FR Technical Instruction

It is the responsibility of the user to read this guide before using our material

Security Classification	Document Approval Status
Unclassified	Approved

Product Sizes:

FR is available in a standard sheet size of 1,300 mm x 800 mm and thicknesses of 1mm, 2 mm, 5 mm, 10 mm, 15 mm and 20 mm.

Surface cleaning:

- **DO NOT USE 'ACETONE' 'PROPANE' 'STYRENE' OR CHEMICALS WHICH WILL CORRUPT THE SURFACE OF THE BOARD**
- IPA (isopropyl alcohol) is recommended as the safest cleaning product to use
- If painting surface, trials 'MUST' be carried out to ensure there is no reaction between the board and paint adhesion/finish quality

TECHNICAL PROPERTIES

Property	Value	FR Available Product Thicknesses				Test Method
		1 mm	2 mm	5 mm	10 mm	
Maximum Weight	Kg / m²	< 1.4	< 2.6	> 7.2	> 14.6	Calibrated weighing scales
Compressive Strength	MPa	63	83	357	291	According to BS EN ISO 604: 2003 for 5 mm & 10 mm and D695-15 for 2 mm
Compressive Modulus	GPa	20.7	22.2	13.89	15.4	According to BS EN ISO 604: 2003 for 5 mm & 10 mm and D695-15 for 1 mm & 2 mm
Flexural Strength	MPa	217.3	182.8	67.8	102	According to ISO 178: 2010 + A1: 2013
Flexural Modulus	GPa	11.9	11.4	8.93	15.8	According to ISO 178: 2010 + A1: 2013
Tensile Strength	MPa	107	118	91	59.9	According to BS EN ISO 527.4: 2013
Tensile Modulus	GPa	16.76	17.5	17.5	14.5	According to BS EN ISO 527.4: 2013
Density	g / cm³	1.38	1.23	> 1.15	> 1.15	Acc. to BS EN ISO 1183-1:2012, Method A
Colour	-	Black				Visual
Working Range	° C	-196 to +1200		-196 to +1500		External and In-house testing
Fire Protection Time	Mins	> 60	>120	> 240	> 720	External and In-house testing
Standard Available Dimensional Size	cm	80 x 130				-

Storage:

- Keep away from direct sunlight
- Do not let material freeze
- Store between 5 - 25 ^{O}C / 41 - 77 ^{O}F
- Store the product in a clean and dry place
- Store flat and fully supported
- Handle in accordance with good hygiene and safety practices
- Move mechanically where possible
- If manually handling/moving, do so in a safe manner in accordance with current manual handling guidelines for your county/country

Health and Safety:

This technical document should be read in conjunction with the current **FR** material data sheet (MSDS), which is available at www.cfpcomposites.com. It is also advised that users familiarise themselves with the current regulatory regulations, Health and Safety policies and operating guidelines for the required machinery and tools to be used.

Precautions should be taken to ensure all local health and safety guidelines have been met. Personal Protective Equipment (PPE) should consist of a minimum of a suitable rated breathing apparatus, safety overalls or disposable overalls, suitable gloves and safety glasses/googles to meet the requirements of the materials/chemicals you will be using.

Author	Release Date Issue 'A'
D Deakin	Dec. 2019

Author	Release Date Issue 'B'
D Deakin	April 2021

Author	Release Date Issue 'C'
D Deakin	January 2024

Author	Release Date Issue

Author	Release Date Issue

Print date: 01/03/2024

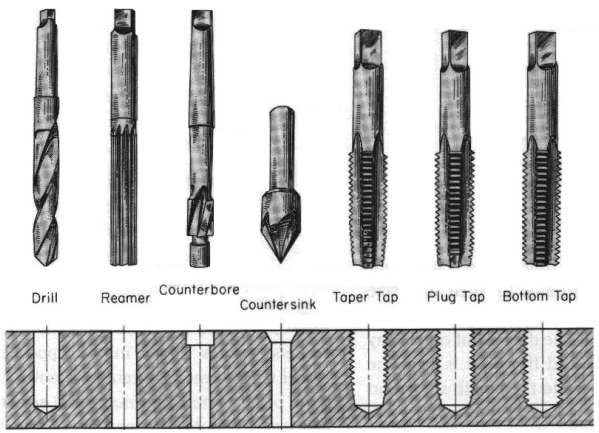
Cutting and Handling Requirements:

