Where glass reinforced polyester (GRP) rooflights, discussed in the previous section, are made as panels which are joined to form translucent rooflights. Opaque GRP panels can be made as monolithic, self-supporting shells, usually made from panel segments which are brought to site and bolted together. The segment sizes of GRP shells are made in sizes which are suitable for transportation by road, usually set upright on a trailer. The shells can then be lifted by crane into place as a completed assembly, which makes them quite different from roof structures in other materials.

**Smaller panels and shells**

Smaller shells consist of a set of segmented panels which are bolted together to form a roof shell of approximately 7.0 metres diameter. Some variations are supported by an additional frame, while others are self-supporting GRP shells.

GRP panels can be supported by a light metal frame beneath. The frame comprises steel or aluminium T-sections which are welded together to form a structure that supports the complete outer skin. The frame has curved members that radiate from the centre at the top to the edge and from the centre at the lowest point of the structure, back to the perimeter. The radiating 'spokes' of the wheel are held in place by T-sections that, in plan, form concentric circles. This "bicycle wheel" form is supported near its perimeter by a metal ring beam that is set immediately above the glazing beneath the GRP roof. The ring beam is supported by posts that are fixed to the roof deck beneath.

The metal frame is clad in prefabricated GRP panels which are bolted to the support frame on their internal face in order to avoid visible fixings. Panels are made with an outer skin of GRP around 5mm thick, with an overall panel depth of around 45mm for the panels sizes shown of 3500mm long and 1800mm wide. The GRP panels are stiffened by concentric ribs, around 120mm wide. The long edges of panels do not require thick ribs, and these are around 10mm thick. Panels are secured with bolts which are fixed through the metal support frame into reinforcing ribs at the edges of the GRP panels. Joints between GRP panels are formed by butting panels up to one another and sealing the gap between the panels. The seal is formed in a continuous step profile on the long edges of each panel that creates a continuous groove at the joint between panels. The groove is filled with a lamination of glass fibre and resin to fill the groove to the level of the top of the panels. The external face of the GRP is then ground smooth, usually by a hand-held grinder, to achieve a uniform, smooth surface that conceals the joint lines. Finally, a paint finish is applied, usually as a spray, to give a smooth and reflective finish. Where pigments are applied to the top coat, or 'gel' coat, in the factory, a more limited range of colours is available. Thermal insulation is set on the underside of the shell, being bonded to the inner face of the GRP panels in order to achieve continuity of insulation.

Typical examples use glass fibre ribs that form part of the shell to provide integral structural stability to the shell. Panels are generally around 200mm deep, and are bolted together to form a self-supporting GRP shell. Ribs are made in solid GRP in order to allow...
Horizontal and vertical sections 1:50. GRP shell roof

3-D section through roof assembly