribulations. I don't call that pioneering. That's merely making use of a known building material (glass) in a somewhat different form (block). Look at it this way - the architect's way. Suppose I had been doing it for a client. Would I have the right to burden him with all the attendant annoyances, the holding up of construction, the added expense caused by this first attempt to use a new material? However, I was finally allowed to build as I had designed, and once the first case had been approved it established a

> "precedent" and from then on, there being a precedent, every subsequent case had a much easier time.[51]

Although Lescaze was incorrect in his statement that this was the first time glass blocks were used in the country, his building was nevertheless an important event in the history of glass block. Because earlier uses of the material in the City never comprised large expanses of wall in a residential building, the New York City Department of Buildings was unsure of how to proceed with the code regulations and acceptance of this new material. The Department of Buildings was hesitant to allow Lescaze to use such large expanses of blocks, for fear that the building would not have proper ventilation. To remedy this, Lescaze agreed to include an extensive system of mechanical ventilation and air conditioning.[52]At the time, air conditioning very new, but Lescaze was familiar with it from his design for the Philadelphia Savings Fund Society building, which was the second skyscraper building to have central air conditioning. In the future, buildings with large expanses of glass blocks and few, if any, operational windows were a signal that the building was air-conditioned. Throughout the 1930s, an air conditioned building indicated that the owner of the building was up-to-date with the latest in modern technology.

Lescaze's building was given great attention and praise by architectural publications. The press did help to spark interest in glass block, and some architects even constructed very similar buildings to Lescaze's in the same block shortly thereafter. Lescaze himself designed two more townhouses in the city that utilized glass block: the Kramer House at 32 East 74th Street, built in 1934-1935, and the Norman House at 124 East 70th Street, built in 1940-1941. Both of these houses were commissioned as private residences. Both the Kramer and Norman families admired the

[51] William Lescaze, *On Being an Architect* (New York: Putnam, 1942), 205-206.
[52] New York City Landmarks Preservation Commission, *William Lescaze House and Office Designation Report* (LP 0898)(New York: City of New York: 1976).

Modernist approach of Lescaze's own home, and sought out the architect to design for them in his recognizable aesthetic.

Figure 26- The William Lescaze House, 2013 (photo from www.ephemeralnewyork.com)

Figure 27- William Lescaze, Kramer Residence, built 1935, photo from 2013
(photo by Ruth Fernson, published in "An Urban Standard, Coolly Reimagined
The New York Times, January 10, 2013)

Figure 28- William Lescaze, Norman Residence, built in 1940, photo from 2011 (photo by David Cobb Craig, www.davidcobbcraig.blogspot.com)

The Owens-Illinois Glass Block Building and the William Lescaze House represent the start of two different aesthetic uses of glass block which would continue throughout the 1930s and into the 1940s. The first aesthetic path used glass block freely to create volumetric forms – walls, towers, columns, pylons etc. The second aesthetic path was the use of glass block in plane - as an infill material for angular wall openings in the Modernist style. Most of the buildings, which used the material in free, volumetric ways, were designed in the Streamline Moderne or Art Deco styles. Although many buildings in this style had a Classical composition - featuring a central, vertical axis from which low, horizontal wings extend from – the way that the glass block was used in these buildings is arguably more innovative than the way it was used in Modernist, flat planes. For example, the Owens-Illinois Glass Block building featured a Classically-inspired form, but the way that it used colored glass blocks to build its walls instead of traditional masonry materials made the building wholly innovative.

Chapter 3: The Beginning of the Age of Glass Block

Technological Developments and the Appearance of a New Manufacturer:

By 1934, glass block had started its transition from a largely experimental product into a readily available and desirable building material. Because the product had been well-received at both the Chicago Century of Progress and with the Lescaze House, manufacturers started improving the material and its marketing and sale to the general public. Prior to the Lescaze House, projects using large amounts of hollow glass block were not designed and intended for actual use as a home, office, factory, etc. Buildings like the Owens-Illinois Glass Block Building, and even the earlier Falconnier glass greenhouses were only designed as temporary exhibition buildings, and the glass blocks were not expected to, or designed to, withstand regular use and be a permanent construction. Yet, as the material became more popular and desirable, manufacturers saw the need to improve the glass block technology to provide a material that would be durable and permanent.

In 1935, Owens-Illinois introduced their Insulux glass block, which was arguably the most influential and well-known glass block from its introduction until the 1950s. Beginning in 1932, prior to the release of their Insulux product in 1935, Owens-Illinois had been working on a merchandising plan for the material's introduction. In this plan, the company believed that glass block's "use in the field is going to develop its uses and applications". The company originally planned for the blocks to be produced in a series of colors: flint, light green, emerald green, amber, dark blue, and black. [53] The first trade catalog for the Insulux blocks product was distributed in 1935. Titled "Translucent Masonry of Owens-Illinois Insulux Glass Building Blocks", the publication cited glass block as "a product demanded by the functional and aesthetic requirements of present day buildings". The publication also outlines, in detail, the various properties and advantages of the material. This is

[53] Owens-Illinois Glass Company, "Merchandising Plan: Glass Building Block" (Toledo, OH: Owens-Illinois Glass Company, 1932), 1, 5.

likely the first time the attributes of glass blocks were described in detail. These attributes include: low cost; light transmitting and diffusing properties with an absence of glare; uniformity; high compressive, lateral, impact and bond strength; thermal resistance, with low heat conductivity and reduction of solar radiation; deadening effect against the transmission of sound; fire-resistance; free of condensation; and easy to clean, maintain, and replace.

The Insulux block set the standard for glass block manufacture. The blocks were created by pressing two, identical molded sides of block together and sealing them with a metal alloy, likely made of lead. The first wave of Insulux blocks was manufactured in three different "Series" and eight different "Cuttings", which were the patterns on the face of the block. These blocks came in a few sizes (measurements here are rough, but more detailed measurements and patterns can be found in the Appendix): a rectangular, eight inch by five inch block, a square six inch by six inch block, and a larger square eight inch by eight inch block. All blocks were approximately four inches thick. Each block series also had a corner block, which had a rounded edge. The various cuttings (also shown in the Appendix) all transmitted different amounts of light, ranging from the highest at 86.5% transmission, to the lowest at 11.7% transmission (as stated in Insulux trade catalogs). In addition to numerous other facts and figures about the material, the publication included constructions drawings, examples of how glass blocks could be paired with brick masonry, and a series of renderings showing how Insulux blocks could be used in new design. This comprehensive publication was an effective method of convincing architects and owners that they "needed" this new and exciting product. Although glass block had been on the public radar before 1935, it was still a gamble for Owens-Illinois whether or not its product would be successful in a broader market.

After Owens-Illinois, the Pittsburgh Corning Corporation became the second of the two largest glass block manufacturers. Pittsburgh Corning followed in Owens-Illinois' footsteps in the production of glass block, and did not start manufacturing and selling glass blocks until 1938, three

years after Owens-Illinois' Insulux block was introduced to the market. Yet, while Owens-Illinois no longer manufactures glass blocks, Pittsburgh Corning still sells glass block products to this day. Pittsburg-Corning began as the Steuben Glass Works, founded in Corning, New York in 1903. In 1918, the Steuben Glass Works merged with the Corning Glass Works, founded, in 1868 by Armory Houghton and also located in Corning, New York. The Corning Glass Works had been experimenting with heat-resistant borosilicate glass in the early 1910s, and in 1915 patented their trademark Pyrex glass. This Pyrex glass, used for cookware and in laboratories, was used for the solid cast glass artwork at 30 Rockefeller Plaza, completed in 1933. [54]In the 1932 Sweet's Architectural Catalog, the company lists Pyrex "glass construction blocks" as one of the material the company offered, but there is little information and no images of this material. The first true hollow glass block for building was produced by Steuben-Corning was referred to as a "Pyrex glass construction unit". Introduced in Architectural Record in 1935, the block featured a fluted pattern and was used in the construction of the new Steuben-Corning office on Fifth Avenue in New York. The company merged with the Pittsburgh Plate Glass Company in 1937, and intended to expand its production of glass blocks. In 1938, the newly-formed Pittsburgh Corning Corporation introduced their new line of glass blocks, which were produced in two patterns – the fluted "Argus" pattern and the wavy "Decora" pattern.

[54] For a study of Corning's Pyrex glass block and their use in artistic applications, see: Mary Jablonski, "Cast Pyrex Glass Block: Illuminating its History and Conservation Issues" *APT Bulletin* 41, no. 2/3 (2010): 37-45.

Figure 29 - PC Glass Blocks in the Argus and Decora pattern (from a Pittsburgh Corning advertisement in *Architectural Forum*, April 1938)

More Early Buildings:

In this period just on the cusp of glass block's surge in popularity, around 1934 to 1936, a few notable building examples show that architects were becoming more comfortable with using the new product. As mentioned in Chapter 2, glass block's ability to create buildings entirely made with light was only just being developed during the early 1930s. Like the Ohio Oil Company Gas Station, another gas station in New York City was built entirely out of glass – transforming the building into a lantern. Located at East 124th Street and Morningside Drive, the Shell Oil Company Gas Station was built in 1934. Although constructed out of glass tiles, not hollow glass blocks, this building shows that the development of using glass as a material to create entire walls of light was not just occurring with hollow glass blocks. Noted as one of the "most interesting original examples of construction in the modern spirit", the building was designed with clear glass tiles as well as red and yellow ones in the colors of the Shell Oil Company.[55] The tiles measured six inches square, similar to the size of hollow glass blocks, and were 3/8 inch thick. Published in General Electric's *The Magazine of Light*, the authors of the article predicted that the use of glass in this "striking and attention-compelling" design would be a symbol of how glass would be used for future architectural designs.

[55] A.L. Powell, "A Gas Station in Glass and Color," *The Magazine of Light* 4 (Summer 1934), 24.

Figure 12 - Shell Oil Company Gas Station, 1934 (photo from *The Magainze of Light,* Second Summer Issue, 1934)

Figure 13 - Shell Oil Company Gas Station, 1934 (photo from *The Magainze of Light,* Second Summer Issue, 1934)

One of the best examples of a large, volumetric use of glass block was at the Owens-Illinois Research Lab in Toledo, Ohio, built in 1935. After the Glass Block Building in Chicago, this was the second building to use glass blocks for almost the entire structure.

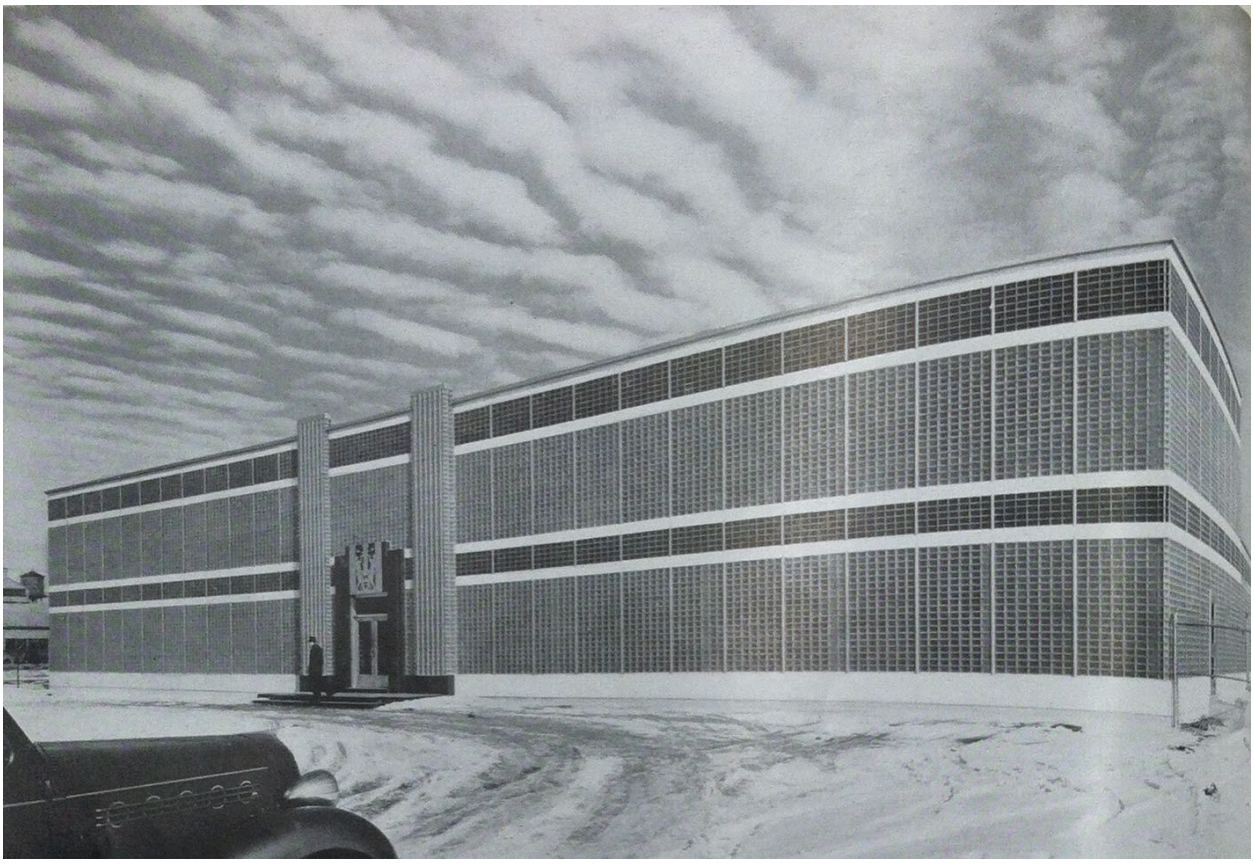


Figure 32 - The Owens-Illinois Research Laboratory, 1936 (photo from *Architectural Forum*, May 1936)

The Owens-Illinois Research Lab, designed by Walter & Weeks, used the latest Insulux blocks for its construction. On the exterior, the spandrels were backed with green sheets to give a darker color contrast to the design. Unlike the Lescaze House, where glass blocks were inserted as a flat plant into a wall opening, here the walls *are* glass. Even the pilasters surrounding the entrance are made of blocks, bringing a new concept of creating traditional, Classical structures out of a new material. Rather than using stone for the pilasters, they became translucent masonry - a complete reversal of their historical meaning. In addition, the blocks are laid in a gridded pattern, rather than staggered,

as earlier glass block applications had been. Although the earlier use of staggered jonts in glass block construction made a direct reference to brick masonry walls, here the use of gridded joints reinterpreted the idea of the wall. In order for most load-bearing masonry walls to stand up, the joints must be staggered so that each brick will be supported by the one underneath. Without staggered joints, the bricks must be tied back to a structural wall behind it. The use of gridded joints at the Owens-Illinois research laboratory signified that the walls were not load bearing, but were supported by a steel frame. In addition, the use of glass blocks signified that glass could be used to build the same forms as those built with traditional masonry materials.

Figure 33 - Detail of the door at the Owens-Illinois Research Laboratory (photo from "Owens-Illinois Insulux Glass Masonry" trade catalog, published 1935)

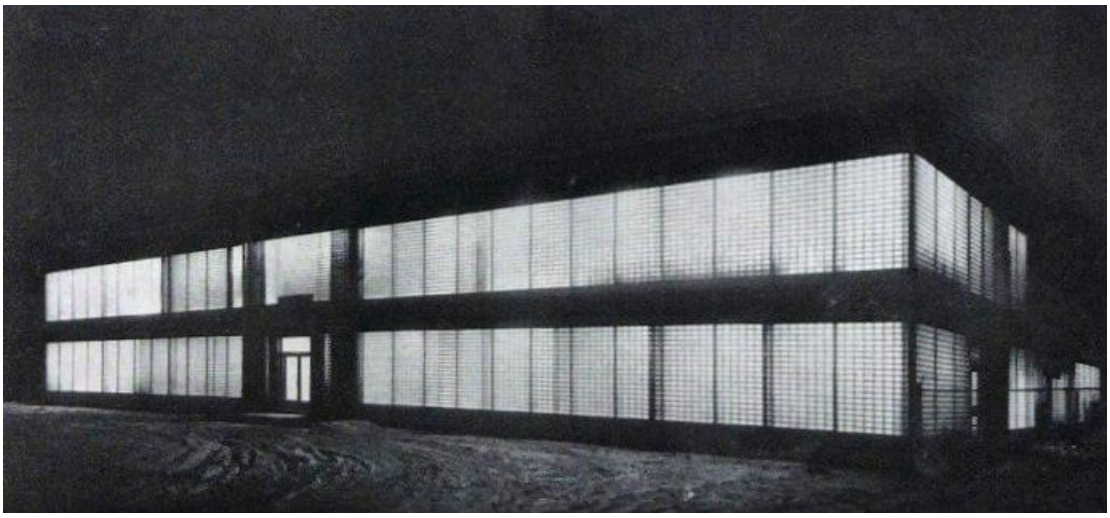


Figure 34 - The Owens-Illinois Research Laboratory, 1936 (photo from *Architectural Forum*, May 1936)

Another early use of glass block in a volumetric way is at the Campana Factory in Batavia, Illinois. Built in 1936 and designed by architect Frank D. Chase, the Campana Factory uses glass block to build its long, outstretched wings and central tower. Similar in form to the Glass Block building at the Century of Progress, the Campana Factory takes on a Classical structure and reinterprets it using a new material. Framed by buff brick and teal-colored terra cotta, the factory features strong horizontal lines, anchored from a tall central tower. This symmetrical form derives from Classical architecture, but here it is reinterpreted using both traditional ceramic materials (brick and terra cotta), and the newly-introduced glass block.

