

## History of Glass in Architecture

It's hard to imagine a world without ubiquitous glass. It lets light into our homes and workspaces, holds our liquids, and sustains thousands of touches each day as we access our data and keep in touch with our friends. Once a humble material with few uses, it has evolved into an irreplaceable part of modern life. In the construction world in particular, the evolution of glass has produced fascinating results and triggered many new ideas.

### **Origins of Glass**

Glass as we know it in our domestic and corporate spaces has natural origins - obsidian and fulgurite. These two elements (volcanic glass and lightning-struck sand, respectively) were used primarily in the making of weapons by prehistoric peoples, with little to no alteration of the substances in their native states. It wasn't until approximately 3500 BCE in Mesopotamia and Egypt that glassmaking emerged, likely the result of many years of experiments with heat and various substances. The perfect formula for synthetic glass was silica, sodium oxide, and calcium carbonate, and artisans began using it to produce items like vases and beads. These wares were expensive and sparse, and glass quickly became a high-end item for only the most wealthy. The advent of glassblowing techniques in the first century BCE only increased this notion, as craftsmen were able to craft beautiful luxury works to trade all throughout the Mediterranean.

### **Glass in Ancient Architecture**

But this magical glass combo did not yield the clear glass that we are accustomed to looking through. In Alexandria, in the first century AD, it was found that the addition of manganese oxide to the usual glass formula yielded a material that was transparent. The Romans were among the first to employ this technology in a new and unexpected way, incorporating clear rectangle-shaped glass in the walls of their villas. Wealthy inhabitants could look out upon their land and bask in sunlight while remaining inside, an unbelievable luxury. Ruins from Pompeii indicate that windows were fairly common in the fanciest buildings and residences in the ancient city, a testament to how quickly this idea caught on. Eventually the art of the window spread all throughout Europe and beyond. Cathedrals from the earliest centuries AD sport intricate stained-glass windows, many of which still stand today.

### **Moving Beyond the Window**

Windows captured the hearts and minds of millions of people throughout history, and continue to do so today, but as architecture evolved, even more creative uses of glass were discovered. Fast forward to the nineteenth and twentieth centuries, where the employment of glass as a load-bearing and insulating element became more and more commonplace. Perhaps the most famous first example of glass used structurally is the Crystal Palace in London, a building conceived by Sir Joseph Paxton for the Great Exhibition of 1851. It was simple, cost-efficient,

and easy to construct, and undoubtedly gave designers and architects reason to sit up and take notice.



All glass: Crystal Palace, London

### **Curtain Wall: The Next Big Thing**

Though impressive, the Crystal Palace was an example of glass-as-wall, which must be differentiated from the burgeoning curtain wall, another exciting development in the use of glass. Architect Arthur Korn mused in 1920 that some of fellow architect Mies van der Rohe’s buildings indicated “evidence of a new structural concept where all load-bearing elements are kept within the core of the building, leaving the outside wall free to be nothing but a wrapping to enclose and allow light to penetrate.” This is an apt description of a curtain wall, which is often non-load bearing but does important insulating and enclosing work. Buildings like the Hallidie Building in San Francisco (1917), the Van Nelle Factory in Rotterdam (1931), and St. Cuthbert’s Co-operative Association in Edinburgh (1937) all featured this glass veil, welcoming light into the interior while protecting inhabitants from the elements.



Van Nelle Factory, Rotterdam



St. Cuthbert's Co-operative Association, Edinburgh

## A Clear Field

Windows and curtain walls are everywhere we look. Pick any big city skyscraper for a fascinating case study in glass use in construction - does it have a curtain wall? How are the windows connected? Does it feature glazing or cladding? All these features are the product of thousands of years of innovation and creativity. From the crude vases of ancient Mesopotamia to the skyline-defying One World Trade Center, glass has come a long way.



Views of the One World Trade Center from the ground, courtesy of Brian Peregrina

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