Guidance notes

Glass Floors – Pedestrian use only

Two British Standards are relevant to the use of glass in floors and stair treads. These are 'BS EN 1991-1-1 : 2002 : Actions on structures' together with the UK National Annex, and BS 5395 : Part 1 : 1997 (1984) Code of practice for the Design of straight stairs. The latter makes reference to the danger of slippage and specifies minimum coefficients of friction.

For applications having four-edge support thick annealed laminated glass has been the traditional option. The use of single toughened glass is not appropriate as if broken it disintegrates and no longer supports a load. Laminated toughened glass is now commonly used when annealed glass lacks sufficient strength or is too large or heavy.

For four-edge supported toughened glass there must be at least two panels of glass, each fully capable of supporting the design loads although preference should be given to the use of three panes, two of which are designed to be fully capable of performing the load bearing function with the third one spare.

For support by two edges there must always be three thicknesses of toughened glass.

A single thickness of annealed glass may be appropriate if the floor does not protect a dangerous drop, perhaps where it is required to view something immediately below it or for use as a dance floor. If a dangerous drop is being protected, say 300mm or more, then a laminated solution must be used. The lower glass will help maintain integrity and prevent fragments falling if the upper glass is broken.

All glass floor specifications should be individually calculated to comply with the relevant loads given in the UK National Annex to 'BS EN 1991-1-1 : 2002 : Actions on structures'. It may be worthwhile taking advice from Building Control as in some instances the quoted design loads are very high and it might be appropriate to use a lower but safe and sensible load.

The loads to be considered are uniform (UDL) and concentrated. Glass performs poorly under a concentrated load and it is this that will determine the glass thickness.

The need to protect modesty can be achieved by using a translucent interlayer or sandblasting the glass. Sandblasting can also be used to provide slip resistance either by an all-over treatment or by deep sandblasting to raise dots on the glass that are similar to cushion flooring.

The glass must be supported by its edges and never at a mid-point. Size should preferably be limited to around one metre square or less to prevent individual panels becoming excessively heavy and difficult to install and replace. (1m2 of 50mm thick glass weighs 125kg). The edges should be flat ground and arrissed or water-jet cut.

The choice of framing material will depend on overall size and the nature of the project. Timber lends itself to small scale and domestic work whilst steel angles and “tee” sections enable large composite frames to be made easily and accurately. The strength of the frame must be calculated by a competent structural engineer. Where appropriate, the deflection of the frame must be limited as detailed in the above specifications.

The frame must provide edge support equal to the thickness of the glass plus at least 3mm clearance and there should be similar clearance if adjacent panes are to be butt-jointed.

Points to Consider

- Avoid high loads from hard objects such as castors on furniture.
- Electric lighting below glass floors can generate sufficient heat to crack annealed glass. Use either `cold` light or artificial ventilation.
- Thick annealed glass used externally can be subject to thermal stress and possible cracking. Special solutions are available when this may be a problem.
- External floors must be protected from wheeled traffic.
- Floors near entrance areas may be walked upon by people with wet footwear. Whilst the use of small panes or sandblasted finishes will act as a slip retardant, the provision of suitable matting may be required.
- External floors present the most danger of slipping. For these and other hazardous areas an upper pane can be included that has a slip-resistant treatment fired into its surface. Deflection inherent in the glass may lead to puddling when large sizes are specified.
- Clear glass floors at high level can be visually disturbing to users. The use of a sandblasted surface or translucent interlayer will help overcome this as well as preventing modesty problems.
- The nosings of stair treads should be protected by a suitable flange projecting up from the tread support.
- It is possible to provide fire resistance of up to one-hour integrity and insulation. Specialist advice is required.
- The edges of toughened glass must at least be arrissed. Full grinding or polishing is optional. The edges of annealed glass must be ground or polished.
- When toughened glass is specified consideration should be given to heat-soak testing.

Indicative Glazing Principles