Fire, Smoke & Toxicity
Retardant Materials
INTRODUCTION

Gurit has established itself as a leading global supplier of composite materials, engineering, tooling, parts and systems. Over 30 years’ experience in the practical application of composites across various market sectors, combined with a unique technical approach enables Gurit to offer the complete composite solution.

Gurit’s range of Fire Retardant (FR) products are designed to deliver high performance laminates whilst meeting demanding fire requirements. The ease of use and processing properties of these systems allow large parts to be manufactured in one operation using vacuum only consolidation.

The FR range is available in a wide variety of formats from ambient curing liquid systems to elevated temperature curing SPRINT™ products. Typical applications include cladding of buildings, interior and exterior train parts, commercial/military craft and fire protection on passenger ferries/superyachts.

GURIT’S RANGE OF FST MATERIALS

<table>
<thead>
<tr>
<th>FORMAT</th>
<th>SYSTEM</th>
<th>MAIN FEATURES</th>
<th>INTENDED APPLICATION</th>
<th>FIRE TEST STANDARDS</th>
<th>PAGE</th>
</tr>
</thead>
</table>
| Laminating | Ampreg™ 21FR | ~ Range of working times  
~ Capable of ambient only cures  
~ Ideal for wet laminating large composite structures | Large Civil Structures                                      | BS 476 (Parts 6 & 7) UL94                                                        | 2    |
| SPRINT™ | ST 70FR | ~ Low smoke toxicity  
~ Halogen-free  
~ 70°C curable  
~ Suitable for Lloyds and MCA compliant structures | Industrial / commercial marine craft and civil applications | BS 476 Parts 6 & 7  
BS 6853 Annexe B.2  
ISO 5658-2  
DIN 5510-2  
ISO 4589-2 | 3    |
| SPRINT™ | ST 91FR | ~ Outstanding compressive properties  
~ Controlled flow  
~ Light tack – suitable for use in higher ambient temperature | Civil Structures                                             | ASTM E84  
UL94  
BS476 Part 7 | 3    |
| SPRINT™ | ST 130FR | ~ 85°C Curable  
~ Tg > 130°C (with elevated temperature cures)  
~ Low smoke formulation  
~ Excellent tack and drape | Rail / Industrial / Commercial Marine Craft                | EN 45545  
IMO FTP Part 5 | 4    |
| Prepreg | SE 130FR | ~ HL2 in R1 and R7 to EN45545  
~ Pass for Bulkheads, walls and ceiling linings to IMO FTP Part 5 | Civil Structures                                             | ISO 5660-1  
FMVSS302 | 4    |
| Resin Film | SE 90FRBL | ~ Black tinted resin  
~ Outstanding compressive properties  
~ Controlled flow  
~ Light tack | Civil Structures                                             | ISO 5660-1  
FMVSS302 | 4    |
| Surface Film | SF 80FROBL | ~ Effect FR layer to epoxy substrates  
~ High gloss black surface finish  
~ Resistant to Moisture ingress | Protection of structural components; engine bays and exhaust runs in marine craft | ISO 5660-1  
FMVSS302 | 5    |
| Surface Film | SF 130FR | ~ Benefits from same features as SE/ST130FR  
~ Improves demoulded surface finish | Rail / Industrial / Commercial Marine Craft                | EN 45545  
IMO FTP Part 5 | N/A  |
| Resin Film | SA 130FR | ~ Benefits from same features as SE/ST130FR  
~ Provides additional resin for sandwich laminate manufacturing | | | |

1
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 hours working time at 25°C; ideal for laminating large</td>
<td>composite structures</td>
</tr>
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<td>composite structures</td>
</tr>
<tr>
<td>Meets BS476 part 6 &amp; 7 class 2</td>
<td>BS476 part 6 &amp; 7 class 2</td>
</tr>
<tr>
<td>Meets UL94 V0 rating</td>
<td>BS476 part 6 &amp; 7 class 2</td>
</tr>
<tr>
<td>Low initial mixed viscosity for fibre/fabric wet-out</td>
<td>Low initial mixed viscosity for fibre/fabric wet-out</td>
</tr>
<tr>
<td>Low exotherm &amp; shrinkage</td>
<td>Low exotherm &amp; shrinkage</td>
</tr>
</tbody>
</table>

Ampreg™ 21FR has been optimised for the manufacture of large composite structures using hand layup, and vacuum bagging techniques. Ampreg™ 21FR has been designed to give excellent mechanical and thermal properties from both ambient temperature cures, and moderate temperature postcures (50°C). This system uses Ampreg™ 21 hardeners and is available with a range of hardener speeds, from Standard to Ultra Slow.

