



ILLUSTRATION BY



THE LUXEY BROS. & CO.  
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TORONTO

Prismatic glass is characterized by small horizontal triangular ribs on the interior face that refract light rays deep into a room. Commonly used in pre-electric commercial buildings to improve lighting, this type of glass was originally produced in tile form and later in larger sheets.<sup>1</sup>

Origins and Development

Because prismatically shaped glass can redirect light, it seems to have been applied to the illumination of rooms as early as the eighteenth century.<sup>2</sup> Used at first to distribute light from above into the dark interiors of ships, this application was modified in the second half of the nineteenth century for pavement lights, used for lighting basements in urban centers in the United States and Europe. While the deck prism distributed light evenly, pavement lights redirected the light sideways into the basements underneath buildings.

Beginning in 1845 Thaddeus Hyatt, a pioneer of reinforced concrete construction, patented a number of pavement lights, which he produced after 1873 in his New York factory.<sup>3</sup> They were so successful that some building codes recommended Hyatt lights as a fireproof source of light in basements.<sup>4</sup>

Translucent, light-diffusing glasses such as rough plate glass ground on both sides or corrugated glass with horizontal grooves were used from the 1800s on to provide factories with an evenly distributed light. Corrugated glass had the additional effect of refracting a large part of the light deeper into the room and gained some success in New England's factories as "factory-ribbed glass."<sup>5</sup> The product that came closest to the development of the new prism glass was the so-called stallboard light, which had been developed in England in 1883 and quickly became a standard feature in British commercial architecture. It consisted of square glass tiles with horizontal V-shaped ribs on the inside; these were set in rows in a metal frame adjacent to the pavement lights at the bottom of the exterior wall or above the display window.<sup>6</sup> Similar ideas were patented at the same time by a number of inventors in both Europe and the United States.<sup>7</sup> Among them was the British inventor James Pennycuik, who in 1882 filed a U.S. patent that was eventually to provide the basis for the Luxfer Company's success. He proposed window glass with prismatic ridges on the inside, which would "double the quantity of reflection or illumination of the plain window-glass of the same size."<sup>8</sup> After several unsuccessful

D I E T R I C H N E U M A N N

PRISMATIC  
GLASS

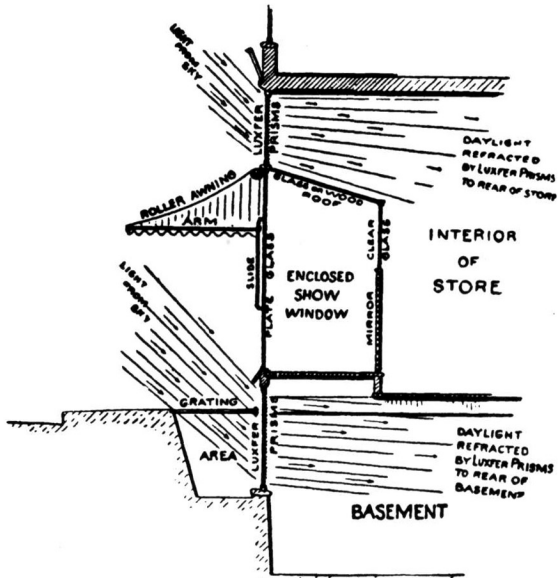
D A T E S O F P R O D U C T I O N

1896 TO C. 1940

C O M M O N T R A D E N A M E S

A M E R I C A N 3 - W A Y P R I S M ,  
D A Y L I G H T P R I S M , L U M I N O U S P R I S M ,  
L U X F E R P R I S M , S E A R C H L I G H T P R I S M ,  
S O L A R P R I S M

An early, evocative advertisement for the Luxfer Prism Company depicted its motto—*Illustrus Obscuritas* ("light from darkness")—and suggested that prismatic glass could shower the world in light.



