Design of the Thin Glass Pavilion

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Abstract

Although light in appearance, as a material the perception of glass is one which is flat, stiff and heavy. In addition, the transparency of glass structures is often diminished by the inevitably of steel bolts, clamps and framing. In the design of the thin glass pavilion the authors wish to explore these limitations and challenge the perception of glass as a material.

Thin glass, defined as glass less than 2mm in thickness, was chosen for the pavilion. This material has recently become popularised by its use on smart phones however so far has not been utalised in architecture.The thin glass is composed of aluminosilcate rather than the standard soda-lime glass making it more suitable for chemical toughening, giving it greater strength.

The vast majority of glass that is produced for architecture is planar, however various processing techniques do exist to give glass non-planar form such as: hot slumping, tempered bending , lamination bending and cold bending. The high strength combined with the 0.5mm thickness of the glass selected for this project make it particularly adept for cold-bending. Thus the pavilion challenges the preconception that glass is flat and inflexible through bending the glass. This is exentuating through the curvature of architectural form. Cold-bending also helps to meet the brief that the pavilion must be transportable in limited space as the glass can be flat packed and formed on-site.

Compared to standard glass thin glass naturally has a greater strength to weight ratio. However the curvature of the glass gives additional geometric stiffness which further reduces the weight of the pavilion to meet the weight limitation set by the brief and again challanges the idea that glass and glass structures are heavy.

In order to maximise transparency and ease on site fabrication many different connection details have been explored. In designing the pavilion, the Authors preferred to utilise transparent or translucent materials for the connections. Compared to other materials such as timber and steel the development of glass connections is more involved due to their visual prominence and the unforgiving brittle nature of glass. Some of the connection details which were considered were: polymer clamp connections with silicone friction pads; and GFRP details laminated between glass ply.

Geometrically the pavilion is based on the thickened dual of a geodesic dome. As with other structures based on a geodesic dome, the structure benefits from a level of repetition on the elements, simplifying both fabrication and on-site assembly. The way in which the geodesic wireframe is thickened produces the geometrically stiff, curved glass beam structure.