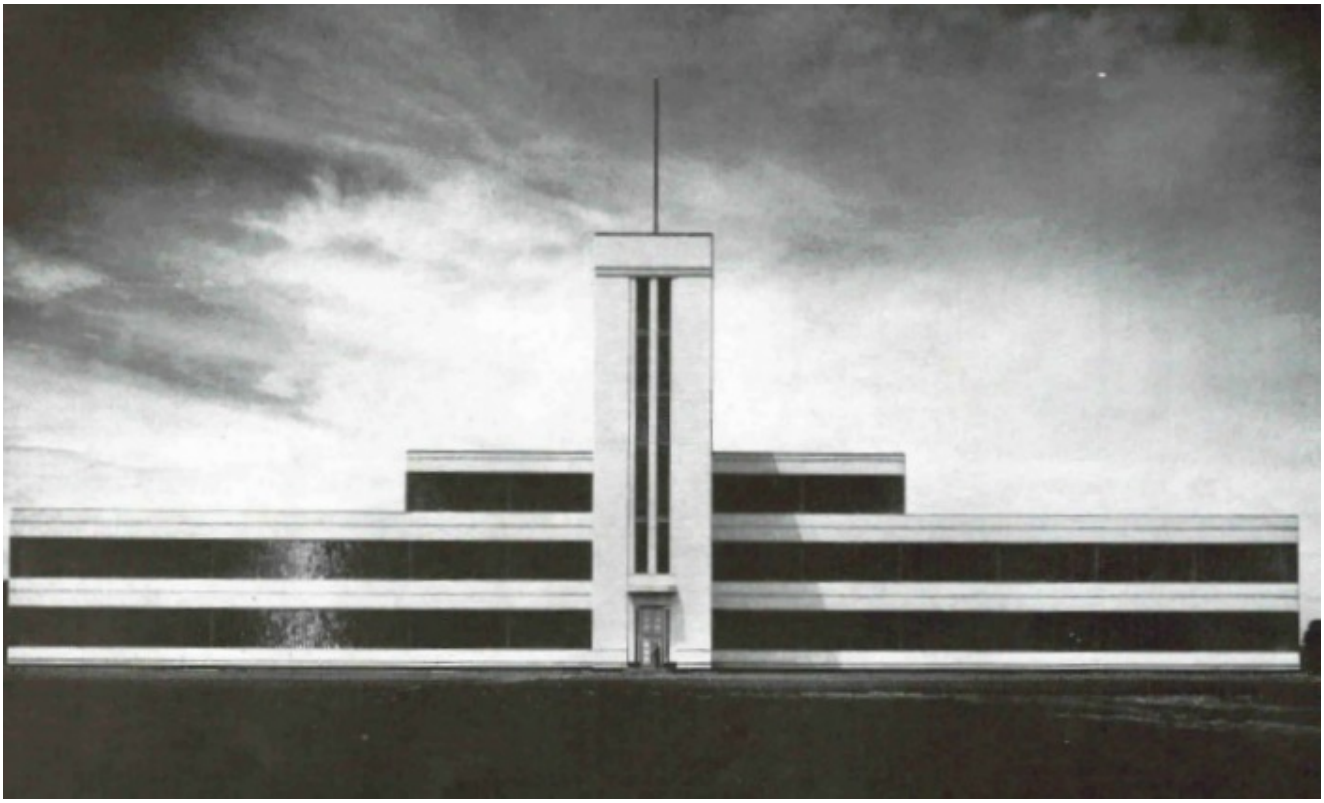


Figure 35 - Campana Factory, 1935, (photo from *Architectural Forum,* August, 1937, p. 114)

Figure 36 - Campana Factory, 1935, photographed 2011 (photo by David Schalliol)

Figure 37 - Campana Factory, 1935, photographed 2014 (photo by Laurence Pearlman)

While the Owens-Illinois laboratory and Campana Factory were experimenting with glass block walls, architects like William Lescaze and Morris B. Sanders continued to use blocks as an infill material. Morris B. Sanders, inspired by Lescaze's design, built his own glass block house just around the corner at 219 East 49th Street. The house was one of the more publicized early residential glass block buildings, although there were other houses which used this material around the same time, including Edward Durell Stone's Kowalski Residence and his Mandel Residence, which both featured curved glass walls and were built in 1934 in Westchester County, New York. The Morris B. Sanders house was utilized glass block mostly for its ability to keep out noise and dirt but still bring in light. Unlike the Owens-Illinois Laboratory and the Campana Factory, glass block was not a central feature of the Sanders Home. Here, glass block was used more out of necessity, for "when brownstone houses were built, city streets were not unpleasant places: sunlight was not at a premium, nor was the air yet vitiated by the stale fumes of gasoline. Today, however, a totally different picture greets the architect...a hermetically sealed refuge, designed as an escape from the noise and the dirt of its surroundings." In addition, central air conditioning would "eliminate the necessity for opening windows". [56] The house featured large, rectangular panels of glass block at the each floor, while the rest of the facade featured blue glazed brick. Smaller glass blocks are used on the first, third, and fifth floors and are flush with the façade. Larger glass blocks are recessed into the balconies on the second and fourth floors. Although there is a significant use of glass blocks here, they are not critical to the design. If the glass blocks were to be replaced with plate glass, the form and overall aesthetic of the building would not really change. The openings on the façade do not rely on the use of glass block, and if they were comprised entirely out of plate glass the building would still read as a Modernist building. In the case of, say, the Campana Factory, if glass blocks were to be replaced with plate glass, it would change the entire aesthetic of the façade. The Campana Factory's

[56] "House of Morris B. Sanders," *Architectural Forum* 64 (1936): 157-166.

design relies on its continuous walls of glass block, and the introduction of plate glass might interrupt this smooth, seamless wall.

Figure 38 - Morris B. Sanders House, 1935, photographed 2008 (photo by the New York City Landmarks Preservation Commission)

Figure 39 - The Richard Mandel Residence, designed 1934, photographed 2013 (photo by Roger Strauss III, from www.architizer.com)

Figure 40 - Kowalski Residence, 1934 (photo by Bill Maris, from www.architizer.com)

Chapter 4: Building Walls of Light - The Age of Glass Block, 1937 to 1940

During the 1930s, glass block became a fixture in many new Streamline Moderne and Modern buildings. Glass blocks provided numerous benefits in one single material. They not only let in light, like a window, but they provided insulation similar to masonry materials, were low maintenance, and easy to purchase and install due to their modular nature. Glass block was used in practically every building type, a sign of its popularity, and the following sections in this chapter will outline some of the ways in which architects used this material.

All architects, though, did not use glass blocks, in the same manner. Many Modern designs used blocks for their technical properties – such as light-giving and sound-proofing - rather than using them as an integral element of the design. While using the blocks for their technical value is by no means insignificant, architects' use of glass blocks in the short-lived Streamline Moderne form was arguably much more bold and daring, for it challenged notions of what a wall should be built of and what it should look like. The Streamline Moderne aesthetic introduced the idea that walls could be built with light. With glass blocks, the building itself could become a beacon – an advertisement of modernity.

The use of glass block in buildings blossomed between 1937 and 1940. As exemplified with the Owens-Illinois Glass Block Building and the William Lescaze House, the material was used in two different aesthetic paths: for volumetric walls and curves as part of the Streamline Moderne style; or for planar, infill material as part of the Modern and International Styles. While most significant uses of glass block fall into these two categories, there are, of course, a number of buildings which do not, and some that seem to straddle both aesthetics. These two aesthetic paths occurred concurrently, yet by the 1940s, as the International Style began to take hold, the use of glass block had changed. This decline of the material will be discussed more in the next chapter.

Glass Block, the Streamline Moderne, and the Modernist Styles:

Some of the most architecturally notable buildings using glass block were constructed between 1937 and 1940, and likely most of the buildings using this material were built during this time as well. During the height of glass block's use, the Streamline Moderne style was in full swing in America. Streamline Moderne and the use of glass block go hand-in-hand. Not all Streamline Moderne buildings used glass block, but it is a common feature of many buildings in this style. The development of this style of architecture did not come about because of glass block, but it can be argued that the material fueled the style's development and attraction.

The Streamline Moderne style grew out of Art Deco, although both labels "Streamline Moderne" and "Art Deco" were not created until many years after these styles were relevant. In the 1920s and 1930s, architects sought to adapt the Classical styles and worked towards the creation of a "new style". It was a time when American culture was at an exciting, fast pace, and numerous avant-garde movements were occurring in both the U.S. and in Europe. The Streamline Moderne style, in particular, found precedent in the designs of European architects like Erich Mendelsohn. Mendelsohn's works inspired later Streamline Moderne designs in America, as a number of his works used long, horizontal forms, curved corners, and large expanses of glass.

The Streamline Moderne movement began in the early 1930s and was inspired by the idea of speed and the machine. Lead by industrial designers such as Norman Bel Geddes and Walter Dorwin Teague, the style's visual vocabulary included the curve, the teardrop, and the uninterrupted horizontal line. This vocabulary was derived largely from the forms of high-speed modern transportation - planes, trains, and automobiles – all of which were redesigned in the decade with sleek, aerodynamic curves. A style that looked towards the future, Streamline Moderne architecture sought to lift America out of the Great Depression. The style was often used to remodel buildings (such as storefronts) rather than build new construction, since many building owners did not have

the financial means to build a new building. Although the Streamline Moderne style was popular for public and commercial buildings, it was not as common in residential architecture. Despite the futuristic designs of architecture, transportation, and new consumer goods, Americans still clung to revivalist styles in their homes, often living in idyllic Colonial Revival houses.

Although many Modern and International Style architects thought of themselves and their designs as completely separate from the Streamline Moderne movement, the two were closely related. In *The Streamlined Decade*, author Donald J. Bush mentions that both movements used aesthetics of

> starkness, severity, and commitment to the processes and aesthetics of the machine age. But where the work of the Stijl and Bauhaus masters was uncompromising in its adherence to a canon of geometric functionalism, the Streamlined Moderne was less strident in voice, and its forms were relieved by organic lines. It was marked by a combination of flat and curved walls, light in tone.[57]

Glass block worked well with the Modern and Streamline Moderne aesthetics because it was a machine-made material, and was never intended to appear otherwise. Both styles favored mass-produced, easy-to-install products. Architecture after the Depression favored cost-efficient building materials, and glass block's strength, light-giving properties, insulative properties, cleanliness, and ease of use and repair certainly made it an efficient, all-in-one material.

In the Streamline Moderne style, the use of curved lines lent itself to the use of glass block. It was much easier and less expensive to produce small units of curved blocks, whereas using curved plate glass for the same applications (i.e. Erich Mendelsohn) would have been too costly. The Streamline Moderne style was seen as new and up-to-date, therefore many corporations adopted it in the construction of their buildings. By projecting an image of progress and modernity, companies could attract more customers. For the Modern and International Styles, glass block was primarily used as a way to let in daylight and foster a relationship between the interior and the exterior, an

[57] Donald J. Bush, *The Streamlined Decade* (New York: G. Braziller, 1975), 133.

important theme in Modernist works. Glass blocks provided visual interest without using any additional ornamentation, and they also benefitted modern architecture's emphasis on functionalism. Because glass blocks were easy to maintain while at the same time providing insulation and cleanliness, a building which used the material could be most efficient.

Glass block may have also come into popularity in the 1930s because it was a material that, in a sense, eased the transition from a more Classically-focused architecture to the new Modern and International styles. By the 1930s, the use of wide expanses of glass had been largely accepted in European architecture. Buildings such as Gropius' 1913 Fagus Factory in Germany featured large, plate glass curtain walls. Yet, at the same time, many American building designs were still focused on the use of masonry walls and punched windows, despite the freedom of having a steel frame support. In 1932, the Museum of Modern Art featured an exposition on the International Style, which helped bring the style to the attention of Americans, although it would take time for this style to become accepted in American culture.

Glass blocks were sort of a "happy medium" between the masonry that American architects were comfortable with, and the glass walls of European Modern architecture. On one hand, the material provided a sense of freedom – the ability to build walls of light. Yet, on the other hand, American design was not ready for the full transparency of floor-to-ceiling plate glass windows in their homes and workplaces, as society was still largely conservative and apprehensive of the world around. It can be argued that Americans in the 1930s, still recovering from the Depression, were still cautious about the world and its realities. After suffering tremendous loss and hard times, one can imagine that Americans were not ready to live fully transparent lives, especially in their own homes, offices, schools, and stores. Glass blocks provided privacy, as they were translucent but not transparent. This material provided the best of both worlds – buildings could have large amount of

daylight pouring in, yet people did not have to look out onto the world, and outsiders could not look in.

"Architecture of the Night" – The Use of Glass Blocks as a Form of Advertisement

In the years following the Great Depression, America sought to lift itself from despair. Architecture was just one of the outlets through which the nation could express hope for the future. Although the building industry suffered after the Depression, it is a misconception that there was no new construction. In fact, the 1930s saw a great deal of new and innovative designs. For architects, the 1930s marked a time when advertising and consumer culture impacted architecture more than ever. Beginning in the 1920s, the advertising industry rapidly grew and changed. It was the age of the automobile, the radio, and other goods that were not truly necessities, but were advertised as such. During this decade, consumer credit became more available, and Americans began to purchase things that they really did not need, but wanted. By the 1930s, the advertising industry became even more influential, as companies urged people to continue spending and buying goods to boost the economy.

The consumer market was more competitive than ever before. It was often the case that many manufacturers produced the same product, and that the quality of the product was largely the same regardless. It became essential for companies to find ways to separate themselves from the pack and declare their product the "best". Earlier, around the turn of the century, advertisements mainly just stated basic information and product price, so that it was up to the customer to comparison-shop. Yet by the 1930s, as there was little variation in product, advertisers had to come up with ways to sell their product to consumers and convince them that they *needed* this product, without much text or tangible product information. Advertisements became largely graphic and illustrated, with bright colors and bold letters to sell goods.

In this ever-competitive culture, architecture also was affected by changes in advertisements. Buildings were yet another medium through which companies and owners could exert their influence and convince others that their establishment or product was worth the time and money of consumers. Architects began to design buildings with large, illuminated signs and stylized forms to draw the eye of passersby. The Streamline Moderne, in particular, was one of the first architectural styles to incorporate electric lighting into its design

By 1930, two-thirds of American households had electricity. The rise of corporations and the growth of cities lead to illuminated skylines in places such as New York, Chicago, and Los Angeles. This decade introduced the idea of electricity and illumination as advertisements. With the help of illumination, buildings would become billboards. As author Jane Brox states of the illumination of buildings, "lighting effects…not only enhanced and punctuated the detail of the buildings but also granted structures a distinct appearance at night, completely different from the way they appeared during the day. And architects could now design buildings constructed almost entirely of glass, which not only showed off interiors at night but also made interior lighting integral to exterior illumination." [58]

In 1930, architect Raymond Hood coined the term "Architecture of the Night", the title for a promotional magazine published by General Electric. The magazine featured essays by prominent architects about the different ways in which electricity could showcase architecture through nighttime illumination. This publication came at a time when the illumination of buildings was becoming a central part of architectural planning and design. Beginning in the 1920s, architects were carefully constructing lighting arrangements for their buildings so that they would stand out in the darkness. As architectural historian Dietrich Neumann states, "No other artistic medium of the

[58] Jane Brox, *Brilliant: The Evolution of Artificial Light* (Boston: Houghton Mifflin Harcourt, 2010), 211.

twentieth century has crossed the boundaries between art and commerce, technological display and utopian vision, easy entertainment and demagogic politics as effortlessly as this."[59]

The introduction of glass block provided a kind of nighttime illumination that could not be found with exterior lighting, or even neon signs and floodlights. When glass blocks were viewed at night, they became walls of light themselves. Glass blocks emanate a glow from within that is difficult to replicate in any other way, because the use of glass in this form makes light into something tangible. Arguably, glass block was not viewed by many architects as a window material, but rather as a masonry unit. The blocks had modular dimensions and were similar to bricks or stone in that they were placed on top of each other and held together with mortar. In addition, as will be discussed later, the blocks were similar to other masonry materials, like brick, since they provided good insulation and durability. Henceforth, architects used this material to compose entire walls in place of brick, stone, or concrete. By doing so, the wall was transformed from a static, opaque plane into a dynamic one with illumination and glow. The exterior appearance could change moods in an instant - if only a few lights were on the inside, the building could give off a subtle warmth, and if all of the lights were on inside it would give off an entirely different feel, that of excitement and splendor.

[59] Dietrich Neumann, *Architecture of the Night: The Illuminated Building* (London: Prestel, 2002) 7.

The Attributes of Glass Block:

The widespread use of glass block in the 1930s was not only due to its aesthetic value, but also to its technical properties. Because of how glass blocks are constructed - two molded glass sides sealed together, creating partial vacuum in the hollow center - they could provide a number of beneficial properties combined into a single material. Earlier glass blocks were sealed with a metal alloy. In 1938, Pittsburgh Corning had introduced their patented "all-glass" unit, which replaced the metal seal with a glass seal, formed by fusing the blocks together at a high temperature. Although trade catalogs of the period were meant to convince customers to buy glass blocks, these publications are good sources of information on the value of this building material. These properties (adapted from a variety of trade catalogs dating from 1935 to 1950) included:

- Light transmission – Glass blocks were transparent, but not translucent. Depending upon the cutting pattern on the glass, different percentages of light transmission were possible. While transmitting light, the rays are distorted and diffused, which reduces glare.
- Sound-proofing – The hollow center of the blocks helped to buffer noise, making for a quieter home and workplace.
- Fire-proofing – Glass blocks were resistant to fire.
- Insulation – The partial vacuum in the center of the block worked to retard heat rays and help maintain the temperature of a building's interior. In addition, the blocks were resistant to condensation, since the interior face of the block would remain at a stable temperature. It was claimed, by 1936, that glass blocks had an equal insulating value to 16 inch thick clay brick walls.
- Durability – Glass blocks, although not load bearing, were resistant to cracking and deterioration. In addition, the non-porous surface of the glass was easy to clean.
- Easy Installation – Glass blocks could be laid by regular masons, as their installation was similar to clay bricks. By using mortar, glass blocks could be erected easily and efficiently.
- In addition, glass blocks were a modular material, therefore made purchasing and installation easier because they came in a variety of standardized dimensions. As more patterns began to be introduced, owners and architects were afforded more design choices.

Some of these values were prized more than others, depending upon the use of the building. While America was still recovering from the Depression, it is likely that glass block was popular because it was a material that offered the best "bang for your buck". Glass blocks provided numerous

beneficial qualities in one single material. They not only let in light, like a window, but they provided insulation similar to masonry materials, were low maintenance, and easy to purchase and install due to their modular nature. Glass block was used in practically every building type, a sign of its popularity, and the following sections will outline some of the ways in which architects used this material.

Glass Block in Commercial Architecture:

Some of the most interesting uses of glass block occurred in commercial architecture. As a new, modern material, glass block helped companies project the image that their goods and services were up-to-date and of the latest fashion. Nationwide, companies built using glass block, or remodeled facades and storefronts to include the material. From theaters, to gas stations, offices, department stores, to restaurants and radio stations, practically every type of commercial architecture that used glass block. Two of glass block's greatest advantages for commercial buildings were its ability to bring in daylight, and its ability to give off electric light from within at night.

A fine example of glass block's use in an office building is at the Corning-Steuben building, now demolished, located at the southwest corner of Fifth Avenue and Fifty-Sixth Street in Manhattan. Construction on the building began in 1936 and was completed in the 1937, with designs by William and Geoffrey Platt and John M. Gates. Although the building was clearly designed to emphasize glass blocks, since it housed a glass block manufacturing company, this building is nevertheless a good example of how the light-giving properties and modular nature of the material could be adapted to many forms of design, including the Stripped Classicist aesthetic of this building. The Corning-Steuben building was five stories tall and featured glass block walls, framed by panels of Indiana limestone. The 3,800 glass block units used in the building were larger than what the company would produce later, and were at around one foot square and four inches thick.

An article in the *New York Times* mentions that the glass used for the blocks was the same heat-resisting glass used in the manufacture of their Pyrex ovenware. In the design of the building, the fluted pattern on the blocks was arranged differently for different walls. The fluting ran horizontally on one wall, and vertically on the opposite wall to provide better light transmission and more diverse decorative lighting effects. The building was also innovative in its use of glass blocks as a veneer that concealed floor levels and supporting columns. According to architect William Platt, the fluted pattern of the blocks helped to obscure vision just enough that these structural elements were not readily visible. According to one source, had it not been for an "obsolete provision in the building code a masonry wall panel of eighteen inches between floors…would have been required."[60]

Figure 41 - Corning-Steuben Building, 1937 (photo by the Wurts Bros., from the Collection of the Museum of the City of New York)

[60] "Last Block Laid On Building of Glass Exterior," *New York Herald Tribune,* June 6, 1937, D7.