attempts at finding commercial support for his “improvement in window glasses,” Pennycuik founded the Radiating Light Company of Chicago in 1896 with a small group of entrepreneurs.<sup>9</sup> In April 1897 the company adopted the name Luxfer, referring to the Latin *lux* (light) and *ferre* (to carry).<sup>10</sup>

The company hired the prominent physics professor and spectroscopist Henry Crew of Northwestern University and his assistant Olin H. Basquin to develop the product further, explore its potential applications, and signal the scientific intent of its enterprise.<sup>11</sup> In contrast to the existing applications such as corrugated glass, stallboard lights, or Pennycuik’s patent, Crew and Basquin aimed at a precisely predictable light refraction. They developed mathematical formulas to calculate specific, individual prescriptions for a building’s lighting needs, similar to the way eyeglass prescriptions are precisely adjusted to a patient’s imperfect vision.<sup>12</sup> Crew claimed that their products were directly inspired by Augustine-Jean Fresnel’s mathematically exact system of prismatic lenses, which since 1821 had been the standard equipment for lighthouses all over the world.

In 1897 alone the Luxfer Prism Company submitted 162 patents for designs and technical details of the frames and the machinery necessary to produce prisms and prismatic pavement lights, such as molds and grinding machines, as well as angle measurement devices.

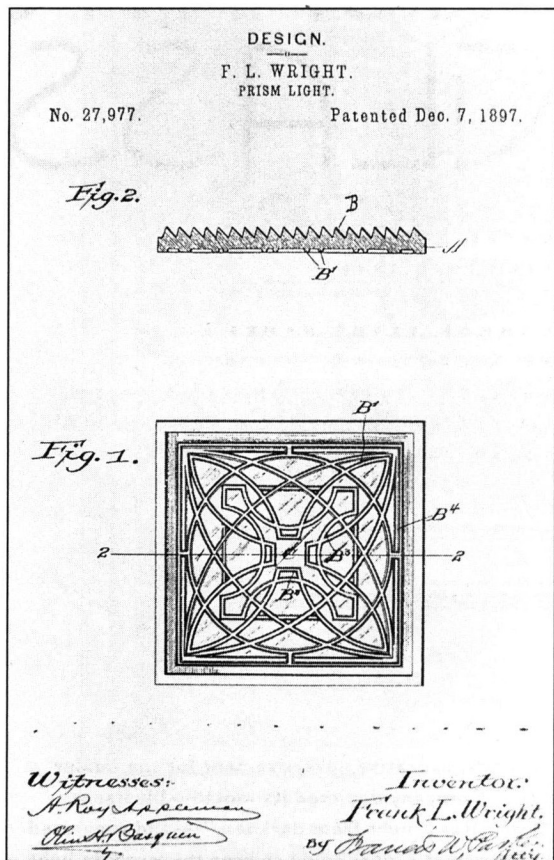
### Manufacturing Process

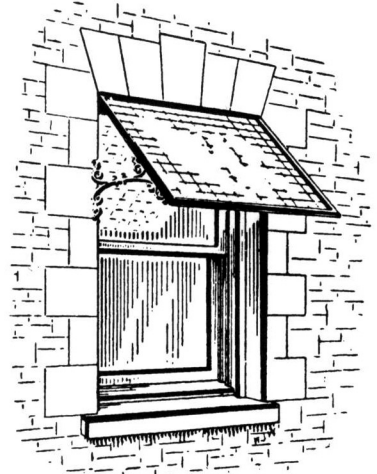
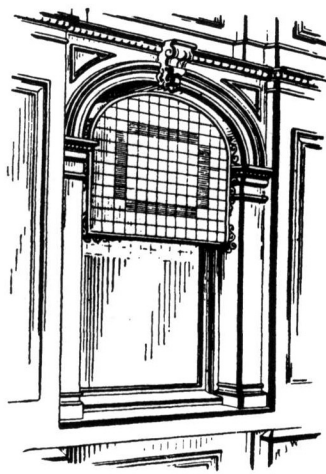
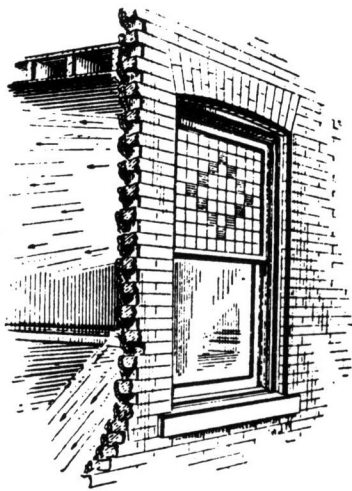
To produce prismatic glass, glass was pressed in iron molds. Special dies were created to form the ribs in various degrees and any ornamental patterns on the opposite face. Because of the complicated manufacturing process, initially only small, 4-by-4 inch tiles with 21 triangular ribs could be produced; larger plates tended to crack when they were removed from the molds.