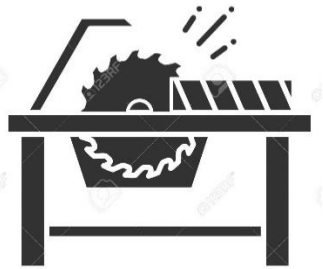
- Avoid the dispersion of loose fibres
- Cut and sand sheets in well-ventilated premises
- Ventilation devices should have a suitable filters to avoid discharging loose fibres back into the open air
- Where there are electrical appliances, they should be protected in sealed or pressurised cases
- Insulating varnish may be applied to electronic boards and electrical terminals
- Carbon fibres/dust are electrically conductive and may cause electrical short-circuits which could result in damage or malfunctioning of electrical equipment

Cutting, Drilling, Tapping and Machining:

- Flat sheets can be filed, sanded, cut, drilled, and tapped to suit the required application Aesthetically and durable coatings can be applied to the surface face
- Diamond tip/coated blades are best for cutting our material
- Cold, dry airline blowing during cutting can help maintain a cooler cutting blade as long as a suitable extraction system is being used

Do not use cutting fluids – dry cut only





Laser Cutting Trials:

The below is an extract from a full report which is available upon request.

Laser cutting trail of FR 5mm and 10mm thick carbon fibre board.

The sample pieces of FR had a blue painted surface on one side. The board was cut with the painted surface on the underside.
The laser cutter used was a Bystronic 2kW fibre laser using argon gas.
The parameters of the laser (feed rate and power) will be adjusted to see what achieves the best cut.

Conclusion

FR – 5 mm

The laser cutter can cut the 5mm thick carbon fibre board with a good quality cut surface finish with a feed rate of 1000mm/min @ 1800W.

FR – 10 mm

The laser cutter struggled to cut through the thickness of the 10mm thick board and provided a poor cut, causing the material to delaminate. It should be noted that the painted surface was on the underside of the material and this may be causing a problem. Instances in past testing on cutting a metal sheet, the label on the underside of the laser has affect the laser cutting and the quality of the cut in that area. If this is the case with our material; additional trials will need be carried out. The paint may also be preventing full penetration of the laser and the heat maybe forced back up towards the top surface, causing delamination.

It may be the case that the laser cutter is not powerful enough to cut the 10mm thick material at a sufficient feed rate to prevent delamination.

Waterjet Cutting Trials:

One customer has carried out their own inhouse waterjet trials, but we are unable to disclose any of the data.

We are only able to say that they successfully waterjet our FR 2mm, 5 mm and 10 mm material.

The size and shape cut are unknown, including machine type, specification and settings used.

Painting FR:

CFP have only carried out in-house small-scale trial painting and not productionised volumes.

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- IPA (isopropyl alcohol) is recommended as the safest cleaning product to use
- If painting surface, trials 'MUST' be carried out to ensure there is no reaction between the board and paint adhesion/finish quality

Primer coating application notes:

- When you apply the first coat of primer you may observe some raised fibres during spraying/drying
- Once coating is fully dry, sand flat and apply addition primer coats
- Continue to apply primer coats until you have no raised fibres and the surface is fully sealed/coated

Spraying method:

The best standard car paint and method we have found to work on our FR.10 is as follows:

1. 240 grit paper on a mechanical sander to flatten surface to be painted if required.
   Blow off as much dust with an airline and cloth and only clean with IPA (isopropyl alcohol) if necessary.

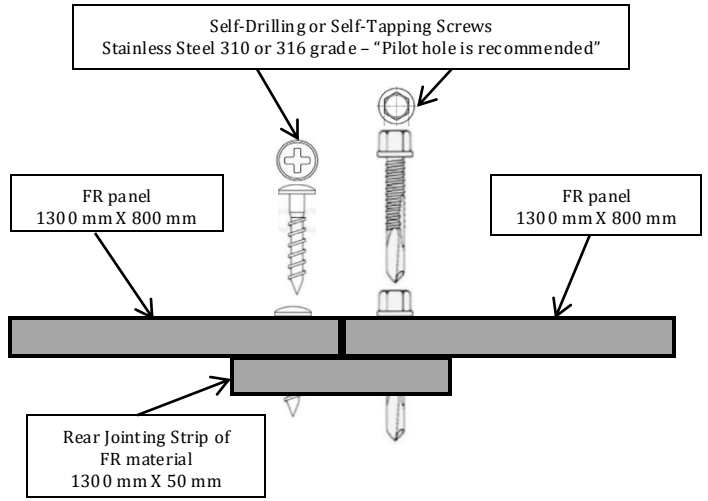
1. Base coat:
   Spectral Under 385 Epoxy Primer with Spectral H 6985 Hardener
   Spray light coats of primer to slowly build up the thickness to seal the top surface.
   Use a fine grit paper in between coats