Figure 42 - Interior of the Corning-Steuben Building, 1937 (photo by Gottscho-Schleisner, from the Gottscho-Schleisner Collection at the Museum of the City of New York)

Other commercial examples of glass block include a number of department stores, bus depots, and banks. Designed in 1936 and completed in 1937, the Wieboldt's Department Store in Oak Park, Illinois, is one of the best and earliest examples of a type of glass block "palace of retail". Here, glass block was used in full force as an advertisement of the store and the variety of goods it offered. Designed by architects Holabird & Root, the store is set on a corner lot and features a curved central axis and two wings extending back from this curved center. Glass block is used in a large panel at the curved cored, and in long horizontal strips running the length of the wings. The remainder of the building is constructed of Indiana limestone. At the start of construction in 1936, the store was predicted to be "the world's most modern department store in both design and equipment". The store was noted upon for its "extreme modern design" and windowless facade, different from the six other Wieboldt's stores built earlier. This store showed a clear departure from the company's other locations, marking the company as wholly up-to-date with the latest trends.

Figures 43 & 44 - Wieboldt's Department Store, 1937 (photos from the Chicago History Museum/Getty Images)

Other influential glass block department stores were the Benson & Rixon store in downtown Chicago and Coulter's Department Store in Los Angeles. The Benson & Rixon store was designed by Alfred S. Alschuler and built in 1937. Located at the corner of State and Quincy Streets, the store replaced a historic 1892 clothing store and saloon with a fully-modern and Streamlined new structure. Similar to the Wieboldt's Store, the Benson & Rixon store featured horizontal streaks of light across its façade. The Coulter's Department Store, built in 1938-1939 in Los Angeles, was an embodiment of a Streamlined box that functioned as a machine for merchandise. Designed by Stiles O. Clements, the building featured a massive rectangular panel of blocks above the main entrance, which ran the full height of the building. In addition, thin strips of glass block ran along the building at each floor, curving around the façade. These blocks brought in daylight which would fill the floors and help products appear their best, rather than being displayed under artificial light. The glass blocks on the façade shimmered in the daytime and glowed in the nighttime, providing a spectacle that would make any passersby want to come in and see this ultra-modern store for themselves. The construction of the building was regarded as a "wide forward step" for the Coulter's company, which had been in operation since 1878 and was regarded as one of the pioneering establishments in Los Angeles. Here the Streamline Moderne style, with the help of glass blocks, helped the company revamp its image and usher it into the ever-competitive modern age of consumer culture, where businesses relied on flashy stores to set themselves apart from the rest.

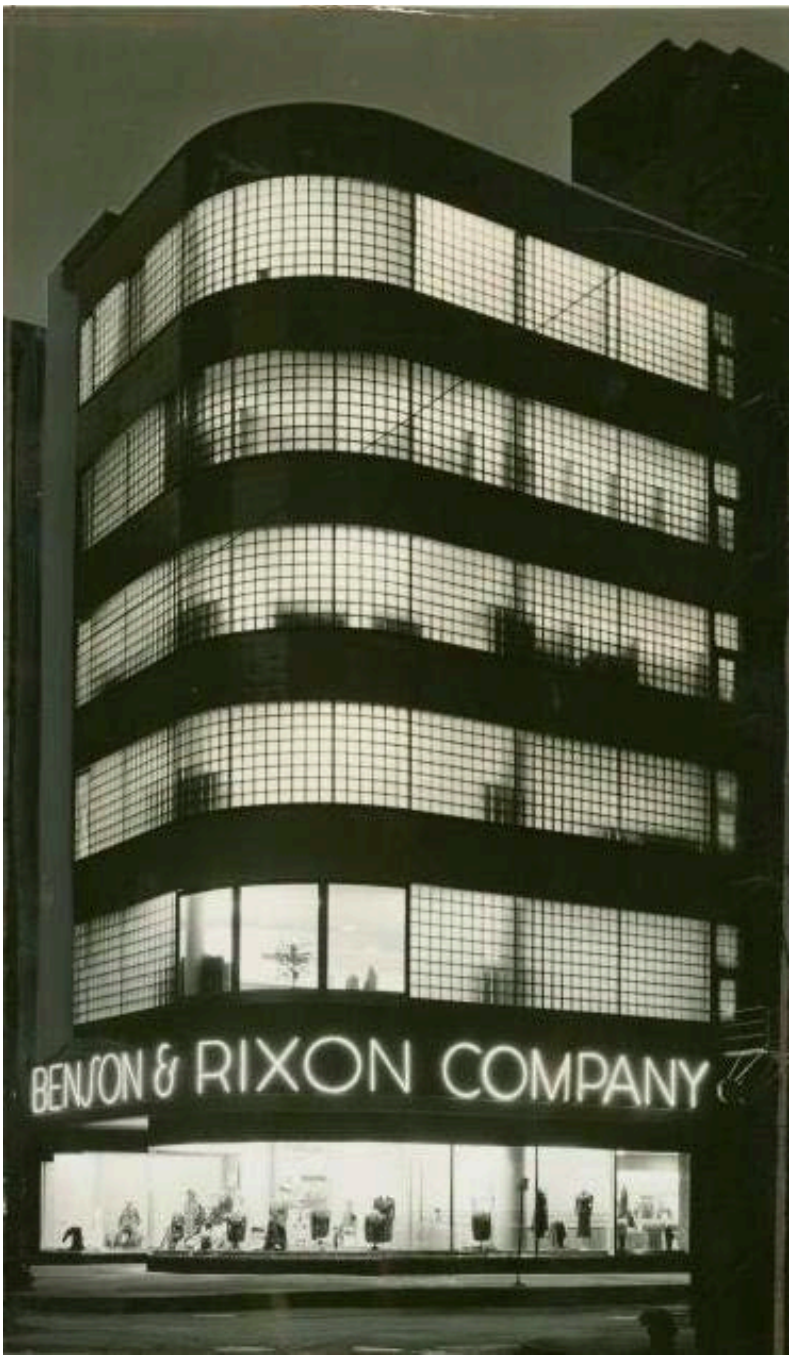


Figure 45 - Benson & Rixon Department Store, photographed 1938 (photo by Hedrich-Blessing, from the Irma and Paul Milstein Division of United States History, Local History, and Genealogy at the New York Public Library)

Figure 46 - The former Benson & Rixon store, photographed 2013 (photo by Lynn Becker, www. arcchicago.blogspot.com)

Figure 47 - Coulter's Department Store, 1939 (photo from the Julius Shulman Photography Archive, Research Library at the Getty Institute, accessed via the LA Conservancy website, www.laconservancy.org)

Movie theaters and glass blocks were a perfect pairing. Whether comprising dramatic curved walls, (as seen in the 1937 Webster Theater in Hartford, Connecticut and the 1942 Auburn Theater in Rockford, Illinois) or creating strong vertical pillars (as seen in the 1937 Cine Theater in Chicago), glass block provided a unique type of lighting that artificial lights and neon signs could not offer. A large number of movie theaters in the 1930s and into the 1940s featured large applications of glass blocks, which gleamed and glittered in the night to signal to customers that the latest screen spectacle could be found inside. The illumination of the glass blocks was a supplement to the signage and artificial lighting on the exterior of the theaters. While some of these theaters remain in good condition today and retain their historic blocks, a number of them (such as the Cine Theater),

no longer retain their glass blocks, and have lost most of their original character. What once made these theaters so glamorous and visually-arresting, now is a remnant of the past.

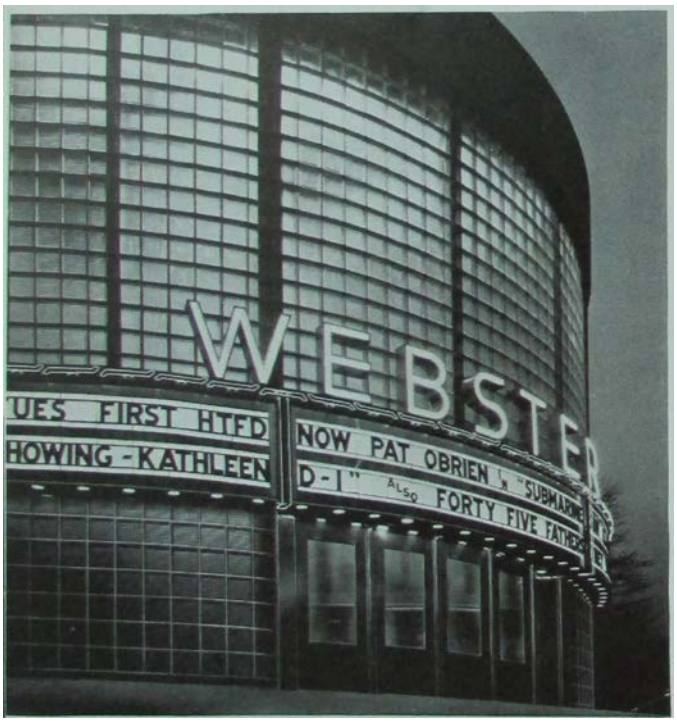


Figure 48 - The Webster Theater, 1937 (photo from "PC Glass Blocks: A Modular Product", trade catalog published in 1946)

Figure 48 - The Webster Theater, 1937 (photo from "PC Glass Blocks: A Modular Product", trade catalog published in 1946)

Figure 50 - The Auburn Theater, 1937 (photo from "PC Glass Blocks, A Modular Product", trade catalog published in 1947)

Figure 51 - The Auburn Theater, photographed 2006 (photo from www.cinematreasures.org)

Figure 52 - The Cine Theater, 1937 (photo from "Owens-Illinois Insulux Glass Block Makes Stores, Shops, and Restaurants More Attractive", trade catalog published 1938)

Figure 53 - The former Cine Theater, photographed 2011 (photo from www.cinematreasures.org)

Aside from department stores and movie theaters, other commercial buildings used glass blocks in visually interesting ways. The Star Electrical Supply Company Building, built from 1936 to 1937 and located in Newark, New Jersey, used vertical strips of glass block to accentuate their building and the goods sold within. The rectangular panels of glass block wrap around the corner of the building, similar to how masonry quoins wrap around the corners of Classical buildings. In addition, a thin column of blocks at the corner of the ground floor store window evoke the traditional cast iron columns found at the corners of many retail buildings. As we have seen before, this building takes traditional building elements and reinterprets them with glass blocks. Instead of masonry quoins and cast iron columns, which have opacity and mass, the building is transformed

with a translucent masonry. At night, the Star Electrical Supply Company Building was even more impressive, an embodiment of artificial lighting and possibilities it could provide, complete with hundreds of lamps on display in the ground floor windows.

Figure 54 - Star Electrical Supply Co. building, 1937 (photo from *Architectural Forum,* August 1937)

Figure 55 – Detail of entrance, Star Electrical Supply Co. building, 1937 (photo from *Architectural Forum,* August 1937)

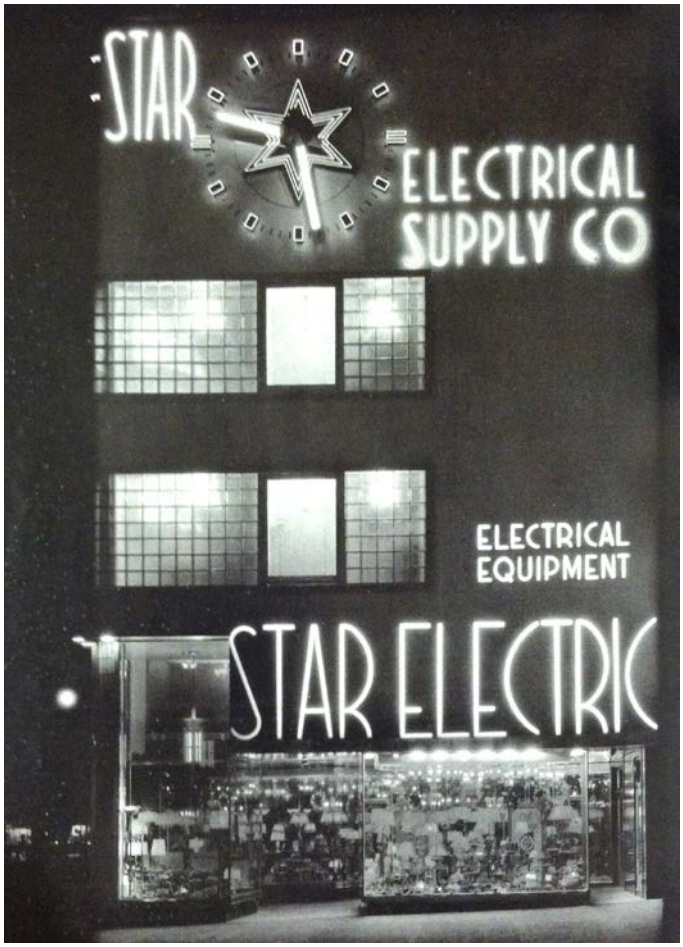


Figure 56 - Star Electrical Supply Co., 1936 (photo from *Architectural Forum*, May 1936)

Other commercial buildings used glass block to comprise the entirety of the structure. The National Cash Register Company building in Miami, Florida, exemplifies how a wall of glass block can become a billboard. Designed by Robert F. Smith from 1940 to 1941, the building is a simple, large, flat rectangle of glass blocks, with plate glass storefront windows at the base. The glass blocks, when illuminated at night, act as a backdrop for the National Cash Register sign hung upon the façade.

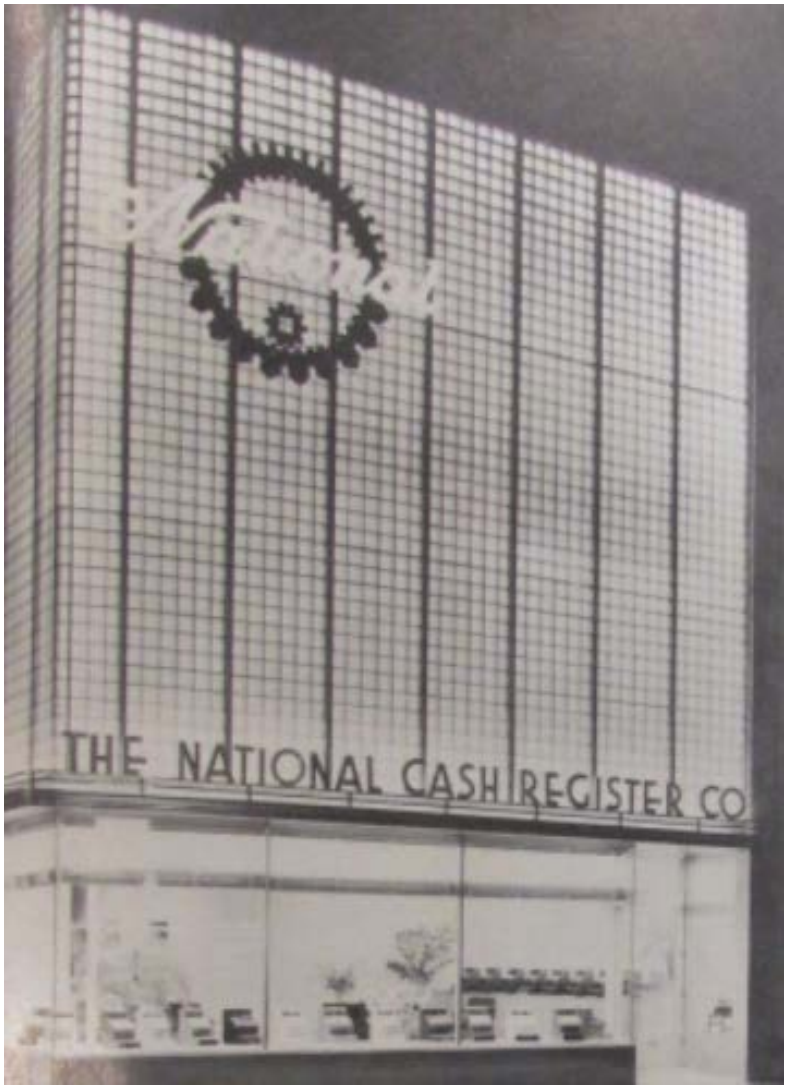


Figure 57- The National Cash Register Company, 1941 (from "Owens-Illinois Insulux Glass Block", trade catalog published 1944)

One of the best examples of the commercial use of glass block is the Direct Oil Service Station, designed in 1937 by Arthur Brammer and located in Minneapolis, Minnesota. This building fully encapsulates the idea of "translucent masonry". Here, a Classical form is reinvented with light. A vertical tower, accented by thin setbacks on and rounded wings on either side, draws from traditional architectural composition. But rather than taking this traditional form and using a masonry material with applied artificial lighting, such as an illuminated sign or floodlight, the building has a much more dramatic effect as it is *made* of light. The fact that a building could be constructed of light with the use of glass blocks helped commercial buildings become more striking and attractive to potential customers.

Figure 58- Direct Oil Service Station, 1937 (photo from Hulton Archive/Getty Images)

Glass Block in Industrial Architecture:

As seen in Chapter Three's discussion of the Campana Factory, glass block found great success in industrial architecture. By 1940, over seven million glass blocks had been used in industrial projects alone. Because glass block's hollow center helped to give it good insulation value, factories could be more effectively climate controlled, especially coupled with the use of air conditioning. In factories where a humid environment was required, glass block resisted condensation as well. The non-porous surfaces of the blocks were easy to clean and did not trap dirt, a benefit to companies where sanitary conditions were strictly maintained. The light-giving and light-diffusing properties helped to cut down on electricity bills, and provided better, safer daylighting for employees. In chemical factories with acidic environments, glass block offered an advantage over wood and steel sash windows, as the former was less affected by acidic atmospheres than the latter, which could deteriorate easily.

Glass blocks were heavily advertised for remodeling projects, especially in industrial buildings. Owens-Illinois and Pittsburgh Corning often published advertisements and catalogs specifically geared to the industrial building owner, explaining how they could use glass blocks for a "window modernization program". With phrases such as "Old buildings don't have to *look* old", and "Old buildings can give *new* service", these manufacturers published a number of examples where old plate glass windows were successful replaced with glass block.[61] Indeed, this was a popular use for the product, although it is unclear if the use of glass block was more popular for the remodeling of old industrial buildings over new design. Companies like Pittsburgh Corning cited examples of remodeling projects where, in one building, it was possible to remove one third of the radiators in the building because of the insulating values of the blocks. It is likely that the poor economic state of

[61] Pittsburgh Corning Corporation, "How to Modernize Old Windows with PC Glass Blocks" (Pittsburgh Corning Corporation: 1954).

the country in the 1930s meant that more building owners and companies chose to remodel industrial building to make them more efficient, rather than take on the cost of building a new structure. This is one of the reasons why glass block was so popular in the post-Depression years – it could update and modernize a building, and it took the pressure off cash-strapped owners to build a new structure to keep up with the times. Below is an example of an industrial building in which the façade was modernized with new glass block.