The tiles were supported by a grid of thin metal bars of soldered zinc coming and cement or the new, sophisticated,

**Prismatic glass refracted light, directing it to the rear of store interiors and basements, as shown in this diagram from a circa 1910 Luxfer catalogue (top).**

**Luxfer hired young Frank Lloyd Wright to design a prism pattern, which he patented in 1897. The only one of Wright’s glass patterns ever mass-produced, it enlivened the glass’s surface appearance but did not enhance its refractive qualities (bottom).**





**Common types of prismatic glass installations included window sash filled with prismatic glass (left); separate screens set in front of window glass (middle); and protruding canopies (right), often used for buildings on narrow streets or where tall buildings blocked natural light.**

and very expensive methods of copper electroglazing, which had been invented in 1897 by William H. Winslow in Chicago, one of Luxfer's shareholders.<sup>13</sup> In this process the prisms were placed between thin copper ribbons ( $\frac{3}{8}$  inch wide and  $\frac{1}{32}$  inch thick) and exposed to an electrolytic bath in copper sulfate (36 hours for vertical plates, 48 hours for canopies). During this procedure additional copper molecules would be deposited on the edges of the copper bands, thereby forming flanges that eventually firmly welded the materials together. The copper surface was sometimes plated with nickel or silver.

Prisms were generally about  $\frac{3}{32}$  inch thick with an additional  $\frac{3}{32}$  inch for the depth of the ribs. Luxfer provided nine angles of refraction and various qualities of prism glass: "cut," the best quality; "Iridian," with linear ornament; "commercial," which was untested; and "factory," with minor flaws.<sup>14</sup>

### Uses and Methods of Installation

Prismatic glass was used in window sash as a replacement for a sheet of window glass, in a separate frame in front of an existing window, or as a protruding canopy to capture direct zenith light in narrow streets or alleyways. Prismatic glass was used most frequently in commercial structures but was also installed in residences, schools, and hospitals.

