



# Daylight Systems

## Factory Assembled Insulating Rooflights (FAIR): design considerations for reliable site fixing

Brett Martin Daylight Systems' FAIRs, specifically intended for use with composite panels, have been designed to ensure easy installation and reliable watertight sealing of every fixing and lap; full fixing and handling instructions are given in Technical Bulletins 124 and 125.

Brett Martin Daylight Systems' FAIRs comprise an inner and outer skin, manufactured from either GRP or polycarbonate, bonded together with Hardpak internal spacers positioned to align with purlins once the rooflight is installed.

**FAIRs are secured with through fixings at every purlin; there are a number of design considerations:**

- a good seal must be achieved between every fixing and the FAIR outer skin.
- deflection of the FAIR outer sheet must be avoided when the fixings are tightened, to avoid ponding and risk of leaks.
- FAIRs must be easy to fit, requiring similar levels of workmanship to other roofing materials.
- standard fasteners and fixing techniques should be used wherever possible, to minimise risk of confusion or error.



**It is essential that sufficient support is provided to the FAIR outer sheet beneath each fixing to achieve these requirements, enabling fastener washers and sealants to be compressed for a good seal whilst preventing deflection of the outer sheet.**

**Use of Hardpak rigid internal supports, alignment of these with supporting steelwork and correct fixing are all critical.**

### HARDPAK RIGID INTERNAL SUPPORTS

All Brett Martin Daylight Systems' FAIRs are manufactured incorporating Hardpak rigid internal supports as standard. These allow fasteners to be correctly tightened onto the outer sheet without it deflecting, avoiding risk of ponding and ensuring correct seal of the washer against the FAIR.

High density polyethylene foam fillers do not normally offer sufficient rigidity for use as internal reinforcement in FAIRs. Brett Martin Daylight Systems has previously used GRP or aluminium internal reinforcement to ensure good support for fasteners, but in conjunction with a specialist polymer foam supplier has now developed Hardpak: a laminated rigid foam specifically for this application.

Hardpak fillers have a density of 50kg/m<sup>3</sup> (the same as standard high density foam fillers), but polymeric modifications and laminating technology have been used to make the fillers extremely rigid. The compressive bulk modulus has been increased from 0.2 MPa to 3.5 MPa - stiffer than the core materials typically used to manufacture composite panels.

If the weight of a 90kg (14 stone) man is applied evenly to a typical Hardpak filler, 50mm wide, 1 metre long and 40mm deep, there would only be a deflection of 0.2mm.

### FILLER ALIGNMENT

All Hardpak internal supports must be properly located over structural steel work. Care is required to ensure that there is always sufficient bearing of both the top of a rooflight and the bottom of an overlapping composite panel onto the purlin. Steelwork tolerances can cause on-site variations from nominal position; purlin extensions may be necessary to achieve the necessary support, particularly at endlaps.



LEFT: Fixing through Hardpak rigid internal support - tightened to give an effective seal. RIGHT: Fixing through high density filler - causing 'dishing' around the fastener.



**The specification of internal supports, alignment relative to the purlin, and method of fixing are critical to achieving a good FAIR installation.**

## PRIMARY FASTENERS

FAIRs with Hardpak internal reinforcement can be fixed with any fasteners of suitable length, provided they are fitted with large (29/32mm) diameter sealing washers. The top thread of a dual threaded fastener (as typically used for composite panels) will not give any long term benefit when used with rooflight materials as it will not engage reliably in rooflight materials. However, such fasteners (eg: SFS SXTTP5-A32-5.5) can be used without any problem, and are usually preferred for ease of supply and consistency of fastener types on site.

Providing the fasteners are correctly positioned through the HardPak fillers directly over a purlin (or suitable extension) and correctly tightened, they will compress the FAIR construction against the purlin, complementing the bond of the original rooflight construction, and will ensure a long term fully weather tight seal will be reliably and easily achieved. It is critical that fasteners are never overtightened.

## METAL REINFORCEMENT TO INTERNAL SUPPORTS

Metal reinforcement over the internal fillers is not recommended for use with dual threaded fasteners, as this offers no benefit when fitted over Hardpak fillers, and can cause other problems. Dual thread fasteners are intended for use with composite panels: when designed and fitted correctly they work well. However, they do not give the same benefits if used in conjunction with metal strips in FAIRs:

- The low weight and need to avoid imposed loads on rooflights can allow them to lift clear of the purlin whilst fixing. The high thread can then tighten against the metal strip before the rooflight is compressed against the purlin.
  - The thickness of the large diameter washer and FAIR outer sheet reduce the effective thread length of the high thread, and also eliminate any potential benefit which a thread free section may offer, to contribute to this problem.
  - The coarser thread at the top of some (but not all) high thread fasteners will also contribute to this.
- The high thread will then strip, or the rooflight will hang off the fastener, clear of the purlin. The extent to which this occurs can vary between fasteners, distorting the rooflight, straining the original bonds and jeopardising long term integrity of the rooflight.
- Flexible metal strips fitted over standard foam fillers may on occasion be pushed down by the high thread (depending on rigidity of the metal strip and support beneath it); if this occurs support for the outer sheet is removed, which prevents a seal from being achieved.

Brett Martin Daylight Systems have worked closely with major fastening suppliers to develop their FAIRs, including the use of Hardpak fillers and Underlap Strip: they are now recognised as the best rooflights available for this application, as illustrated by the comments from SFS Intec Ltd.



“During development of their FAIRs, Brett Martin Daylight Systems and SFS worked closely together to design out the potential problems and thus ensure the product could be fixed using traditional procedures to give optimum performance with regards to weathertightness and structural stability of the rooflight. Brett Martin Daylight Systems’ design of FAIRs is our preferred choice and we believe it will also be favoured by the majority of Specifiers and Contractors as their preferred choice.”

Simon Cooper - Technical Manager, SFS Intec Ltd

## SIDE LAP FASTENING AND METAL REINFORCEMENT

Where FAIRs lap over adjacent composite panels, standard stitching screws should be used. Where the adjacent panel laps over a FAIR, Brett Martin Daylight Systems recommend specification of Underlap Strip: a galvanised steel strip bonded into the underlapping sidelap of the FAIR (at small extra cost), allowing standard stitching screws to be used on both sidelaps. This reduces the cost of fasteners and number of fastener types on site, improving ease of installation. 17x17x0.8mm angle section is used (rather than flat strip), to give added rigidity and ensure the stitching screws can be reliably secured into the strip. Where Underlap Strip is not specified, expanding rubber grommet fasteners should be used where the rooflight laps under an adjacent panel



Galvanised steel strip bonded into side lap

## CONCLUSION

- The unique Hardpak internal supports incorporated in all Brett Martin Daylight Systems’ FAIRs ensure that they can be easily installed to achieve an effective watertight seal at every fixing and lap.
- Metal strips over fillers at purlins are not recommended.
- Care is required to ensure correct installation: fasteners must not be overtightened, and purlin extensions may be necessary to ensure correct alignment of internal fillers with steelwork.
- It is recommended that Underlap Strip steel angle section is specified at sidelaps to allow use of standard sidestitching screws, improving the ease of installation.

**Correct installation of FAIRs is important to ensure they achieve the correct level of safety performance, and give long term weather tightness.**



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