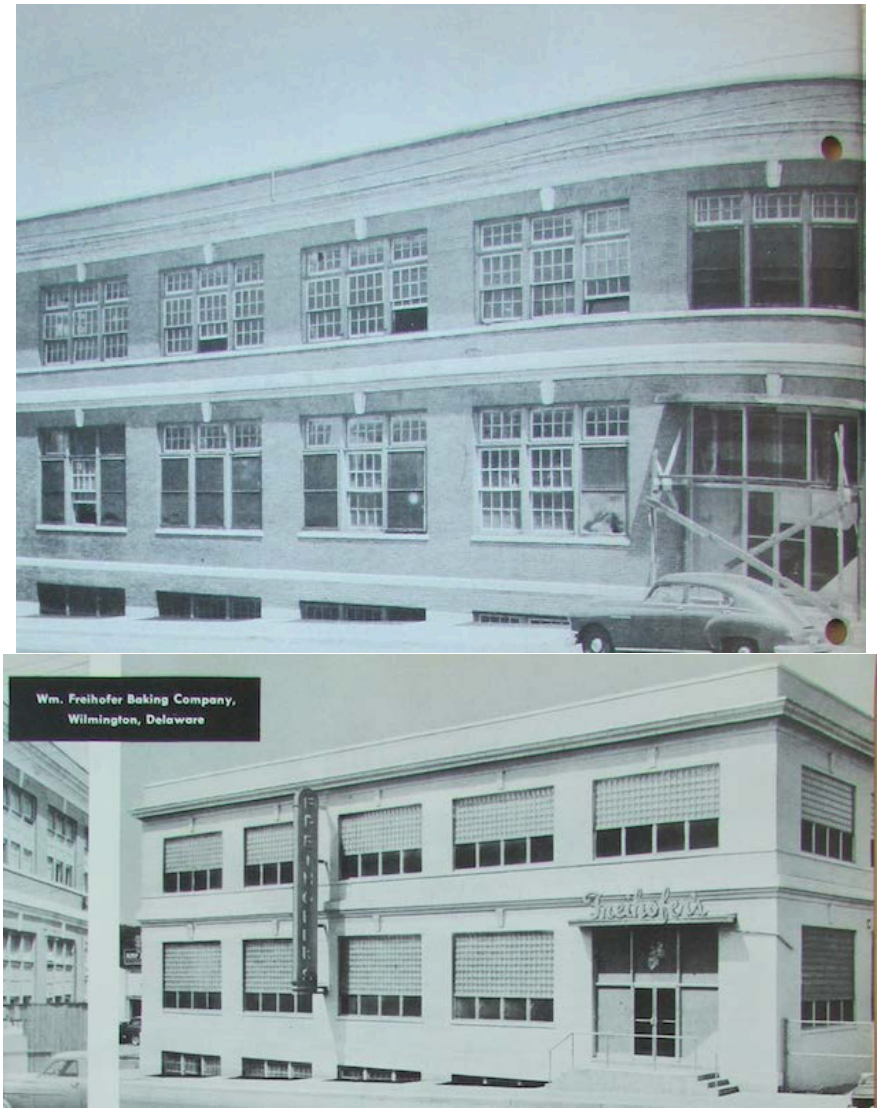


Figure 59- Above, the Wm Freihofer Baking Company in Wilmington DE before renovations, Below: The Bakery after remodeling with glass block (from Pittsburgh Corning's "How to Modernize Old Windows with PC Glass Blocks", published 1954)

The Hecht Company Warehouse, located in Washington, D.C., is one of the best examples of glass block's industrial use, and also one of the best examples of a building which uses glass block as the central, statement-making material. The majority of the building's facade is composed of glass blocks, only interrupted by horizontal stretches of brick between each floor. The warehouse was completed in 1937 and designed by the firm of Abbott, Merkt & Company. The Hecht Company, major department store retailers in Washington, built the new warehouse in order to centralize their operations and increase stock capacity. In a pamphlet published by Owens-Illinois about the Hecht building, the president of the Hecht Company remarked, "We selected Owens-Illinois glass block for a several reasons...with them we could produce a striking architectural effect…they gave us a uniform and satisfactory lighting in the interior of the building…and the low cost per square foot of wall area was little more than brick construction". The building adopted the Streamline Moderne style, and included Expressionist influences as well, seen in the crystal-like motif at its roof. This faceted dome at the top of the building is designed, in a way, to look like a shimmering beam of light.

Figure 60 - The Hecht Co. Warehouse, 1937 (photo by Theodor Horydczak, from the Horydczak Collection at the Library of Congress)

Figure 61 - The Hecht Co. Warehouse, 1937 (photo from "The Hecht Co., Washington D.C., Builds With Owens-Illinois Insulux Glass Block", trade catalog published 1937)

Figure 62 - Detail of the rooftop "crystal" at the Hecht Co. Warehouse, photo taken 2008 (photo from Architectural Preservation Services)

Figure 63 - The Hecht Co. Warehouse, photo taken 2012 (photo by Superbass/Wikipedia)

The American Rolling Mill Co. Research Laboratory, located in Middletown, Ohio, is an example of the quintessential Streamline Moderne factory design. Designed in 1937 by Harold Goetz, the building features a horizontal strip of glass blocks running along the length of the building's extended, curved wings. The entrance is in the central axis of the building, and its vertical form with its aluminum striping provides a contrast to the seemingly endless horizontality of the rest of the building. Other industrial buildings, as seen in the images below, used compositions similar to the American Rolling Mill building.

The use of glass block in industrial buildings advertised that the company which operated out of a sleek, Streamlined building was also a company that was up-to-date, aware of the latest technologies, and would provide the best possible product to its customers. Often, corporations used glass block in a similar aesthetic style for multiple buildings, creating a company-wide architectural style. Such companies include Coca-Cola, who constructed a number of Streamline Moderne bottling plants across the country, as well as the Canada Dry company, who used a similar building form for multiple factories, although these were built later in the 1940s. Many of these Canada Dry plants still exist today.

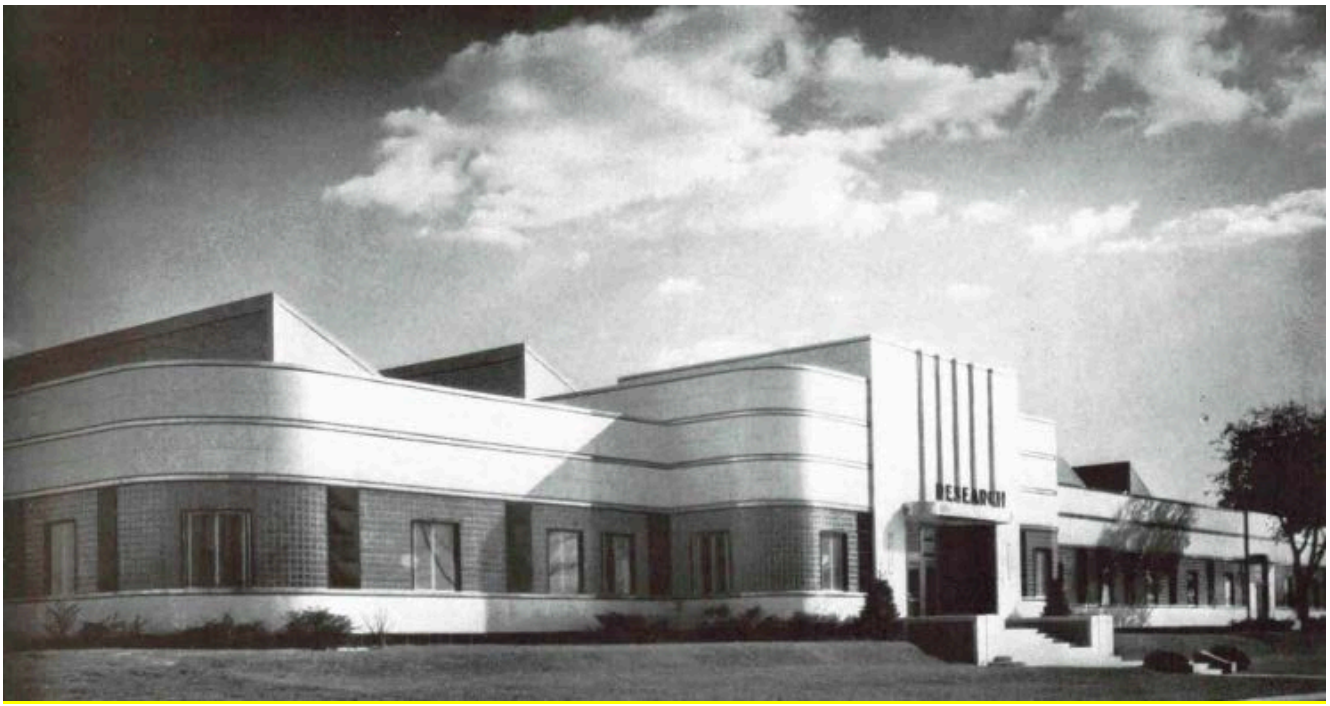


Figure 64- American Rolling Mill Co. Research Laboratory, 1937 (photo from *Architectural Forum*, December 1937)

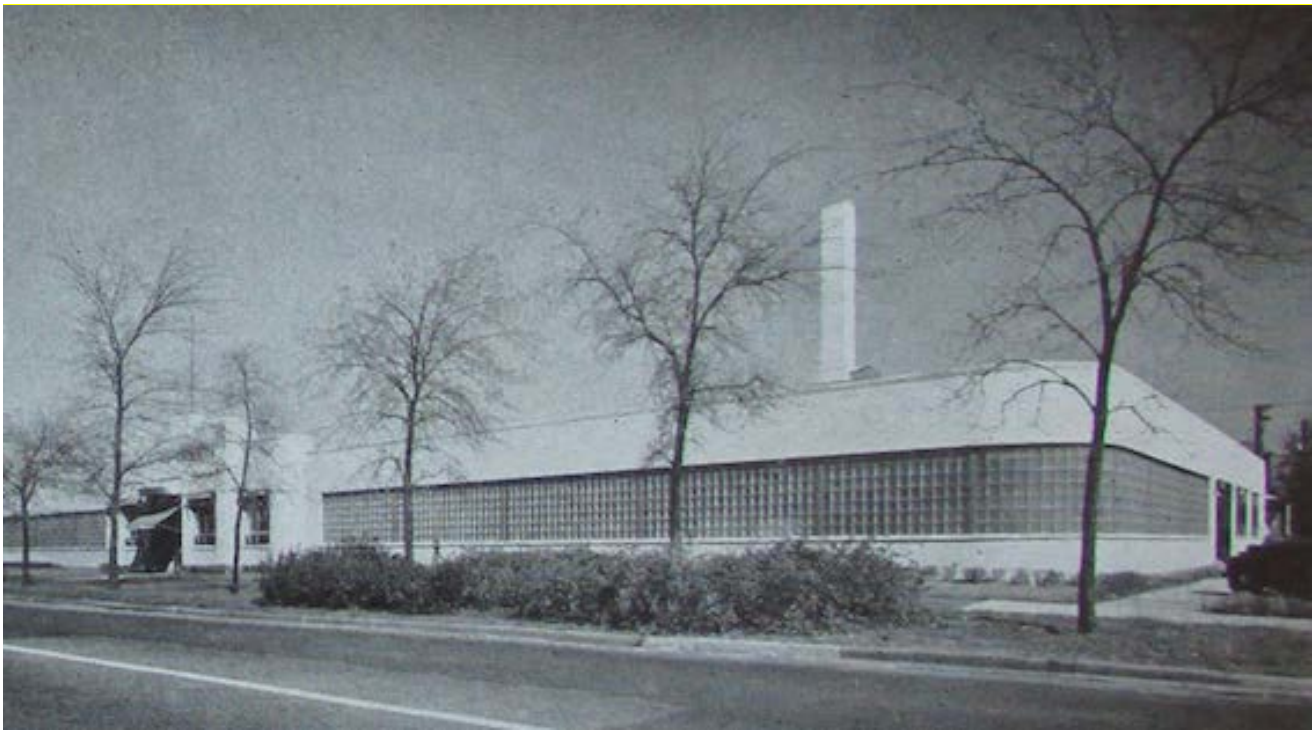


Figure 65 - Another example of the typical Streamline factory composition, Central Ice Cream Company, Chicago, Architects Jensen & Teutsh (photo from "1944 Owens-Illinois Insulux Glass Block" trade catalogue, published 1943)

Figure 66 - Canada Dry, Orange, NJ, built 1940 (photograph date unknown, from www.silverspringhistory.homestead.com)

Figure 67 - Canada Dry Plant, Minneapolis, architect Walter Covy, built 1946 (photograph date unknown, from www.silverspringhistory.homestead.com)

Figure 68 - Canada Dry, Silver Spring, MD, built 1946, photographed 2012 (photo by RockNRoll Doctor, www.panoramio.com)

Figure 69- Canada Dry, San Diego, built 1947 ((photograph date unknown, from www.silverspringhistory.homestead.com)

Glass Block in Residential Architecture:

One of the primary reasons for the use of glass block in residential architecture was to provide light to the interior, while still retaining privacy. Glass block was used for residences in both urban and suburban settings, but its ability to obscure the outside world while transmitting cheerful daylight made it even more well-received in urban areas.

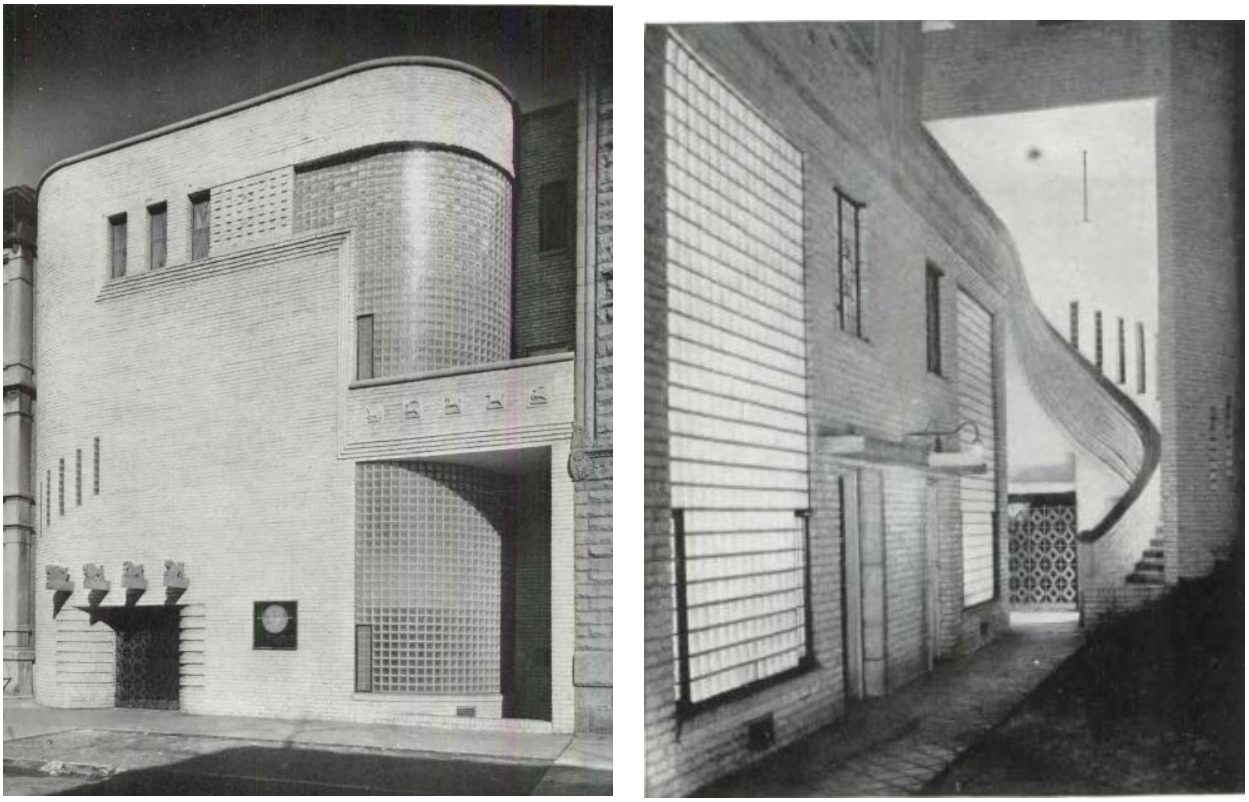


Figure 70 - Frank Fisher Apartments, Left: Front façade, Right: Interior courtyard, 1937 (photo from *Architectural Forum,* May 1937)

Figure 71 - Frank Fisher Apartments, view of side elevation, 1937 (photo from *Architectural Forum*, May 1937)

The Frank Fisher apartments, designed by Andrew Rebori, are an example of the extensive use of glass block in a residential building. Built in 1936, the four story building is comprised mainly of white-painted brick and glass block. With elements of Streamline Moderne curves, seen on the street façade, and Art Deco-inspired ornamentation for artist Edgar Miller, this building fully embraced the use of glass block for both aesthetic and technical purposes. The narrow building features 13 apartment units, set off of a rear courtyard that runs the length of the lot. The duplex units are accessed via this courtyard. Around 90 percent of the building's openings are filled with glass block, which provided light to the narrow, urban setting and privacy for residents facing the courtyard. Two-story high glass block walls are a dramatic feature of the courtyard façade, and are an exemplary use of how the material could be an asset in urban environments by providing both daylight and privacy. On the street façade, the dramatic curved glass block wall is just a hint to the passersby at the innovative design to be found within.

Figure 72 - The Frank Fisher Apartments, photographed 2014 (photo by Curbed Chicago)

Figure 73 - Walter Gropius House, built 1938, photographed 2011 (photo from www.archdaily.com)

The Walter Gropius house is an example of glass block's other aesthetic use, this time in the International Style. Famed architect Walter Gropius used the material for his home built in 1938 in Lincoln, Massachusetts. Here, Gropius used glass block in an angled panel that partially shields the entry door, as well as for an interior partition separating the study and dining rooms. According to Gropius's daughter, he and his wife were "gluttons for light". Here, the interior glass blocks worked to draw in light, and diffuse it across the rooms with their ridged surfaces. While still retaining privacy for the study, this interior partition provided a sense of lightness without adding a heavy masonry wall. This use of the glass blocks aligned with the International Style's ideals, which included "a sense of volume as opposed to solidity, regularity as opposed to symmetry, and detail achieved through the intrinsic elegance of materials, technical perfection, and fine proportions as

opposed to applied ornament." In addition, the design of this structure shows how a machine made, mass-produced material could be used in very different ways – from the austere International Style, to the futuristic curves of the Streamline Moderne.

Figure 74- Interior partition, Walter Gropius House, 1938, photographed 1988 (photo by Jack Boucher, the Historic American Buildings Survey, from the Collection of the Library of Congress)

The Third Avenue Cottages, located at 1370 Third Avenue in Manhattan, were a prime example of how glass block's technical properties could be used advantageously. Designed by E.H. Faile and built in 1937, the Cottages used long, horizontal panels of Insulux glass block on its street façade to keep out noise and maintain privacy, which was crucial because of the building's location adjacent to the Third Avenue elevated train. The trains, which would rattle by at high speeds,

resulted in high noise levels, pollution, and prying eyes. Coupled with the use of glass block, the building also had a central ventilation system so that the few pane glass windows on the street façade would not have to be opened.