**TYPICAL APPLICATIONS**

Laminating of large composite structures for infrastructure, marine and rail applications.
ST 70FR
Fire Retardant SPRINT™

- Meets BS476 part 6 & 7 class 0 rating
- Capable of meeting FAR25.853, 12 second & 60 second burn
- Suitable for Lloyds and MCA compliant structures
- SPRINT™ format allows high quality thick cored laminates to be produced in one operation

ST 70FR is a low temperature curing fire retardant epoxy SPRINT™ product. The SPRINT™ format makes this product ideal for the manufacture of thick sections requiring a high level of fire protection. It can be cured at temperatures as low as 70°C, but can also be used for the rapid manufacture of components through its 60-minute cure @110°C. ST 70FR provides high quality laminates from out of autoclave, vacuum only processing.

TYPICAL APPLICATIONS
Industrial / commercial marine craft and civil applications where thick fire retardant laminates are required.

ST 91FR
Fire Retardant SPRINT™

- Fire retardant
- Capable of meeting BS 476 Part 7 Class 1
- Outstanding compressive properties
- Controlled flow
- Light tack - suitable for use in higher ambient temperatures
- Compatible with SF 80FROBL for improved performance

ST 91FR is a fire-retardant, hot-melt, epoxy prepreg system that offers an extremely good balance of mechanical properties. Capable of meeting ASTM E84, UL 94 V0, BS 476 Part 7 Class 1.

The system is ideal for structural components where self-extinguishing fire performance and high load bearing capability are desired. ST 91FR can be cured at 90°C and retains an outlife of up to 14 days at 21°C. With its 90 minute cure at 120°C, it is also suitable for the quick manufacture of parts, and is also used in the development of trial components.

TYPICAL APPLICATIONS
ST 91FR is ideally suited to marine and civil applications where structural laminates with a good degree of fire retardancy are required.
### SE 90FRBL
FR Epoxy Prepreg

- Fire retardant
- Outstanding compressive properties
- Light tack
- Black tinted resin
- Controlled flow
- Suitable for thick and thin sections

SE 90FRBL is a fire-retardant, hot-melt, epoxy prepreg system that offers an extremely good balance of mechanical properties. The system is ideal for structural components where self-extinguishing fire performance and high load bearing capability are desired.

SE 90FRBL can be cured at 90°C, yet retains an outlife of up to 56 days at 23°C. With its 90 minute cure at 120°C, it is also suitable for the quick manufacture of parts, and is also used in the development of trial components.

### TYPICAL APPLICATIONS
SE90 FRBL is ideally suited to marine and civil applications where high strength structural laminates with a degree of fire retardancy are required.

### SE 130FR
130°C Tg Fire Retardant
Low Smoke Prepreg

- Tested to EN45545 → HL2 Rating in R1, R7 and R17 Categories
- Curable at temperatures as low as 85°C (185°F)
- Can achieve 130°C Tg using vacuum bag processing
- Excellent drape allowing easy in-mould repositioning

SE 130FR is a black, low temperature curing, fire retardant & smoke suppressant epoxy prepreg product.

SE 130FR can be cured at temperatures as low as 85°C / 185°F, but can also be used for faster manufacture of components through its 45 minute cure at 120°C / 248°F. SE 130FR provides high quality laminates from out of autoclave, vacuum only processing.

SE 130FR has been tested in accordance with the stringent European fire test standard EN45545, achieving a HL2 rating in R1,R7 and R17 categories (users must fire test their unique component laminates to ensure expected fire test results are achieved).