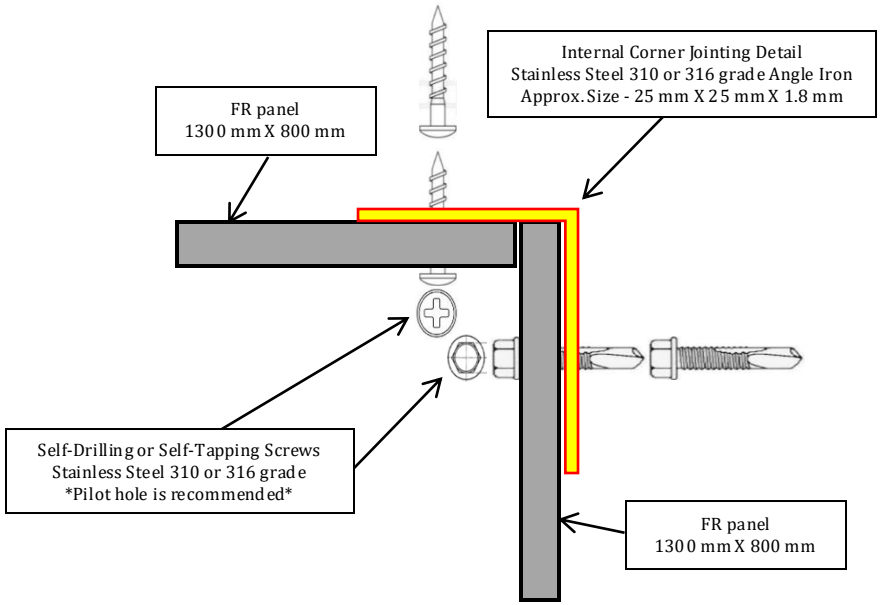
1. Top Coat:
   2K Acrylic Paint with 2K Universal Fast Hardener
   (a good 2 part car paint)

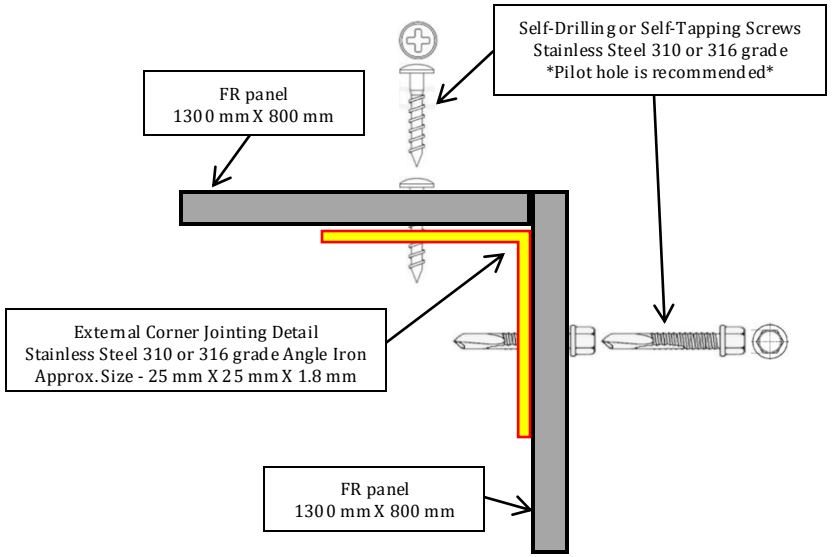
1. Spray gun used:
   Devilbiss Pri Pro Lite Spray Gun

Board Mechanical Joining:

Our FR.10 material can be screwed and tapped in the same manner as metals and/or other materials







Technical

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