Figure 75 - Third Avenue Cottages, 1937 (photo from *Architectural Forum*, August, 1937)

Glass Block in Institutional and Civic Architecture:

Glass block also found popularity in institutional and civic projects. In places like schools and hospitals, glass block provided an abundance of daylight with no glare, which was useful for both students and surgeons alike. In addition, the 1930s saw an increased amount of civic

architectural projects due to the creation of the Public Works Administration (PWA) in 1933, a program created by President Roosevelt's New Deal which provided employment for millions of workers on public works projects across the country. The PWA built roads, bridges, dams, hospitals, and schools, to name a few. Most often, PWA buildings were designed in Art Deco, Stripped Classicism, or Streamline Moderne styles, and glass block was a common material used. One of the largest applications of glass block in the 1930s was in the construction of the Grand Coulee Dam, built from 1933 to 1962 on the Columbia River in Washington State.

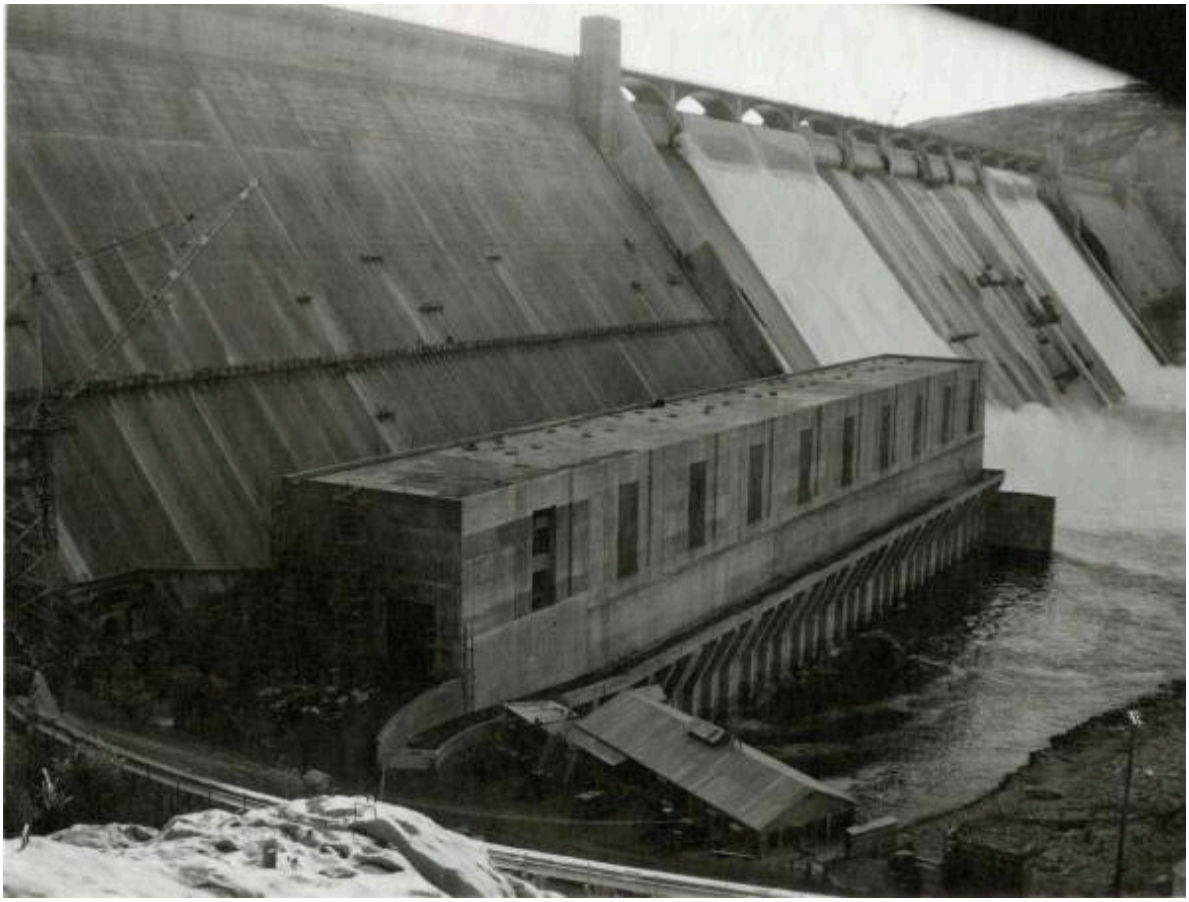


Figure 76 - East Powerhouse of the Grand Coulee Dam, photographed 1942 (photo from the Digital Collections of Washington State University)

Figure 77 - Construction of West Powerhouse windows, photographed 1942 (photo from the Digital Collections of Washington State University)

Funded by Roosevelt's PWA, the dam created a reservoir pumping water to more than a million acres of drought-ridden farmland. Today, the Grand Coulee Dam is one of the world's largest sources of hydroelectric power, and is also the largest concrete structure in the United States.[62] For the Dam, Owens-Illinois supplied 13, 560 glass blocks used in 6,650 square feet of window openings. The blocks were chosen by the Bureau of Reclamation, builder of the site, primarily because they provided a large amount of daylight into the powerhouses without having to spend extra on artificial lighting. In addition, the blocks insulating qualities helped to cut down on

[62] Christian McClung, "Grand Coulee Dam: Leaving A Legacy," University of Washington, last updated 2009, https://depts.washington.edu/depress/grand_coulee.shtml#_edn25.

heating costs, especially important because it would be counterproductive to spend a large amount of money on heating and light for a building whose purpose was to provide energy.

Figure 78 - Astoria Park Pool, 1936 (photo from *Architectural Forum,* August 1937)

Another notable glass block civic project is the Astoria Park Pool in Queens, New York. Built from 1934 to 1936, the pool house features large vertical panels of glass block and was among the earliest uses of glass block in the city, and possibly the first use in New York for a public building. Designed by Aymar Embury II and John M. Hatton, the pool was part of the federally-funded Works Progress Administration (WPA), which helped construct 11 pools in New York City, all of which opened in 1936. Similar to the Public Works Administration, which helped fund the Grand Coulee Dame, the Works Progress Administration was founded in 1935 and built public works projects all over the country, except these projects employed unskilled laborers instead of

contracting the projects out to professionals, which is how the PWA operated. In the design of the Astoria Park Pool, the WPA required the cheapest building material were to be used, and most WPA projects relied heavily on brick and concrete. Here, the use of clay brick and glass block in the Streamline Moderne aesthetic provided a pleasing design while still being cost-effective. In addition, the pool's technologically-advanced water heating and cleaning mechanical systems needed to be housed in a structure which offered proper insulation and protection from the elements, which glass block provided. Finally, the majority of the structure was used as locker rooms for pool visitors, therefore privacy was a necessity.

Figure 79 – Locker rooms at the Astoria Park Pool, 1936 (photo from *Architectural Forum,* August 1937)

Figure 80 - Locker rooms at the Astoria Park Pool, photographed 2006 (photo by Donald G. Presa, from the "Astoria Park Pool and Play Center" Individual Landmark Designation Report by the New York City Landmarks Preservation Commission)

Other institutional buildings, such as schools and hospitals, used glass blocks primarily for daylighting purposes, cleanliness, and insulation. Shown below, the Swedish Hospital in Seattle, Washington used blocks for the walls of its operating room in order to provide glare-free light for surgeons. In schools, such as John Lloyd Wright's 1937 Coolspring School, located in La Porte County, Indiana, glass block was used not only to provide good lighting for students, but to also keep the utility costs of the building to a minimum. Many later schools used a combination of glass blocks and operable plate glass windows, but in this building there are few operable windows, which was possible partly because of the building's innovative ventilation system. There do not seem to be a great deal examples of glass block use in hospital and school architecture during the height of the material's popularity. It wasn't really until the later years of glass block, in the 1940s and 1950s, that a large number of schools began to utilize glass blocks, probably because of the 1941 introduction of

light-directional glass blocks that could reflect light upwards towards the ceiling by using directional prims on the interior face of the block.

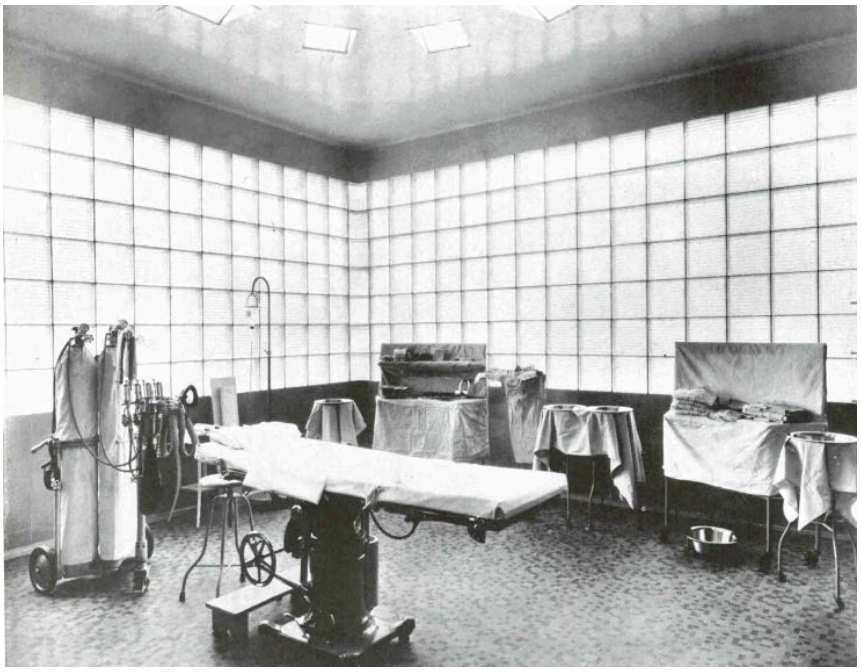


Figure 81 - Swedish Hospital, 1937 (photo from *Architectural Forum*, August 1937)

Figure 82 - Coolspring School, 1937 (photo from *Architectural Forum*, July 1939)

Chapter 5: The New York World's Fair and the Decline of Glass Block

Glass Block at the New York World's Fair:

An influential event in architecture, and American culture as a whole, the 1939 New York World's Fair represents a turning point in the use of glass block. From the early 1930s and through the Fair, which closed in 1940, glass block was used in architecture with vigor and innovation. Yet, for the most part, the use of the material in significant quantities and for influential designs began to decline post-Fair. Unlike during the 1930s, where glass block was used in practically every building type, this widespread use began to slow down, and glass blocks were primarily seen in residential architecture and schools.

The theme of the 1939 New York World's Fair was "Building the World of Tomorrow". Here, the latest in industrial techniques, social ideas, scientific discoveries, and goods and services were proudly displayed. In the design and planning of the fair, "There was no attempt to create a pattern of uniform design in the architecture but only to control scale, color, and relationships". [63] Also, the Fair organizers insisted that no imitations of historic architecture or imitations of permanent materials would be allowed (aside from the States exhibits, which were built in colonial revival styles). Another rule of the Fair was that the use of windows in the buildings' designs was to be limited. Windows would take up precious wall space needed for exhibits, and windows were only usually used in entrance halls. It is possible that the appeal of glass blocks at the Fair were because glass blocks - as seen in its many volumetric, Streamline uses - were thought more of as walls instead of windows.

Glass block was used at the World's Fair in a few different buildings. The largest use, as expected, was for the Glass Center Building, designed by Shreve, Lamb & Harmon. Glass block was also used at the Metals Building and at the Ford Building. The use of glass block at the Fair shows

[63] *Official Guide Book, New York World's Fair 1939*, Third Edition (New York: Exposition Publications, 1939), 26.

the material's use in its two aesthetic paths, now converging in the same place. The Glass Center Building, designed by Shreve, Lamb, & Harmon, represents the use of glass block in an innovative, volumetric way. The building, shaped like an apostrophe in plan, features a 107-foot glass block tower and curved glass block walls at the main entrance. The side façade features glass block as part of a large, rectangular corner wall.

Figure 83 - The Glass Center, 1939 (photo by the Wurts Bros., from the Collection of the Museum of the City of New York)

Figure 84 - The Glass Center, 1939 (photo by the Wurts Bros., from the Collection of the Museum of the City of New York)

Figure 85- The Ford Building, 1939 (photo by Samuel H. Gottscho, from the Samuel H. Gottscho Collection at the Museum of the City of New York)

At the Ford Building, designed by Albert Kahn, glass blocks were also used to create a large, curved wall at the entrance to the building. The building was remodeled in 1940, and the entrance was changed to include a tall, concave panel of opaque white Carrara glass, which removed most of the curved glass block. When viewed in plan, this glass block wall formed almost an entire circle, echoing the curved spiral of the "Road of Tomorrow" automobile track at the opposite side of the building. At night, the illumination of the circular glass entry would transform the building into a wheel of light, an embodiment of the wheel on a Ford automobile.

At the Metals Building, designed by William Gehron, Benjamin W. Morris, and Robert B. O'Connor, glass is used in a more Modernistic, angular, flat plane. The building, shaped like the letter "A" in plan, featured a glass block fountain on its side façade, Used in a tall, rectangular panel that was slightly recessed into the wall, the glass blocks were used here more as a backdrop to the fountain. In postcard drawings, the blocks in the fountain are shown in lit up in various colors, making it seem that the blocks were used because they could provide a number of functions at once. Glass blocks were ideal for this type of application because they provided a non-porous, flat surface that could be used for different illumination and coloring effects. Rather than creating a volumetric form out of the glass blocks, the metals building kept in line with the Modern use of the material – using the blocks in flat planes and using them for the technical qualities they could provide.

Figure 86 - The Metals Building, 1939 (photo by the Wurts Bros., from the Collection of the Museum of the City of New York)

These different uses of glass block at the Fair are examples of the two paths of glass block design. The curved, volumetric, illuminated blocks of the Glass and Ford Buildings show how glass blocks could effectively transform the wall from a static plane into a sculptural wall or pillar of light. The heraldic glass block tower of the Glass Center was like a beam of light and technology shooting upwards towards the sky, and was meant to be a symbol that glass had truly *arrived*. The curved walls of the Ford Building became a cylinder or wheel of light, proving how the nighttime illumination of glass could create symbolic shapes. The Metals Building is an example of the flat, planar use of glass blocks in the Modernist style. After examining the use of glass block in this aesthetic path, it can be argued that the glass blocks were being used more for their technological properties than for their

aesthetic value. For example, the Metals Building used the blocks as a surface upon which to build the fountain, rather than letting the blocks stand out on their own. The blocks were also used because they could be easily colored with paint or light, without affecting the pristine white walls of the building, and were also non-porous so that the water could run off of the surface without damaging it.

The Decline of Glass Block

The end of the World's Fair marked the "last hurrah" of Streamline Moderne, and, in turn, the decline of glass block's use. By the early 1940s, the use of glass block had shifted from the innovative, Streamline designs of the 1930s, to small residential applications. As the International Style and Corporate Modernism began to take more of a hold on American architecture, the volumetric, curved glass blocks designs began to disappear. The decline of the use of glass block may be attributed to the decline in the Streamline Moderne style, which used the material so often to bring interest and value to buildings. The fact that glass block was a relatively new, mass-produced material aligned with the Streamline Moderne ideals of building structures that evoked technology and the idea of the building as a machine. In addition, the light-giving and light-emitting qualities of glass block supported the nation's search for optimism in the post-Depression years.

During the 1930s, most clients were not fully ready to embrace the austere aesthetic of European Modernism. Yet, as Hitler came to power in Europe, many architects fled to America after Hitler's declaration that Modern art and architecture were a representation of Bolshevism and moral decadence. Modern architects like Walter Gropius and Mies van der Rohe immigrated to America around 1937 and 1938, and earned appointments as architecture professors in colleges and universities. The Streamline Moderne style was at its height, and judging by the large number of glass block buildings built at this time, it was also the height of the use of glass block as well. Yet, as

Modern architects and their work began to be more widely accepted by the public, Streamline Moderne was losing its favor as the style that embodied the "now". By the start of the 1940s, the Modern and International Style aesthetics had taken hold.

Although glass block manufacturers noted increases in the sale of glass block during the 1940s and into the 1950s, it is likely that the majority of these sales were for small infill applications. By the mid-1940s, glass block was primarily being marketed by Owens-Illinois and Pittsburgh Corning for use in the middle-class American home. Advertised as a material which you could use in the window above your kitchen sink to provide daylight, or to provide privacy in a bathroom, glass block had begun to transition from a material used in design-focused projects by professional architects to one used by average homemaker to "update" their dwelling. In the 1940s and 1950s, Owens-Illinois and Pittsburgh Corning introduced new patterns and types of blocks, presumably marketed to the homeowner looking for more novelty-type glass blocks. Blocks were introduced with circular, hollowed-out interior sides which could be placed in a wall and hold flowers or other items. A system of easily assembling and disassembling blocks without the use of mortar was readily accepted by those who wished to update their home quickly. These blocks were slid onto a wood frame system, and were used for interior partitions. In addition, another type of block using a half block and set on metal hinges could be opened, similar to a hopper window.

Figures 87 & 88 - Above: Use of glass block as an infill material, Below: Use of glass block in the kitchen, 1945 (from "Beautiful Homes", trade catalog by Owens-Illinois, published 1945)

Yet, although the use of glass block declined in the 1940s and 1950s, it certainly does not mean that large installations of the material stopped completely. In addition, architects did not stop designing in the Streamline Moderne by 1940, as no architectural style has a clearly defined start and end point. Architects still built in the Streamline Moderne style well throughout the 1940s, but it can be argued that the innovative designs and bold use of glass block largely died out during these later years. Of course, there are always exceptions to this statement. For example, IBM built a factory in 1952 in Poughkeepsie, New York, almost entirely out of glass blocks. Reminiscent of earlier glass

block factories of the 1930s, like the Campana Factory, the IBM Plant featured a Classical form with a vertical tower anchoring two long, horizontal wings. Another notable, later use of glass block is at the New York School of Printing, now the High School of Graphic Communication Arts, built in 1959 and located at 439 West 49th Street in Manhattan. Designed by Kelly & Gruzen, almost entire façade of the seven-story school was comprised of glass blocks, only separated by metal mullions and plate glass windows on the lower half of the floors to provide ventilation.