### TYPICAL APPLICATIONS
SE 130FR is ideally suited to rail / industrial / commercial marine craft and civil applications where fire retardant laminates are required.
**SF 80FROBL**

*Fire Retardant Surfacing Film*

- Provides an effective fire retarding layer to epoxy substrates
- With the correct tooling can provide a high gloss black surface finish
- Resistant to moisture ingress

SF 80FROBL surfacing material is a Fire Retardant Obliterated Black (FROBL), filled epoxy film. It provides an effective fire retarding layer capable of withstanding exposure to fire, while preventing the epoxy substrate from combustion.

SF 80FROBL can be used directly against a suitably release treated mould surface, with prepreg or SPRINT™ plies laid up behind it, or as a final layer in the mould. The product is sufficiently tacky to aid placement into vertical surfaces of a mould. SF 80FROBL can be cured with vacuum only processing.

The epoxy system is supplied ready impregnated into a supporting medium and ready catalysed, requiring only a moderate temperature cure.

**TYPICAL APPLICATIONS**

Typical applications include protection of structural components in high risk areas such as engine bays, exhaust runs, and around the fuel system.

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**ST 130FR**

*130°C Tg Fire Retardant Low Smoke SPRINT™*

- Tested to EN45545 → HL2 Rating in R1, R7 and R17 Categories
- Curable at temperatures as low as 85°C (185°F)
- Can achieve 130°C Tg using vacuum bag processing
- Excellent tack and drape allowing easy in-mould repositioning
- SPRINT™ enables high quality thick cored laminate production in one operation

ST 130FR is a black, low temperature curing, fire retardant & smoke suppressant epoxy SPRINT™ product.

The SPRINT™ format makes this product ideal for the manufacture components requiring a high level of fire protection. It can be cured at temperatures as low as 85°C / 185°F, but can also be used for faster manufacture of components through its 60 minute cure at 120°C / 248°F. ST 130FR provides high quality laminates from out of autoclave, vacuum only processing.

ST 130FR has been tested in accordance with the stringent European fire test standard EN45545, achieving a HL2 rating in R1, R7 and R17 categories (users must fire test their unique component laminates to ensure expected fire test results are achieved)

**TYPICAL APPLICATIONS**

ST 130FR is ideally suited to rail / industrial / commercial marine craft and civil applications where fire retardant laminates are required.
Gurit® Balsaflex™
Classic Wood Core

- High quality composite core material made from end grain balsa
- Highest strength to weight ratio of any structural core
- Natural, sustainable and responsibly sourced

Gurit® Balsaflex™ is the classic end-grain balsa wood core, featuring very high strength to weight ratio. When an application requires high-strength and stiffness and cost effectiveness, Gurit® Balsaflex™ is a suitable solution due to a good balance between cost, properties and weight. Gurit® Balsaflex™ is available in a range of densities, thicknesses, formats and finishes. Gurit® Balsaflex™ is DNV GL approved.

TYPICAL APPLICATIONS
Gurit® Balsaflex™ is used for wind turbine blades and nacelles, marine, automotive, truck, rail and aircraft parts. Gurit® Balsaflex™ can be supplied in sheet form or kit-cut to customer’s desired shapes.
## Monolithic panel solutions

<table>
<thead>
<tr>
<th>PAGE</th>
<th>DESCRIPTION</th>
<th>WEIGHT (KG/M²)</th>
<th>THICKNESS (MM)</th>
<th>COST</th>
<th>FR PERFORMANCE</th>
<th>SMOKE PERFORMANCE</th>
<th>INTENDED APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Ampreg™ 21FR Ultra Slow / 5 x plies WRE 581T / 45-50% RC</td>
<td>5.5</td>
<td>3.2</td>
<td>€</td>
<td>★★</td>
<td>★</td>
<td>General: BS476 pt 7; Class 2, UL94; V-0</td>
</tr>
<tr>
<td>8</td>
<td>4 x plies ST 91FR / YE 905 1 x ply SF 80FR/BL 220g (optional)</td>
<td>5.5</td>
<td>3.3</td>
<td>€</td>
<td>★★★</td>
<td>★★★</td>
<td>General: BS476 pt 7; Class 1, UL94; V-0</td>
</tr>
<tr>
<td>9</td>
<td>3 x plies ST 91FR / WRE 581T</td>
<td>2.7</td>
<td>1.3</td>
<td>€</td>
<td>★★★</td>
<td>★</td>
<td>Rail: EN45545-2; HL1 in R7 General: EN13501; Class C S3, ASTM E84; Class A</td>
</tr>
<tr>
<td>9</td>
<td>10 x plies SE 130FR / HEC 300</td>
<td>5.5</td>
<td>3</td>
<td>€€</td>
<td>★★★★</td>
<td>★★★★</td>
<td>Rail: EN45545-2; HL2 in R1 &amp; R7</td>
</tr>
<tr>
<td>10</td>
<td>4 x plies ST 130FR / WRE 581T</td>
<td>4.0</td>
<td>2.2</td>
<td>€€</td>
<td>★★★★</td>
<td>★★★★</td>
<td>Rail: EN45545-2; HL2 in R1 &amp; R7</td>
</tr>
<tr>
<td>10</td>
<td>4 x plies ST130FR / RC416T</td>
<td>3.2</td>
<td>2</td>
<td>€€</td>
<td>★★★★</td>
<td>★★★★</td>
<td>Rail: EN45545-2; HL2 in R1 &amp; R7</td>
</tr>
</tbody>
</table>

