Window Glass

Citation for published version:
Kennedy, CJ & Murdoch, KR 2017, 'Window Glass' *RICS Building Conservation Journal*, pp. 31-31.

Published In:
RICS Building Conservation Journal

BUILDING MATERIALS INFORMATION SHEET 1

Window glass

+info

This Materials Information Sheet was compiled by **Craig J. Kennedy**, Associate Professor of Building Materials at Heriot-Watt University, Edinburgh, and **K. Robin Murdoch**, Principal and Owner of Harlaw Heritage Ltd.
craig.kennedy@hw.ac.uk
krobinmurdoch@yahoo.com

Summary

Window glass is one of the most common building materials. It is long-lasting, resistant to decay and relatively ubiquitous. Identifying glass of different ages and types can be difficult, however.

Composition and performance

The main ingredient in glass is silica, most commonly sourced from sand. This sand is mixed with a fluxing agent to reduce the melting temperature. Historically, fluxing agents were the ashes of plants, trees and bracken. From the early 1700s to the 1830s, the most common source of flux was kelp – the ashes of burnt seaweed. In the 1830s, however, chemically produced sodium carbonate became commercially available and rapidly replaced kelp.


Traditional sash and case window with three “bullseyes”, indicating crown glass manufacture

Other materials can be added to the silica for various reasons. Arsenic and potassium nitrate were commonly used as refining aids in the 19th century, to purge gas bubbles from the melt. Recently, other agents have included sodium nitrate, slag from steelworks and antimony. Recycled or broken glass cullet can also form up to 50% of the glass melt manufactured today.

The composition of window glass has altered significantly over the past 450 years, and analysis has allowed a typology by date to be established.

Decay and degradation

The major cause of window glass decay is breakage, either accidental or as an act of vandalism. Very rarely will glass corrode in situ. Change over time is a result of oxidation of manganese in glass; panes with a relatively high level of the substance will often appear pink or rose-tinted over time.

Perhaps the greatest danger to historic glass is homeowners’ desire for modern double glazing, which has seen a great many windows altered over the last few decades. As a consequence, perfectly serviceable historic and irreplaceable window glass is being discarded on a massive scale.

Identification and application

To manufacture window glass requires large flat sheets that can be cut to the desired shape and size. Broad glass – cylinder glass – was common in the 17th century. The initial globular shape, the paraison, was blown then swung over a pit to create a long glass cylinder. Then reheated, the ends were sliced off and the side slit. Keeping it heated allowed for the cylindrical glass to be flattened on a surface, creating a large rectangle.

Crown glass is perhaps the best-known form of historic window glass, widely used in the 18th and 19th centuries. Here, the paraison was blown as a bubble, to which a solid rod, or pontil, was attached before the molten glass was opened out and spun quickly. This had the effect of creating a large disc of glass, often up to 1.5m in diameter. Glass pieces were then cut from the cooled disk.

Crown glass often curves because the complete tables – the crowns – were slightly mushroom-shaped. This will often contain curved striations and a small bullseye pattern from the centre of the spun disk. It can also have a variety of colour tinges depending on contaminants in the mix, ranging from pale greens to pale blues. It is typically thin because for around a century from 1745, window glass was liable to excise based on its weight. The maximum height of a pane would be around 700mm.

Around the time sodium carbonate was introduced as a flux, the method of making window glass reverted to the old cylinder broad technique, except that now the cylinders were opened out on to smooth glass surfaces, providing improved optical quality and considerably increasing the size of individual sheets. The new method was called “improved” or “German sheet”.

Mechanisation in the late 19th century and 20th century enabled rapid developments such as the drawn cylinder and Fourcault methods, which were both troubled by distortions in the glass. Today, most window glass is made using the float method, devised in the 1950s by the Pilkington company. This involves drawing a continuous ribbon of glass from the melting furnace into an enclosed bath of molten tin. The temperature is kept extremely high, allowing irregularities in the glass to melt out. The surface of the tin is flat, producing a flat surface in the glass.

A major issue, especially in older buildings, is identifying whether glass is modern; all historic glass has some surface distortion. Bubbles not purged from the melt often appear as “seeds”, and historic aspects can be determined by colour; 17th-century kelp glass has a greenish tinge, for example. Modern glass is largely flat and clear, free of imperfections or distortions.

Additional data sources
Dungworth, D. (2011) “The Value of Historic Window Glass”. *The Historic Environment Policy & Practice* 2: 19–46.
Murdoch K. R. (2011) “Glass”. In: *Building Scotland* ed. M. Jenkins. Edinburgh: Historic Scotland. 127–142.