Figure 89 - IBM Plant, Poughkeepsie, NY, 1952 (from "Insulux Glass Block", trade catalog published by Owens-Illinois, 1953)

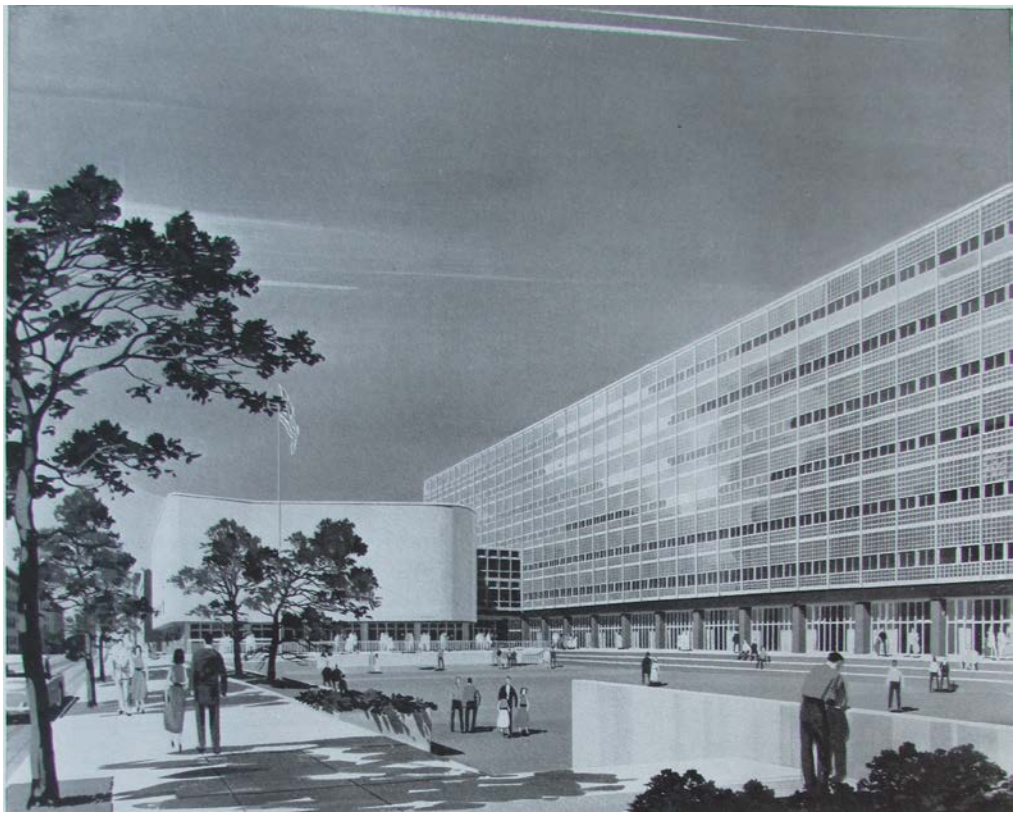


Figure 90 - Rendering of the New York School of Printing, 1957 (from "PC Products", advertisement in *Architectural Forum*, December 1957)

The popularity of glass block in school design was one of the most important reasons for the material's use through the 1950s. The introduction of light-directing blocks in the 1940s - which had prisms on the interior face that would direct light upwards towards the ceiling and diffuse it through the room- proved popular in schools. The blocks allowed for large amounts of daylight with little glare, beneficial to students and their studies. Most of the glass block commissions for schools were used as large panels above row of operable plate glass windows. This use of glass blocks is much like the early prism glass tiles, which were used as transoms above a store entrance to bring in light. Just as early glass blocks had been used as an infill material, they had now come full circle, back to that same use.

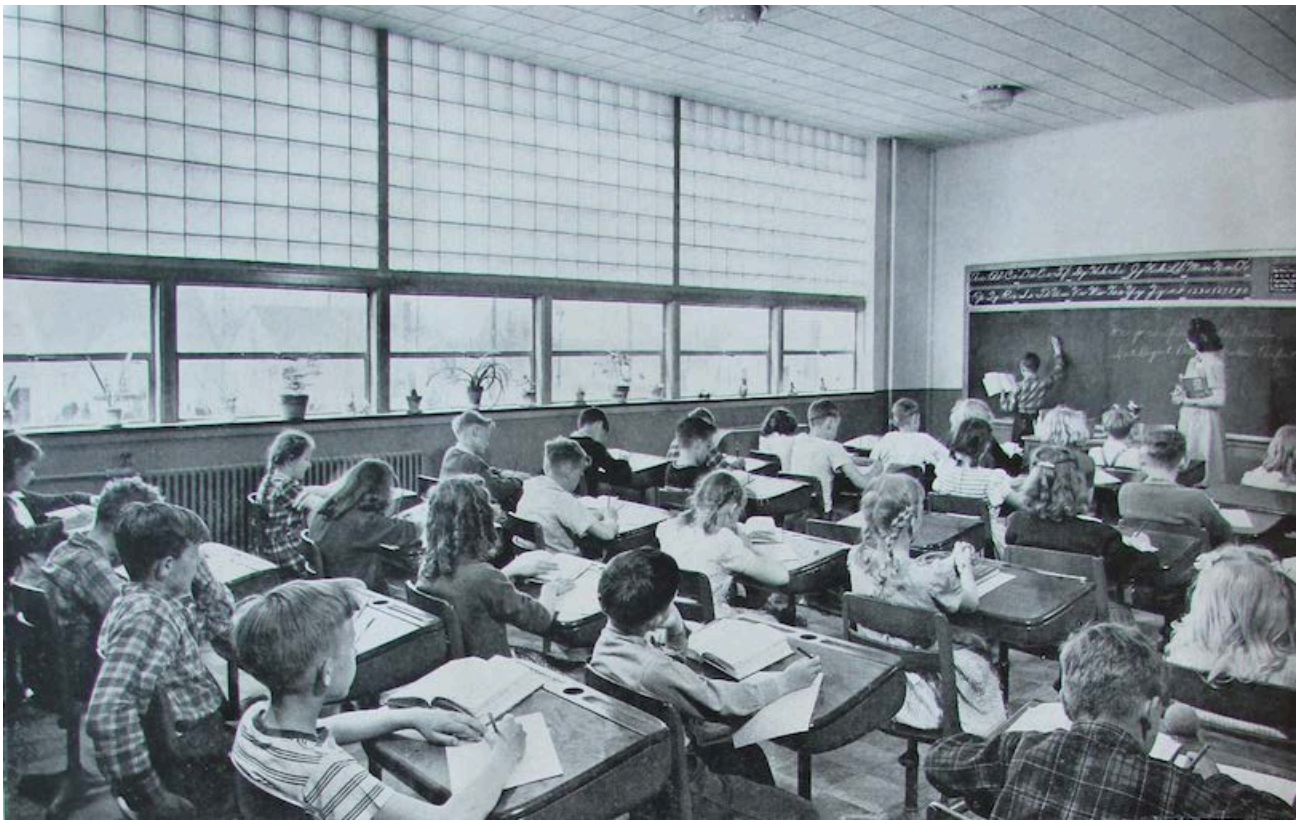


Figure 91 - Oakdale Christian School, Grand Rapids, MI, c. 1949 (from "The Mark of a Modern Building in Industrial, Commercial, and Public Structures", trade catalog published by Pittsburgh Corning in 1949)

Conclusion

Glass block left its mark as a defining architectural material of the 1930s. A material that allowed for translucency and illumination, glass blocks reinterpreted traditional notions of building with masonry. Some of most innovative uses of the material were found in Art Deco and Streamline Moderne buildings, which often featured curved walls, vertical pillars, and other volumetric elements. In the Streamline Moderne, glass block flourished because it could be used to its full potential as a material that could create these volumetric forms with light, glowing from within. The use of glass block in the architecture of the 1930s signified modernity and innovation. The material itself was a form of advertisement for a building – not only due to its nighttime illumination, but because it suggested that the building's owner or company was up-to-date with the latest architectural trends. For commercial buildings especially, glass blocks often signified that the products or services offered on the inside of the store would be just as modern as its exterior. Glass block was also found in Modern style buildings, but was used largely as a planar infill material. In this manner, glass block was used more for the technical properties it could provide, rather than its innovative aesthetic qualities. While using the blocks for their technical value is by no means insignificant, architects' use of glass blocks in the Art Deco and Streamline Moderne form was more bold and daring, for it changed what the idea of a masonry should look like.

Changes in architectural tastes lead to the decline of glass block's use in the late 1940s and 1950s. Although most architects no longer sought out the material to create innovative designs, it still found use for its light-giving and light-directing qualities, especially in school buildings. Although not discussed in this thesis, glass block manufacturers, most notably Pittsburgh Corning, tried to revamp glass blocks in the 1960s and 1970s by offering them in new colors, patterns, and shapes, but the material would not see the popularity that it had seen in the 1930s. Although the

glamorous age of glass block design may be over, some recent architectural works have chosen to bring new life to the material.

Beginning in the 1970s, architect Tadao Ando used glass block to comprise the walls of the interior courtyard of the Ichihara House, designed in 1979, and for a wall of the Horiuchi House, designed in 1979. Both buildings are located in Osaka, Japan. In 1998, Renzo Piano designed an all-glass block commercial building in Tokyo for the Hermes Company. A volumetric, rectangular pillar, Piano stated that he wanted his building to evoke the image of a Japanese lantern.

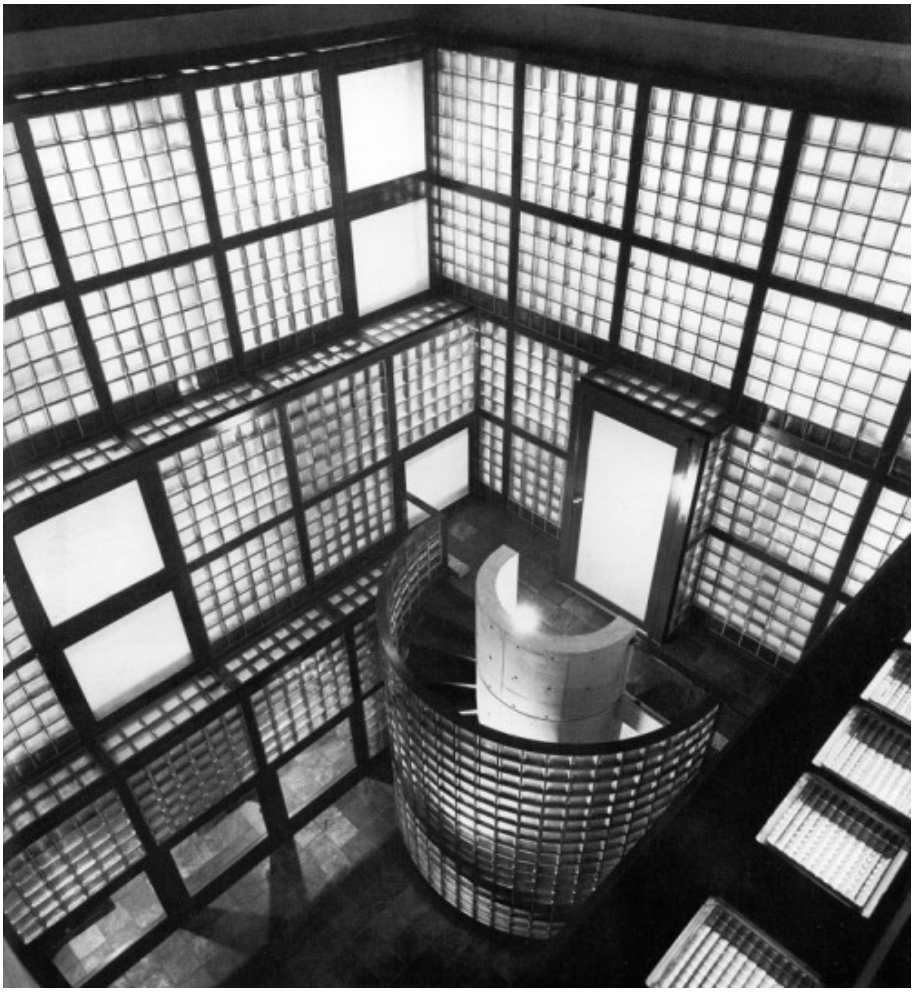


Figure 92 - Ishihara House, 1977 (photo from *Tadao Ando: Complete Works*, 1995).

Figure 93 -Top: The Maison Hermes, 1998 (photo by Michel Denance, from Fondazione Renzo Piano)

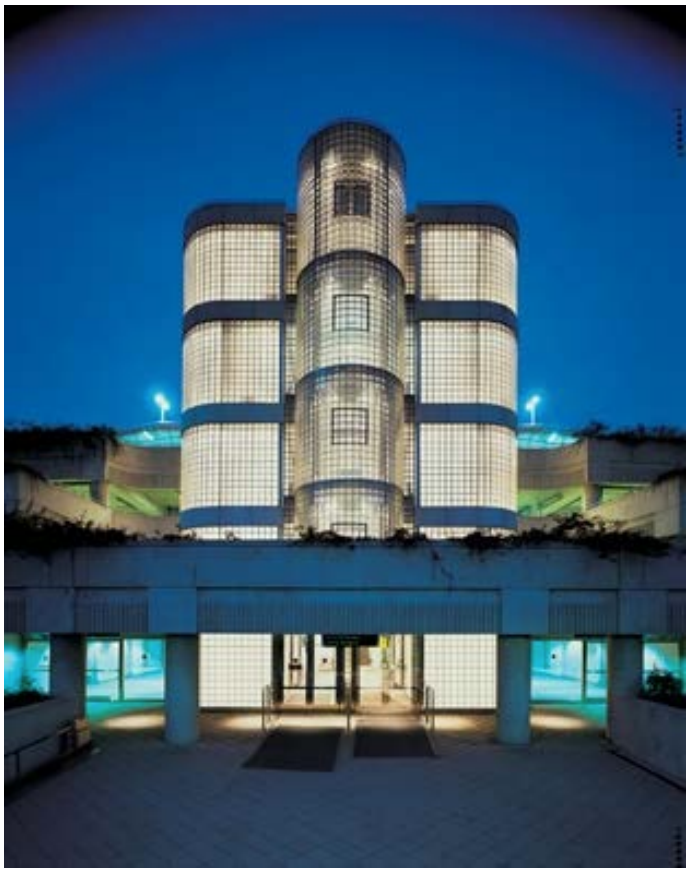
Other recent works of glass block include Crown Fountain in Chicago, built in 2004 and designed by Jaume Plensa. The fountain is comprised of a reflecting pool that is placed between two vertical, rectangular glass block towers, from which a jet of water flows into the pool. The towers display videos of faces, lips puckered, which appear as if they are spitting water from their mouths into the pool. This video imagery is designed to be reminiscent of gargoyle water spouts, typically seen on historic buildings. Here again, glass block is partaking in a project that revamps tradition.

Figure 94 - Crown Fountain, photographed 2008 (photo from Wikimedia Commons)

Finally, another recent glass block work at the Reagan National Airport merges the historic, 1930s glass block forms and reworks it for the present day. Designed by Hartman-Cox Architects in 1991, the structure functions as the entrance to a parking garage at airport. Yet, what could have been a mundane structure was transformed by glass block into a Neo-Streamline Moderne design, drawing from such precedents as the 1937 Arthur Brammer-designed Direct Oil Service Station. Thus, as these recent glass block projects show, the use of glass block may be enjoying a revival.

Glass block was one of the most innovative building materials of its time, as it enabled architects to build with light and illumination. Using Classical forms, architects could now create pilasters and columns with translucent glass, completely changing the idea of what a "solid" pilaster or column should look like. Glass block enabled buildings to be made *with* light– transforming them

into glowing lanterns or shimmering beacons during the night. This "Architecture of the Night", coined by Raymond Hood, was a departure from the opaque masonry buildings of years past. Glass block allowed for buildings to be entirely made of translucency and illumination, and its introduction and use stands as an important moment in American architectural history as a material which reinterpreted traditional ways of building. In the 1930s, the boundaries of indoor and outdoor, opaque and translucent, solid and lightweight, and dark and light were challenged with great success. It is vital to preserve our remaining historic glass block buildings as a testament to, and symbol of, this great era of innovation.



Figures 95 & 96- Top: Reagan National Airport Parking Garage, 1991 (photo from Glass Block of America)

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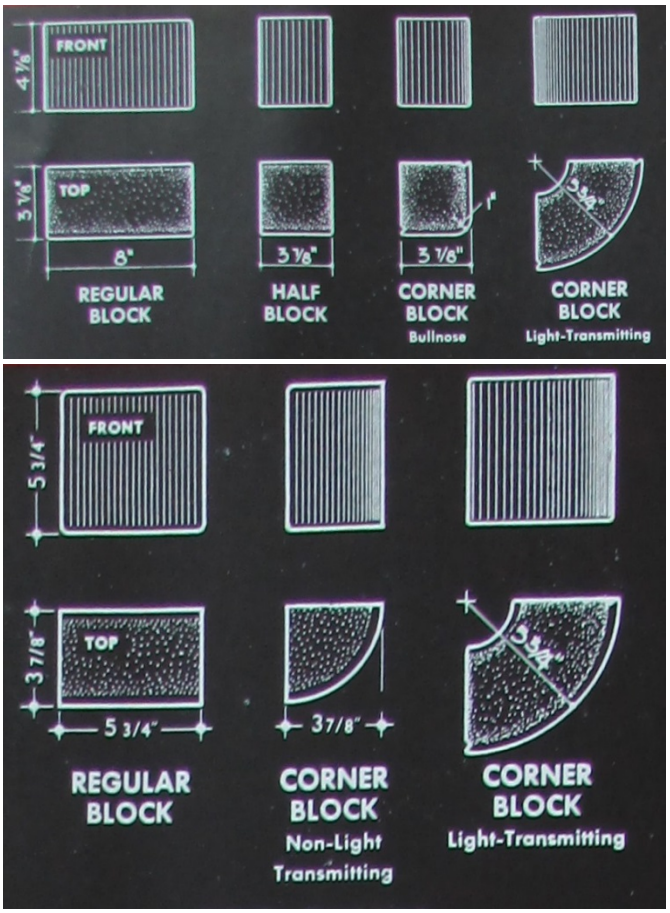
Appendix: Timeline of Glass Block Patterns and Shapes Produced by Owens-Illinois and Pittsburgh Corning, from 1933 to 1954

This glass block timeline is not intended to be comprehensive. It is intended as a basic summary of what patterns and sizes of glass blocks were available from the 1930s to 1950s. This appendix will not mention every type of block produced in these years, but does show as much information as was available in the research of this thesis.

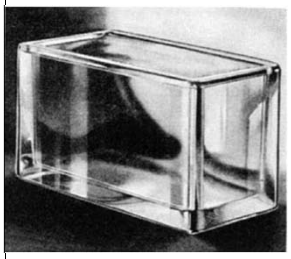
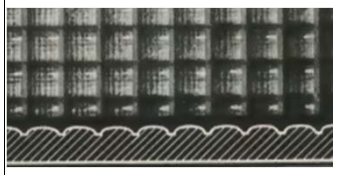
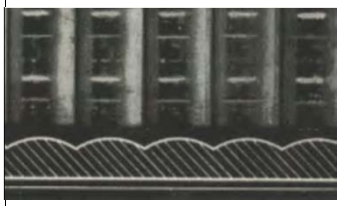
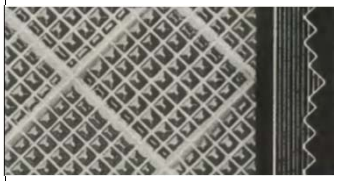
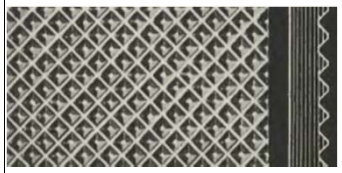
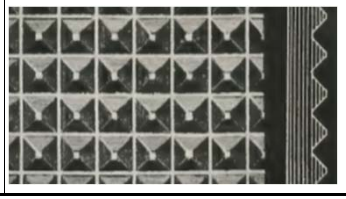
The information used in this appendix is sourced from trade catalogs published by the Owens-Illinois Glass Company and Pittsburgh Corning Corporation. These catalogs are located at the Corning Museum of Glass' Rakow Library. A select few glass blocks (such as the 1933 Owens-Illinois block) are sourced from periodicals or architectural journals, which are noted in the table.