## Sandwich Panel Solutions

<table>
<thead>
<tr>
<th>REF/PAGE</th>
<th>DESCRIPTION</th>
<th>WEIGHT (KG/M²)</th>
<th>THICKNESS (MM)</th>
<th>COST</th>
<th>FR PERFORMANCE</th>
<th>SMOKE PERFORMANCE</th>
<th>INTENDED APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2 x ST 130FR / WRE 581T / 37% 1 x SA 130FR / 250g Aluminium Honeycomb 15mm 1 x SA 130FR / 250g 2 x ST 130FR / WRE 581T / 37%</td>
<td>5.2</td>
<td>17.2</td>
<td>€€</td>
<td>★★★★</td>
<td>★★★★</td>
<td>Rail: EN45545-2; HL2 R1 &amp; R7 Commercial Marine: IMO FTP Part 5 (Part 2 pending)</td>
</tr>
</tbody>
</table>

Actual weight and thickness may vary depending on consumables used. Fire test performance to be used as indication only.
For more information, please contact Gurit Technical Support: Technical.Support@gurit.com
**GURIT MONOLITHIC PANEL SOLUTIONS**

### AMPREG™ 21FR MONOLITHIC LAMINATE

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Vacuum Consolidated</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3 mm</td>
<td>5.5 kg</td>
<td></td>
</tr>
</tbody>
</table>

**LAY-UP AND MANUFACTURE METHOD**
- Vacuum Bag consolidated, 24h ambient cure followed by 16h @ 50°C post-cure
- Breather Cloth
- Release film
- Peel Ply
- 5 x plies WRES81T / 45-50% Resin Content
- Tool Face (Release coated Glass plate)

**TEST STANDARDS & RESULTS**
- BS476 Pt 7
  - Achieves Class 2
- UL94
  - Achieves V-0

**TYPICAL APPLICATIONS**
- Large civil structures, typically in conjunction with other FR building material such as Rockwool.

### ST 91FR MONOLITHIC MULTIAXIAL GLASS LAMINATE

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Vacuum Consolidated</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3 mm</td>
<td>5.5 kg</td>
<td></td>
</tr>
</tbody>
</table>

**LAY-UP AND MANUFACTURE METHOD**
- Vacuum Bag consolidated, cured for 12h @ 90°C
- Breather Cloth
- Release film
- Peel ply
- 4 x plies ST 91FR / YE 905 / 34%
- 1 x ply SF 80FROBL 220g (optional)
- Tool Face (Release coated Glass plate)

**TEST STANDARDS & RESULTS**
- BS476 Pt 7
  - Achieves Class 1

**TYPICAL APPLICATIONS**
- Large civil structures where class A finish may be required.
ST 91FR
MONOLITHIC
WOVEN GLASS
LAMINATE

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Vacuum Consolidated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3mm</td>
<td>2.7kg</td>
<td></td>
</tr>
</tbody>
</table>

LAY-UP AND MANUFACTURE METHOD
¬ Vacuum Bag consolidated, cured for 12h @ 90°C
¬ Breather Cloth
¬ Release film
¬ Peel ply
¬ 3 x plies ST 91FR / WRES81T / 37%
¬ Peel Ply
¬ Tool Face (Release coated Glass plate)

TEST STANDARDS & RESULTS
EN45545-2
Achieves HL1 in R1
EN13501
Achieves Class C S3
ASTM E84
Achieves Class A

TYPICAL APPLICATIONS
Large civil structures, Rail exteriors.