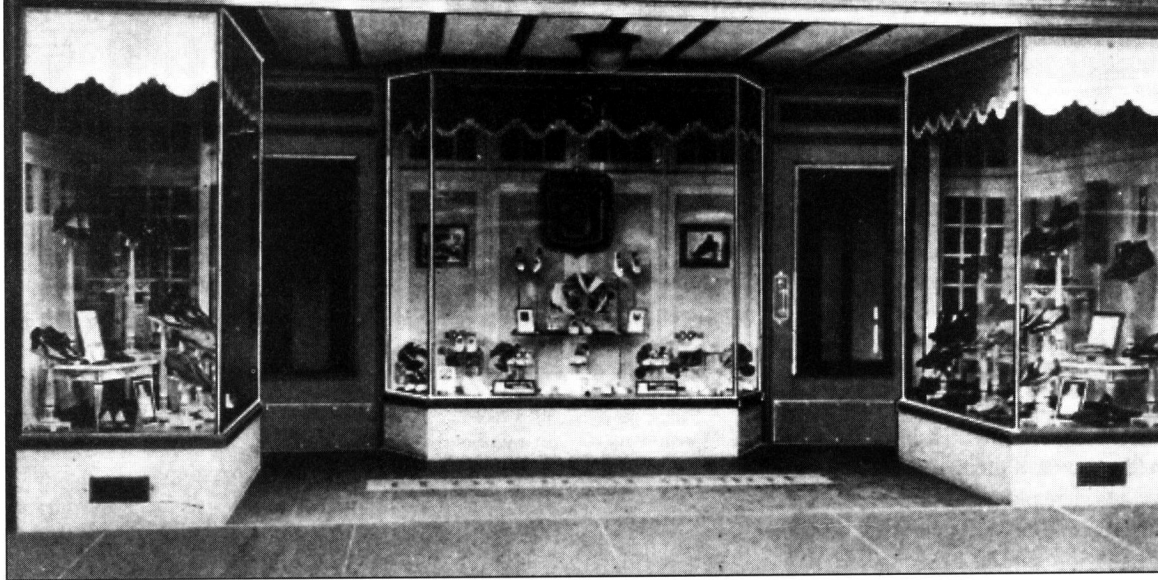
Compound installations mixed glasses of different qual-

ities and ornamental patterns in plates. Vertical plates, held in a wooden, brass, or iron frame, could be up to 15 square feet without any additional internal support. Luxfer guaranteed that the sash would be at least as stable and durable as ordinary window glass. Canopies needed intermediate supports in areas larger than 5 square feet and were not to exceed 15 square feet altogether.<sup>15</sup>

Long, complicated tables in Luxfer's handbook were used to calculate the right kind of prism in the appropriate combination and placement, leading to a specific prescription for a building's lighting requirements.<sup>16</sup> For architects who shied away from such complicated calculations, an average angle of 57 degrees was suggested. Luxfer also distributed color samples with the degree of light absorption, and formulas of how to respond with an additional amount of prismatic glass.<sup>17</sup>

A number of independent tests between 1900 and 1913 reported that the lighting capacity of prismatic glass in the depth of a room was between 5 and 50 times that of ordinary glass.<sup>18</sup> However, its success depended strongly on specific local circumstances. Vertical prism installations reached their limits if the building opposite was higher than twice its distance from the facade. In such cases protruding canopies were recommended. They could deliver sufficient light for storage in rooms overshadowed by a building up to five times as high as the width of the street. Prism installations were not necessary when the street width was at least three times the height of the building

# • SCHMIDT'S SHOE STORE •



The widespread use of prismatic glass panels in storefronts, usually incorporated as a horizontal band in the upper third of the storefront, changed the appearance as well as the design of stores. The 2- to 4-foot high panels were generally fixed in steel frames with copper, zinc, or lead.

on the other side (or, of course, if there was no opposite facade at all, as was often the case with the upper stories of tall buildings). Luxfer's calculation tables assumed the even brightness of an overcast sky. If sunlight struck the prism plates directly from above, it could cause a strong, unpleasant glare and increase the temperature in the back of the room.

The introduction of prismatic glass changed the architecture of office buildings and warehouses considerably. At a time when, especially in Chicago, facades were often reduced to little more than a simple post-and-beam construction with enormous windows, this new element assumed a prominent position: a horizontal checkerboard band, 2 to 4 feet high in the upper third of the storefront of the first one or two floors. It also occasionally influenced the floor plan, when existing light shafts were converted into additional floor space once prismatic glass

had been installed. In newly planned buildings light shafts were left out entirely and replaced by prismatic glass in the facades.<sup>19</sup> Ceiling heights could also be reduced because light could reach deeper into spaces, eliminating the need for high ceilings.