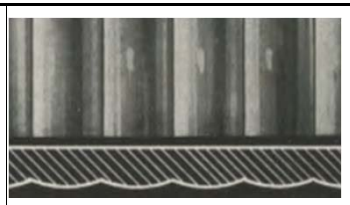
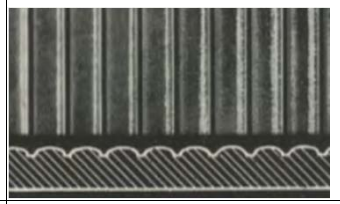
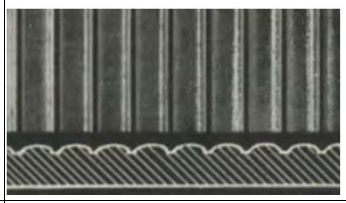
All blocks, regardless of size or manufacturer, measure 3 7/8" deep.

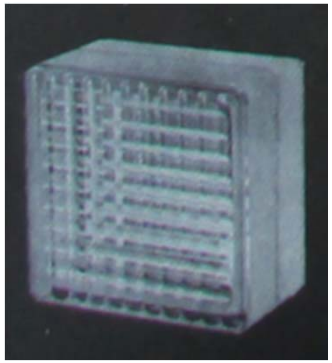
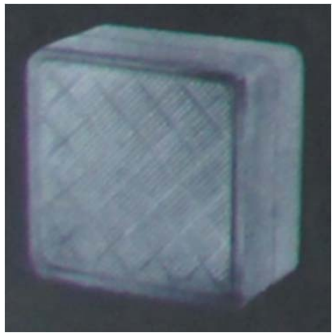
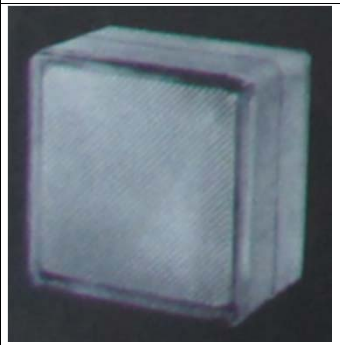
Example diagrams of block measurements and sizes:

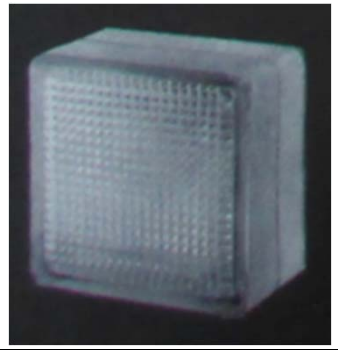


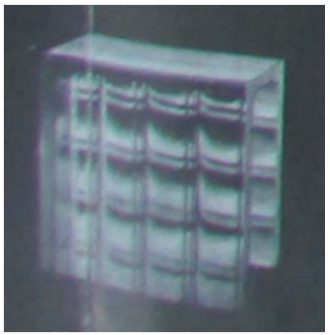
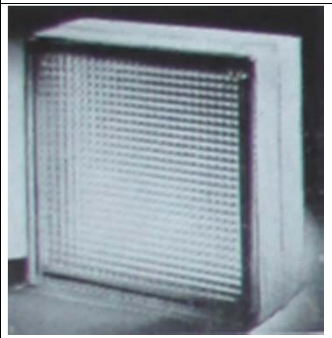
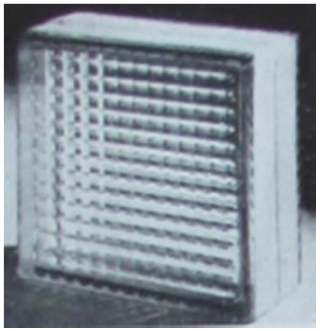
Images from Owens-Illinois, "Insulux Glass Blocks Makes Stores, Shops, and Restaurants More Attractive", 1942.

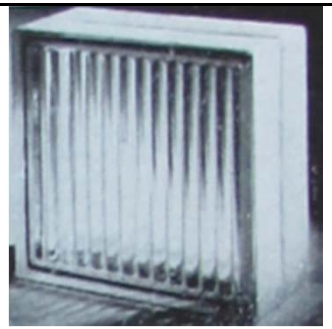
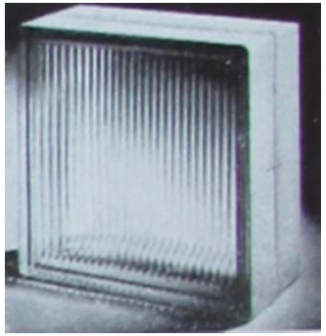
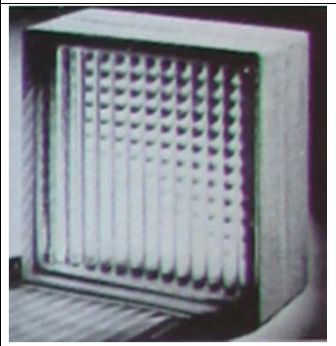
Year	Manufacturer & Catalog Title	Pattern	Image	Sizes Available	Notes
1933	Owens-Illinois, "Owens-Illinois blocks used for the Century of Progress" (from the Scientific American, September 1933, p. 128)				colored was applied to all five faces except the exterior face
1935	Owens-Illinois, "Translucent Insulux Masonry Glass Blocks"	No. 1		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	transmits 78.5% of light
		No. 2		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	
		No. 3		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	
		No. 4		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	transmits 27.6% of light
		No. 5		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	transmits 11.7% of light (as stated in manufacturer's catalog)

		No. 7		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	transmits 84.4% of light
		No. 10		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	transmits 78.5% of light
		No. 11		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 3 7/8" x 4 7/8" half block, 3 7/8" x 4 7/8" corner, 5 3/4" corner, 7 3/4" corner	transmits 86.5% of light
1937	Owens-Illinois, "Insulux Glass Masonry"	No. 1		8" x 4" rectangular, 5 3/4" square, 7 3/4" square, 5 3/4" corner, 7 3/4" corner	transmits 78.5% of light

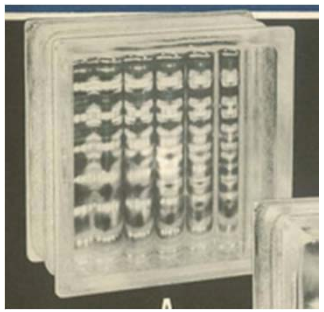
		No. 2		8" x 4" rectangular, 5 3/4" square, 7 3/4" square, 5 3/4" corner, 7 3/4" corner	transmits 73.4% of light
		No. 3		8" x 4" rectangular, 5 3/4" square	transmits 27.6% of light
		No. 4		5 3/4" square	transmits 27.6% of light

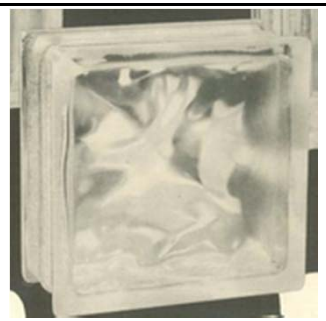
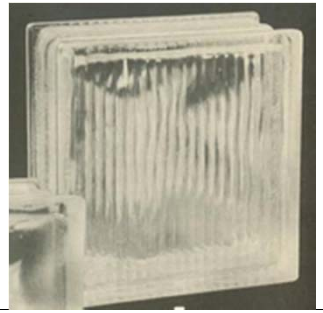
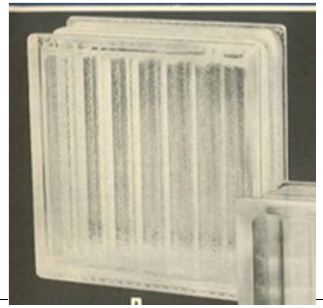
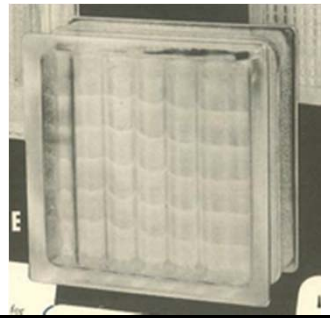
		No. 5		8" x 4" rectangular, 5 3/4" square	transmits 11.7% of light (as stated in manufacturer's catalog)
		No. 7		8" x 4" rectangular, 5 3/4" square	transmits 84.4% of light
		No. 11		8" x 4" square, 5 3/4" square, 7 3/4" square, 5 3/4" corner, 7 3/4" corner	transmits 86.5% of light

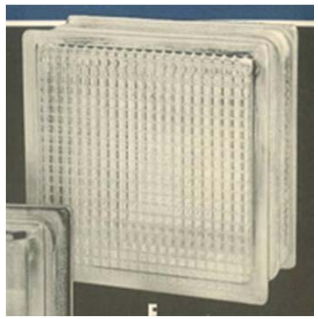
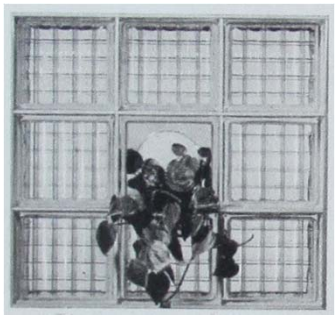
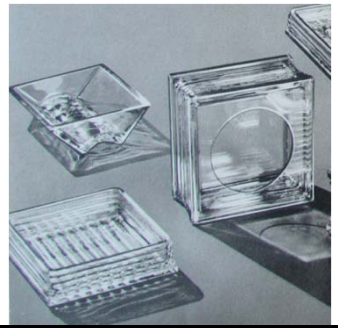
		No. 17		7 3/4" square	transmits 84% of light
1938	Owens-Illinois, "Insulux Glass Blocks Makes Stores, Shops, and Restaurants More Attractive"	No. 1		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square	transmits 78.5% of light, 1/4" convex ribs placed vertically on exterior faces and horizontally on interior faces
		No. 2		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square, 11 3/4" square	transmits 73.4% of light, 1/2" (1" for 11 3/4" size) convex ribs placed vertically on exterior faces and horizontally on interior faces

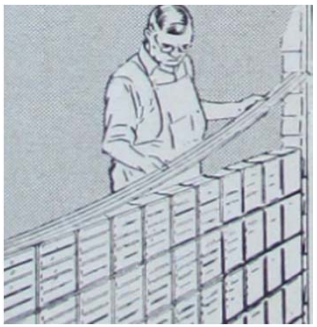
		No. 7		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square, 11 3/4" square	transmits 84.4% of light, 1/2" (1" for 11 3/4" size) convex ribs placed vertically on both exterior and interior faces, exterior faces are smooth
		No. 11		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square	transmits 86.5% of light, 1/4" convex ribs placed vertically on exterior faces, interior faces are smooth
		No. 16		5 3/4" square, 7 3/4" square, 11 3/4" square	transmits 84.4% of light, 1/2" (1" for 11 3/4" size) convex ribs placed vertically on one interior face and horizontally on the other interior face, exterior faces are smooth

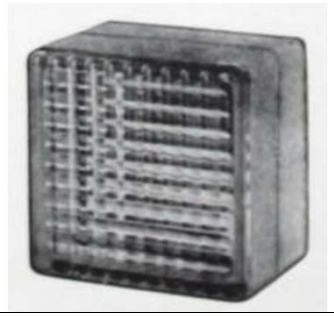
		No. 17		7 3/4" square, 11 3/4" square	transmits 84% of light, 1 1/2" (1 5/8" for 11 3/4" size) concave ribs on both interior faces, placed horiztonally on one interior face and vertically on the other interior face, exterior faces are smooth
1939	Pittsburgh-Corning, "PC Glass Blocks...Combine the Light-Transmitting Values of Glass with the Insulating Values of a Masonry Wall"	Decora		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial, 5 3/4" bullnose, 7 3/4" bullnose	
		Saxon		5 3/4" square, 7 3/4" square, 11 3/4" square	

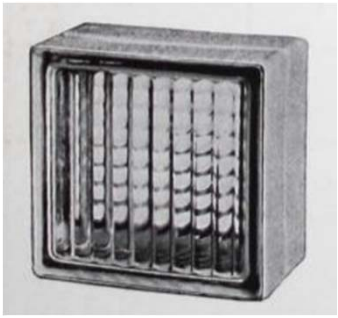
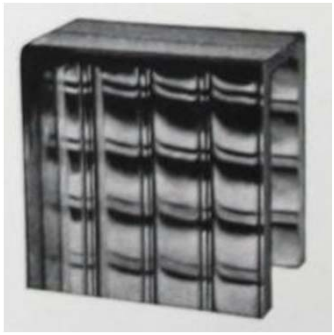
		Argus		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial, 5 3/4" bullnose, 7 3/4" bullnose	
		Baltic		5 3/4" square, 7 3/4" square, 11 3/4" square	
1940	Pittsburgh-Corning, "Glass Blocks for Smarter, More Practical Homes"	Argus		not specified	designed for both decorative and utilitarian use, smooth face, interior flutes identical and assembled at right angles, high light transmission and good light diffusion

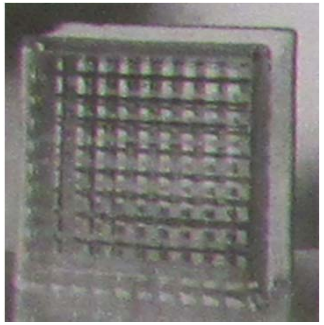
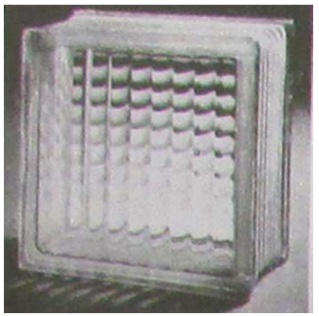
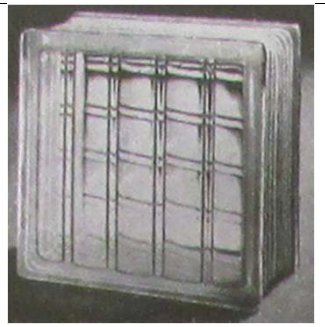
		Decora		not specified	decorative pattern designed to suit both modern and conventional designs, smooth face, assymetric design on both faces, high light transmission and transparency, irregular light diffusion
		Reeded Decora		not specified	modified Decora to increase irregular pattern effects, smooth rounded exterior flutes, narrow convex flutes on both exterior faces, assymetric design on both interior faces, high light transmission, good light diffusion, superior obscurity
		Saxon		not specified	uniform pattern, smooth rounded exterior flutes, narrow convex flutes on both exterior faces that are parallel to wide flutes on interior faces, both interior faces are etched
		Argus LX-75		not specified	designed to produce a softer light with reduced glare and reduced solar transmission, contains a Fiberglas screen insert that reduces light transmission to 68% and solar heat transmission to 55%, smooth face, interior flutes identical and assembled at right angles, Fiberglas insert held with glass seal

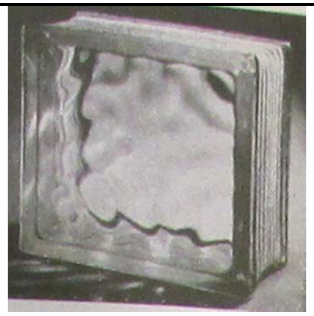
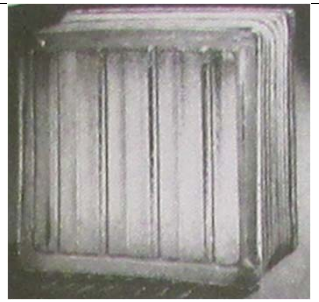
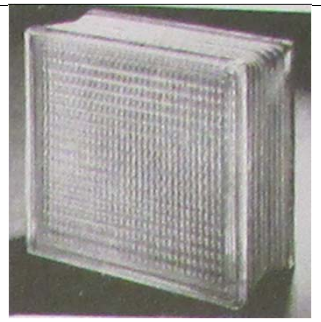
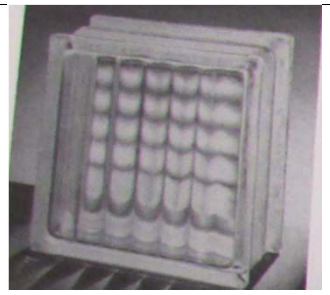
		Prism Light-Directing		not specified	designed to control and direct the distribution of light, unlike prisms on the two inside faces allow the light to be directed towards the ceiling, exterior face is smooth, interior face has concave flutes, unlike horizontal prisms on both faces
1942	Owens-Illinois	BLOCo'GLASS	 		special block designs used for decorative purposes, some blocks feature circular cut-outs which can be used as planters and can be placed within a existing panel, other designs include half-blocks for use as ashtrays, vases, etc

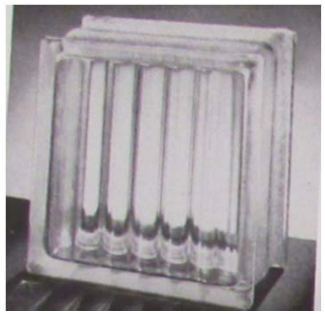
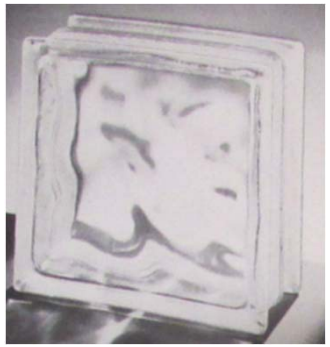
1943	Owens-Illinois	"Set inWood" Demountable Partitions	 	can be used with any square-shaped block	uses prefabricated wood pieces which are dry-set and hold the glass blocks in place without mortar, the wood and blocks can both be easily removed and reused, for interior partitions only, not for exterior use
1944	Owens-Illinois, "Owens-Illinois Insulux Glass Block"	No. 1		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square, 3 7/8" bullnose, 5 3/4" corner	transmits 78.5% of light

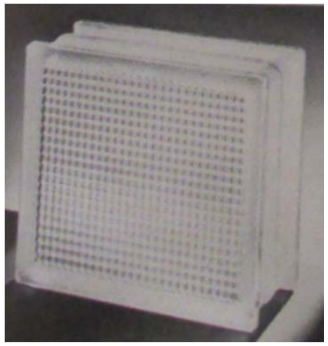
		No. 2		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square, 11 3/4" square, 3 7/8" bullnose, 5 3/4" corner	transmits 73.4% of light
		No. 3		8" x 4 7/8" rectangular, 5 3/4" square, 5 3/4" corner	transmits 27.6% of light
		No. 5		8" x 4 7/8" rectangular, 5 3/4" square, 5 3/4" corner	transmits 11.7% of light
		No. 7		8" x 4 7/8" rectangular, 5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner	transmits 84.4% of light