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SE 130 FR
MONOLITHIC
UD CARBON
LAMINATE

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Vacuum Consolidated</th>
</tr>
</thead>
<tbody>
<tr>
<td>3mm</td>
<td>5.5kg</td>
<td></td>
</tr>
</tbody>
</table>

LAY-UP AND MANUFACTURE METHOD
¬ Vacuum Bag consolidated, cured for 6h @ 85°C
¬ Breather Cloth
¬ Release film
¬ Peel ply
¬ 10 x plies SE 130FR / HEC 300 / 45%
¬ Tool Face (Release coated Glass plate)

TEST STANDARDS & RESULTS
EN45545-2
Achieves HL2 R1 and R7

TYPICAL APPLICATIONS
Structural members in Locomotives and bogies.
## ST 130 FR MONOLITHIC WOVEN GLASS LAMINATE

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Vacuum Consolidated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2mm</td>
<td>4.0kg</td>
<td></td>
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</tbody>
</table>

### LAY-UP AND MANUFACTURE METHOD
- Vacuum Bag consolidated, cured for 6h @ 85°C
- Breather Cloth
- Release film
- Peel ply
- 4 x plies ST 130FR / WRE 581T / 42%
- Peel ply
- Tool Face (Release coated Glass plate)

### TEST STANDARDS & RESULTS
- **EN45545-2**
  - Achieves HL2 R1 and R7
- **IMO FTP Part 5**
  - Achieves a pass for Bulkheads, walls and ceiling linings

### TYPICAL APPLICATIONS
- Typically used as cladding for exteriors, or as part of interior curved sections; Wall panelling in Superyachts and cruise ship cabins.

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![Diagram](image1.png)

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## ST 130 FR MONOLITHIC WOVEN CARBON LAMINATE

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Vacuum Consolidated</th>
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<tbody>
<tr>
<td>2mm</td>
<td>3.2kg</td>
<td></td>
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</table>

### LAY-UP AND MANUFACTURE METHOD
- Vacuum Bag consolidated, cured for 6h @ 85°C
- Breather Cloth
- Release film
- Peel ply
- 4 x plies ST130FR / RC 416T / 48%
- Peel ply
- Tool Face (Release coated Glass plate)

### TEST STANDARDS & RESULTS
- **EN45545-2**
  - Achieves HL2 R1 and R7

### TYPICAL APPLICATIONS
- Typically used as part of structural laminates on rolling stock and locomotives, and where stiffness is a key consideration.
ST 130FR
ALUMINIUM
SANDWICH

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>Weight/m²</th>
<th>Press Cured</th>
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</thead>
<tbody>
<tr>
<td>17.2mm</td>
<td>5.2kg</td>
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</table>

LAY-UP AND MANUFACTURE METHOD
¬ 4 hour total cure time, 1°C ramp to 120°C, dwell 1 hour, de-mould when cool
¬ Tool Face (Heated Steel Platten)
¬ Release film
¬ 2 x plies ST 130FR / WRE581T / 37%
¬ 1 x ply SA130FR / 250g
¬ Aluminium honeycomb Core
¬ 1 x ply SA130FR / 250g
¬ 2 x plies ST130FR / WRE581T / 37%
¬ Release film
¬ Tool Face (heated steel platen)

TEST STANDARDS & RESULTS
IMO FTP HSC Part 5
IMO FTP HSC Part 2 Results pending
EN45545-2 HL2 R1 & R7

TYPICAL APPLICATIONS
Flat panelling e.g. Flooring in commercial marine & rail
TECHNICAL INFORMATION AND PRICING

For more detailed information on fire, smoke and toxicity retardant materials, as well as the complete Gurit product portfolio, please visit: www.gurit.com to view the following:

- Product Data Sheets
- News / Case Studies
- Events Schedules
- Corporate Videos
- Composite Guides
- Representatives Contact Details
- Product Brochures

For pricing or other enquiries, please contact customer.support@gurit.com