Although the whole procedure of choosing the right angle of refraction, producing the tiles, and assembling them in frames was far more complicated and costly than the application of ordinary ribbed glass, Luxfer Prisms were an immediate commercial success. This was probably due to both the product's highly convincing performance and the company's sophisticated promotional campaign. It advertised extensively, published articles in the leading architectural magazines, sponsored a design competition, and edited a handbook, *Luxfer Prism*, with detailed descriptions of the product's qualities.<sup>20</sup> After less than one year on the market, the company had already equipped 296 buildings



**Many prismatic glass installations from the early twentieth century, such this one in Selinsgrove, Pa., combined tile patterns for a striking visual effect.**

throughout the United States.<sup>21</sup> This number jumped to more than 12,000 by 1906.<sup>22</sup>

The Luxfer Prism Company emphasized additional advantages of prismatic glass. As a "new building material," it could be made part of the surface decoration of a building, competing with plate glass, which Luxfer considered a "necessary evil."<sup>23</sup> Luxfer urged its customers to go beyond the transom and fill entire openings with prismatic glass.

Hailed as the "Century's Triumph in Lighting," prismatic glass claimed to contribute to the rise of "good modern architecture."<sup>24</sup> Prominent architects such as Burnham and Root, Holabird and Roche, William Le Baron Jenney, and Ernest Flag used it frequently in their buildings. In 1898 Louis Sullivan used prismatic glass in the facade of the Gage Building in Chicago.<sup>25</sup> Later he carefully integrated huge plates of prismatic glass into the wild flowering of his trademark ornament in the facades

of the Carson, Pirie, Scott Department Store (1904) in Chicago. Frank Lloyd Wright, who in 1897–98 served as a product designer for Luxfer, produced a series of patterns for the outer surface of the prismatic tiles; at least one of them, an interwoven, linear pattern of circular segments and squares, was mass-produced.<sup>26</sup> Wright also designed a visionary office building, never executed, whose whole facade consisted entirely of Luxfer Prisms.<sup>27</sup>

Luxfer's success encouraged competition. By 1905, 14 firms were offering prismatic glass under such names as American 3-Way Prism, Searchlight Prism, Daylight Prism, and Solar Prism. Some advertised products similar to Luxfer's, clearly the industry leader. The American 3-Way Prism Company advertised prismatic glass tiles in slightly different sizes (5 and 5½ inches square) and a newly developed prismatic wire glass for fire protection.<sup>28</sup> Sizes also increased. By 1910 Luxfer offered sheets as large as 36 by 84 inches for factories.<sup>29</sup> In the 1920s plates as large as 54 by 60 inches were available, and many large glass producers, including the Pittsburgh Plate Glass Company, offered prismatic glass in two or three prism angles.<sup>30</sup> Large plates were easier to clean and maximized the refracting surface.

The introduction of electricity as well as technical disadvantages contributed to the dwindling success of the prisms. Contrary to Luxfer's claims, the installations required a certain amount of continual maintenance. The horizontal ridges on the inside were much more difficult to clean than ordinary window glass; as a result they darkened, allowing in even less light than normal windows.<sup>31</sup> The soldered zinc bands did not age well, and leaks were frequent. None of the canopies survived the impact of inclement weather. The complicated procedure of choosing different angles of refraction according to local conditions and the assemblage of small glass tiles into larger frames was too costly to be continued at a time when electric lighting became generally affordable. In the 1930s fashions for storefront designs shifted toward simplified, larger forms and grander, illuminated store signs, often covering the transom area above the display windows. The introduction of air conditioning required generally lower ceiling heights. When load-bearing, hollow glass blocks were introduced in 1935, a new, more efficient, and cheaper daylighting device became available.

In 1926 the American Luxfer Prism Company merged with one of its competitors, the 3-Way Prism Company, and existed as late as 1936 as the American 3-Way Luxfer Prism Company in Cicero, Illinois. However, no manufacturer of prismatic glass seems to have survived the 1930s.