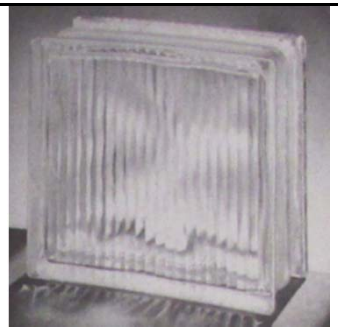
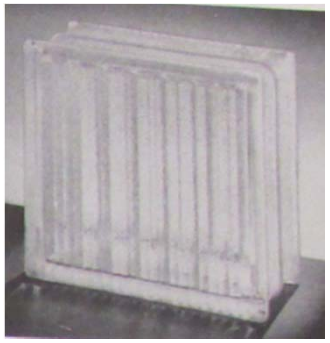
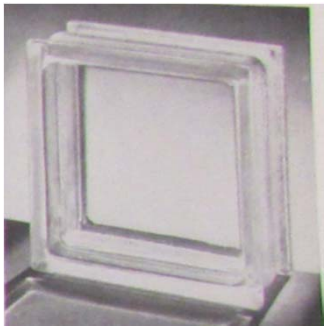
		No. 11		8" x 4 7/8" rectangular, 3 7/8" x 4 7/8" rectangular half-block, 5 3/4" square, 7 3/4" square, 11 3/4" square, 3 7/8" bullnose, 5 3/4" corner	transmits 86.5% of light
		No. 16		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner	transmits 84.4% of light
		No. 17		7 3/4" square, 7 3/4" radial, 7 3/4" corner	transmits 84% of light

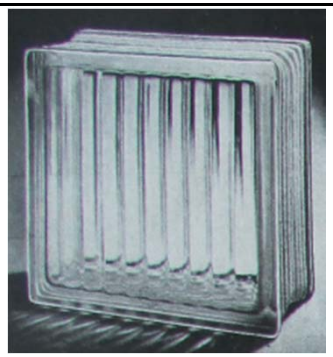
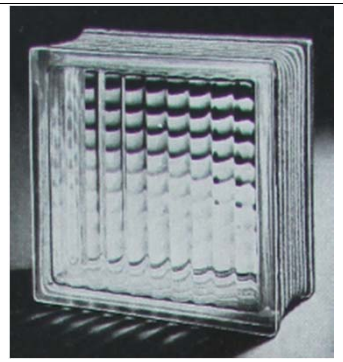
1945	Owens-Illinois, "Beautiful Homes"	No. 2		5 3/4" square, 7 3/4" square	convex ribs placed vertically on exterior faces, convex ribs placed horizontally on interior faces
		No. 7		5 3/4" square, 7 3/4" square, 11 3/4" square	convex ribs placed vertical on interior faces, exerior faces are smooth
		No. 16		5 3/4" square, 7 3/4" square, 11 3/4" square, 7 3/4" radial, 5 3/4" corner, 7 3/4" corner,	convex ribs placed vertically on one interior face and placed horizontally on the other interior face, exterior faces are smooth
		No. 17		5 3/4" square, 7 3/4" square, 11 3/4" square, 7 3/4" radial, 5 3/4" corner, 7 3/4" corner	concave ribs on both interior faces, ribs placed vertically on one interior face and horizontally on the other face, exterior faces are smooth

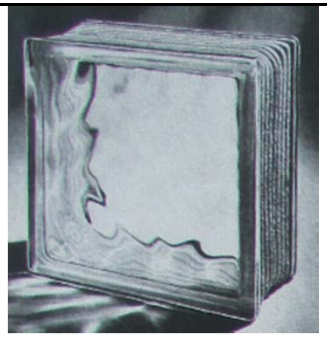
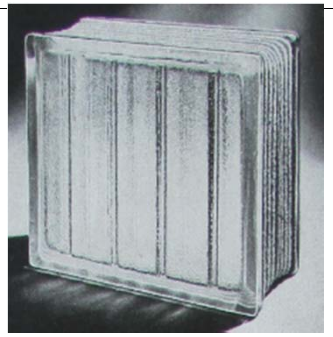
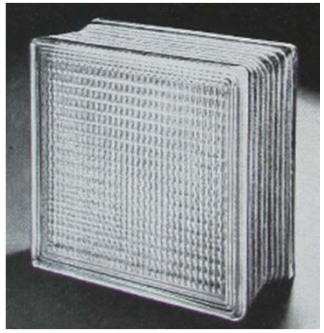
		No. 30		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner	interior design suggests a repeating quarter circular effect which form continuous concentric circles in the panel, exterior faces are smooth
		No. 40		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner	both exterior faces have 13/16" "o-gee" ribs placed vertically, both interior faces have etched stippled surfaces with vertical ribs spaced 1 5/8" on center
		No. 50		7 3/4" square, 7 3/4" radial	both exterior faces have 3/8" wave ribs placed horizontally, both interior faces have 1/4" special vertical ribs with concave sides
1947	Pittsburgh-Corning, "PC Glass Blocks, A Modular Product"	Argus		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	designed for both decorative and utilitarian use, smooth face, interior flutes identical and assembled at right angles, high light transmission and good light diffusion

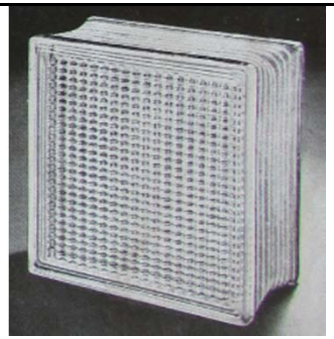
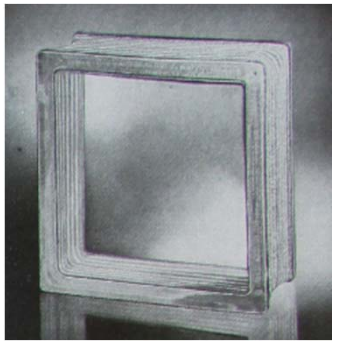
		Argus Parallel Flutes		5 3/4" square, 7 3/4" square, 11 3/4" square	designed for both decorative and utilitarian use, smooth face, interior flutes identical and parallel, high light transmission and good light diffusion
		Bristol		7 3/4" square, 7 3/4" corner, 7 3/4" radial	designed to provide a softer, more diffused light, should be laid with exterior flutes vertical, smooth exterior flutes and lightly etched exterior border, etched interior faces, can also be supplied with a fibrous glass insert
		Decora		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	decorative pattern designed to suit both modern and conventional designs, smooth face, assymetric design on both faces, high light transmission and transparency, irregular light diffusion

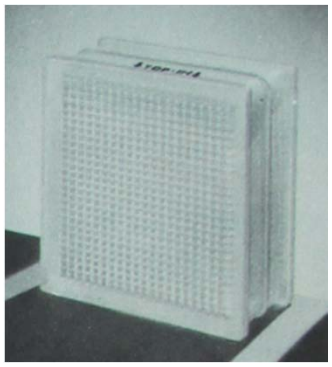
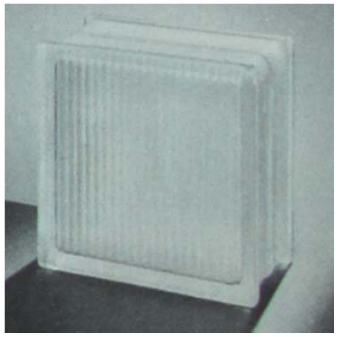
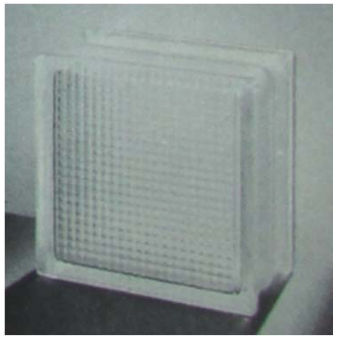
		Druid		7 3/4" square, 7 3/4" corner, 7 3/4" radial	designed to provide high light transmission and closely match the Prism-Light Directing unit, can be used in palces without sun exposure, must be laid with exterior flutes vertical, smooth exterior flutes and lightly etched exterior border, horizontal flutes on interior faces, can also be supplied with a fibrous glass insert
		Essex		7 3/4" square, 7 3/4" corner, 7 3/4" radial	designed for low light transmission, for use below eye level in panels using Prism Light-Directing blocks and on elevations subject to severe sun exposure, must be laid with exterior flutes horizontal, horizontal spreadng flutes and lightly etched border on exterior faces, vertical prisms on interior faces
		Prism Light-Directing		7 3/4" square	designed to control and direct the distribution of light, unlike prisms on the two inside faces allow the light to be directed towards the ceiling, exterior face is smooth, interior face has concave flutes, unlike horizontal prisms on both faces

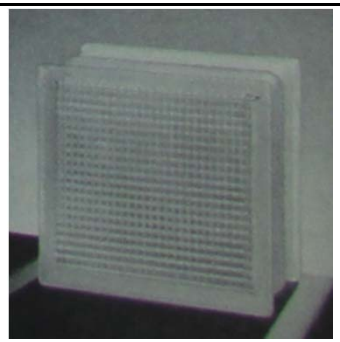
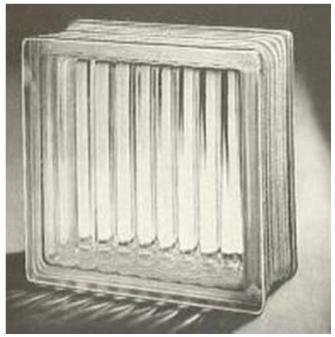
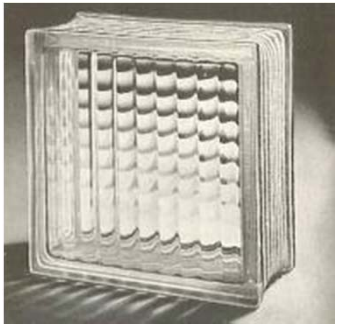
		Reeded-Decora		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	modified Decora to increase irregular pattern effects, smooth rounded exterior flutes, narrow convex flutes on both exterior faces, assymetric design on both interior faces, high light transmission, good light diffusion, superior obscurity
		Saxon		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	uniform pattern, smooth rounded exterior flutes, narrow convex flutes on both exterior faces that are parallel to wide flutes on interior faces, both interior faces are etched
		Vue		7 3/4" square, 7 3/4" radial	designed with clear glass to allow for suffecient general vision of large objects or movement beyond the panel to prevent the "shut-in" feeling, high light transmission, smooth interior and exterior faces

1948	Owens-Illinois, "Insulux Glass Block"	No. 7		5 3/4" square, 7 3/4" square, 11 3/4" square	smooth-face block with parallel convex ribs on both interior faces, high light transmission, limited privacy
		No. 16		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	smooth-face block with convex interior ribs running vertically on one face and horizontally on the other face, use for decorative and lighting effects, gives a fair degree of privacy
		No. 17		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	highly decorative, smooth-face block with concave flutes running vertically on one face and horizontally on the other, gives high light transmission, little privacy,

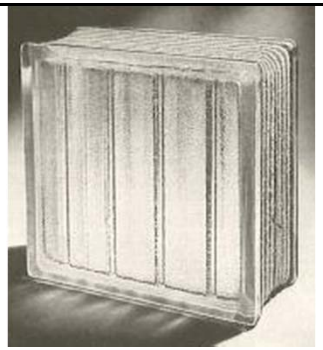
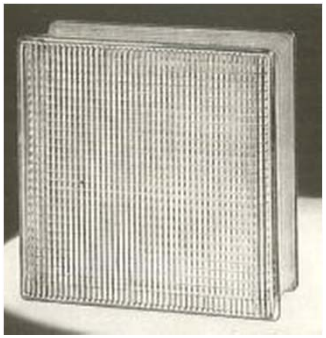
		No. 30		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner	highly decorative, smooth-face block, distinctive designs permits laying with no regard to pattern, high light transmission but low degree of privacy
		No. 40		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner	ribbed-face block, interior and exterior faces have shallow, parallel ribs, interior faces also have stipped surface, very high degree of privacy
		No. 350		7 3/4" square, 73/4" radial, 7 3/4" corner	ribbed-face designed for extreme sun exposure, diffusing qualities for decorative or artifical illumination effects, horiztonal ribs on the exterior, complete privacy

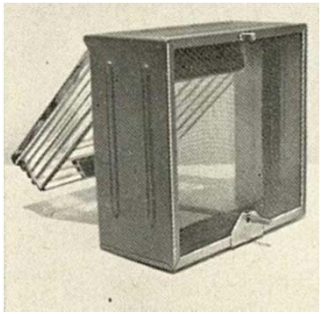
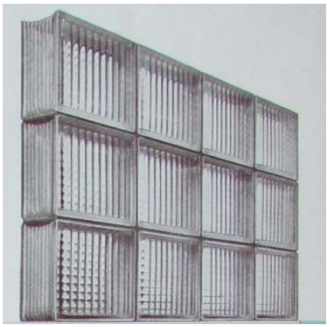
		No. 351		7 3/4" square	functional block designed to direct light above the horizontal towards the ceiling to reflect back down upon a room, use above eye level, has vertical ribs on exterior faces
		No. 370		7 3/4" square	smooth-face on both interior and exterior, provides limited visibility, can be used with other patterns
1949	Pittsburgh-Corning, "Make the Most of Daylight with PC Functional Glass Blocks"	Prism A		7 3/4 square	light-directing type of block, for use in panels with no direct sun exposure

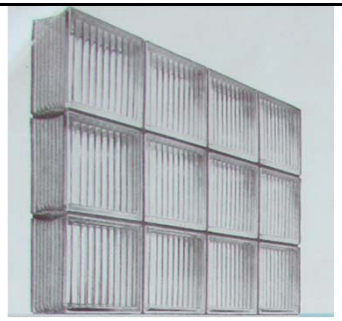
		Soft-Lite Prism B		7 3/4 square	light-directing type of block, for use in panels with direct sun exposure
		Bristol LX-75		7 3/4 square, 7 3/4 corner, 7 3/4 radial	light-diffusing type of block, for use in panels with or without direct sun exposure, in places with direct exposure can be used to maximum illumination with good control of panel brighness
		Druid LX-75		7 3/4 square, 7 3/4 corner, 7 3/4 radial	light-diffusing type of block, for use in panels with or without direct sun exposure, in places with direct exposure can be used for maximum illumination with good control of panel brighness

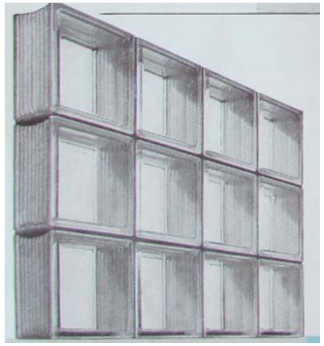
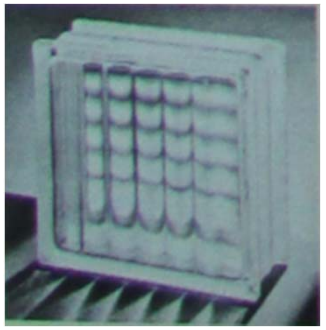
		Soft-Lite Essex B		7 3/4 square	light-diffusing type of block, for use in panels with direct sun exposure, can be used to gain better control of panel brightness consistent with good illumination
1951	Owens-Illinois, "For Brighter Homes: Insulux Glass Block"	No. 7		5 3/4" square, 7 3/4" square, 11 3/4" square	"limited" degree of privacy, smooth face
		No. 16		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	"fair" degree of privacy, smooth face, ribs vertical on one interior face and horizontal on the other interior face

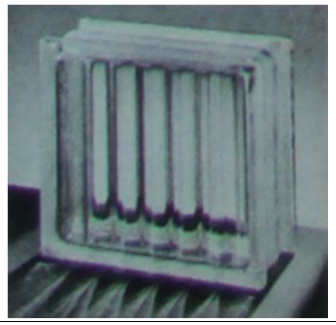
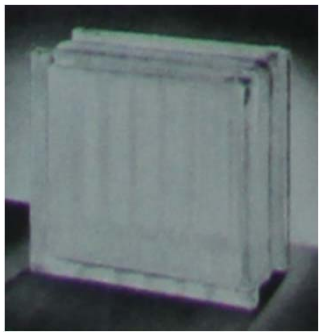
		No. 17		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	"limited" degree of privacy, smooth face, flutes veritcal on one interior face and horizontal on the other interior face
		No. 30		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	"very limted" degree of privacy, smooth face, forms circular design, lay in random pattern
		No. 31		7 3/4" square, 11 3/4" square	"very limited" degree of privacy, smooth face, random design gives effect of handmade glass

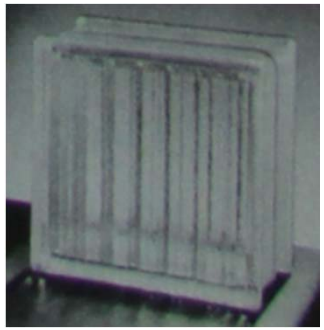
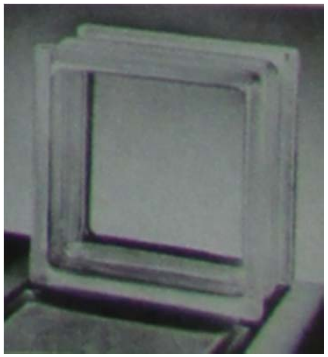
		No. 40		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	"good" degree of privacy, ribbed face, interior face is stipped, exterior face is ribbed
		No. 70		7 3/4" square, 7 3/4" radial	no degree of privacy, gives limited vision, may be inset in panels of other designs
		No. 63/65		7 3/4" square, 7 3/4" corner, 7 3/4" radial	"complete" degree of privacy, ribbed face, No. 63 directs light above eye level for diffusion of light from the ceiling and downwards, No. 65 directs light evenly in horizontal and vertical planes

1952	Owens-Illinois, "Announcing the New Way to Ventilate Glass Block Panels", (Advertisement in American Builder, July 1 1952, p. 209)	Insulux Panel Vent	 		can be manufactured in any of the six decorative patterns that Owens-Illinois offered in 1952
1953	Owens-Illinois, "Insulux Glass Block"	No. 7		5 3/4" square, 7 3/4" square, 11 3/4" square	smooth-face block with parallel convex ribs on both interior faces, high light transmission, limited privacy, lower brightness when ribs placed vertically

		No. 16		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	smooth-face decorative block with convex ribs on interior faces at right angles to each other, fair degree of privacy, decorative light pattern in sun or artificial light
		No. 31		7 3/4" square, 11 3/4" square	similar in appearance to handmade colonial glass, each block varies slightly in design configuration, highly decorative, high light transmission, nearly trasparent
		No. 40		5 3/4" square, 7 3/4" square, 11 3/4" square, 5 3/4" corner, 7 3/4" corner, 7 3/4" radial	exterior faces have wide, flat vertical ribs, stippled interior faces with ribs that are parallel to the exterior faces, high light transmission, moderate light diffusion

		No. 63/65		7 3/4" square, 11 3/4" square, 7 3/4" corner. 7 3/4" radial	functional, azimuth-correcting design for daylight control, No. 63 is light directing and No. 65 is light diffusing, low surface brightness
		No. 70		7 3/4" square, 7 3/4" radial	clear block for limited vision, smooth face, high light transmission, no light diffusion, no privacy
1954	Pittsburgh-Corning, "How to Modernize Old Windows with PC Glass Blocks"	Argus		5 3/4" square, 7 3/4" square, 11 3/4" square	

		Argus Parallel Flutes		5 3/4" square, 7 3/4" square, 11 3/4" square	
		Argus Parallel Flutes LX		7 3/4" square	
		Decora		5 3/4" square, 7 3/4"square, 11 3/4" square	

		Saxon		11 3/4" square	
		Vue		7 3/4" square, 11 3/4" square	