

Engineering composites in fire retardant SPRINT

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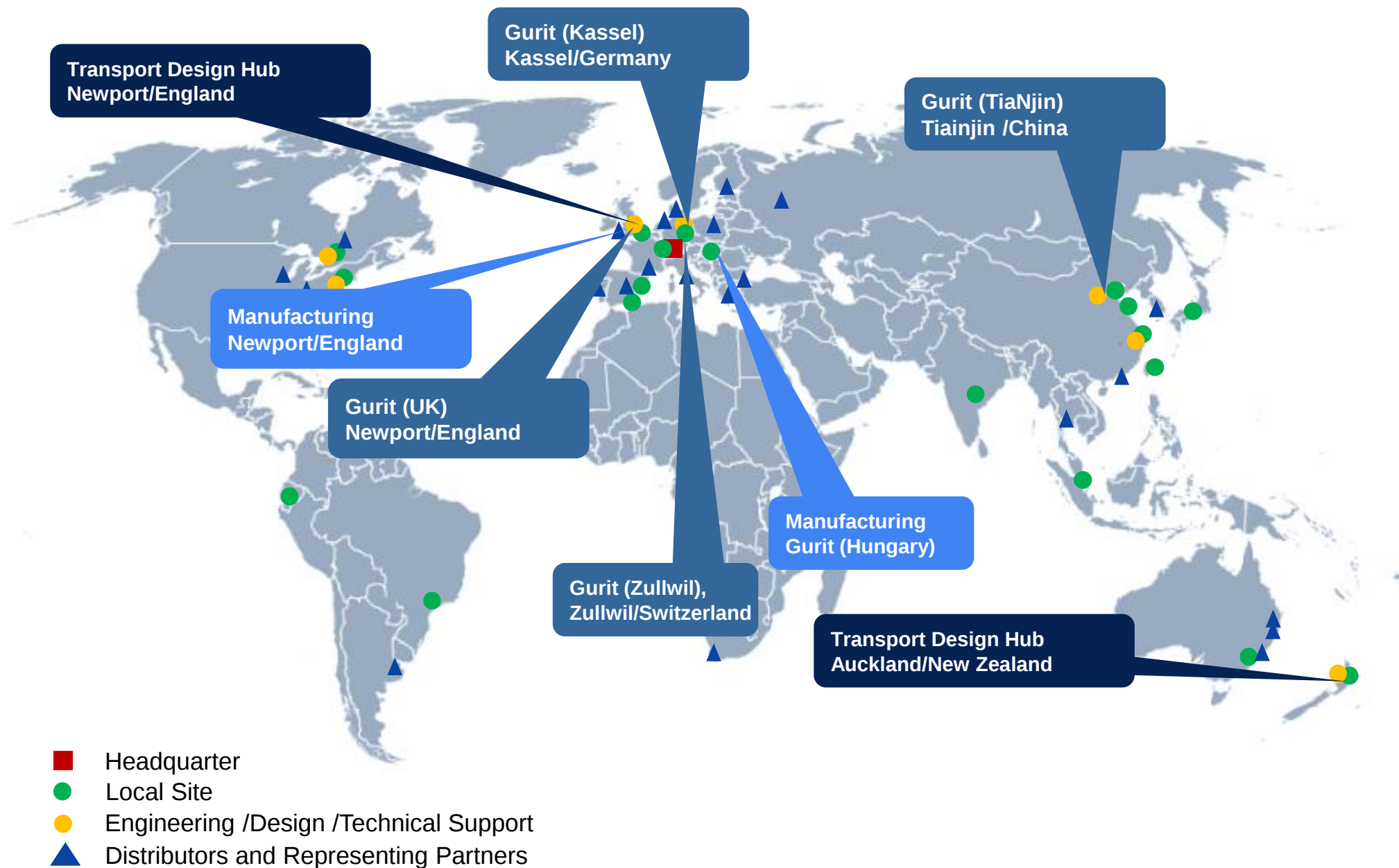
GCE and family..

(Gurit group - a composite solution and technology provider)

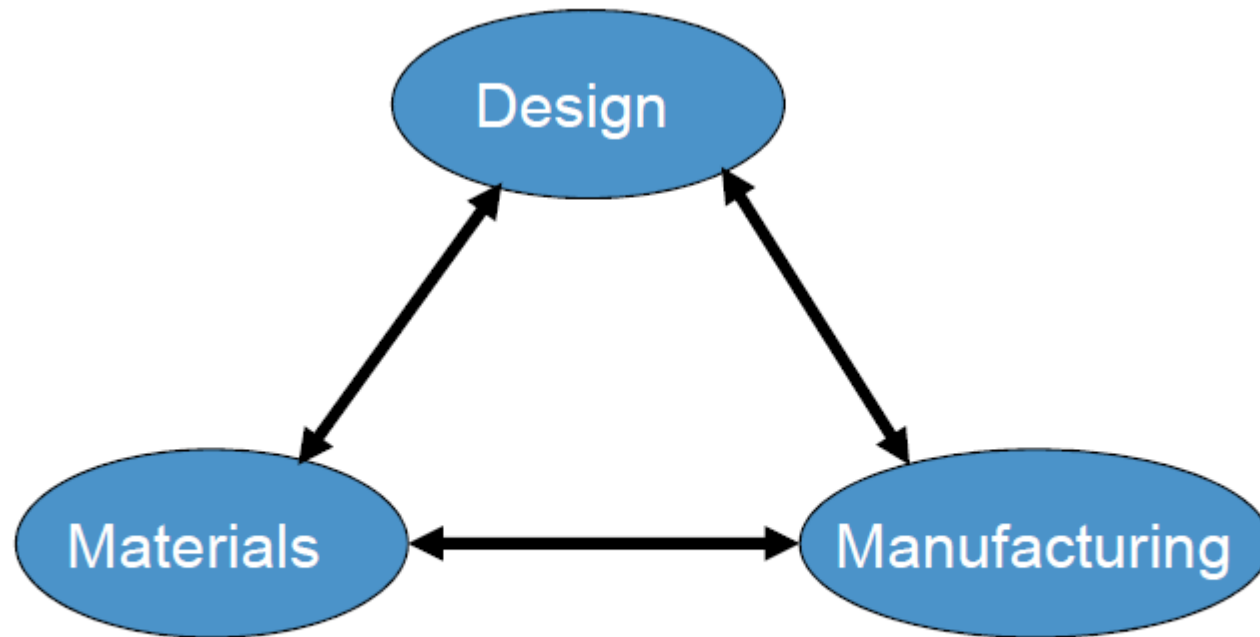


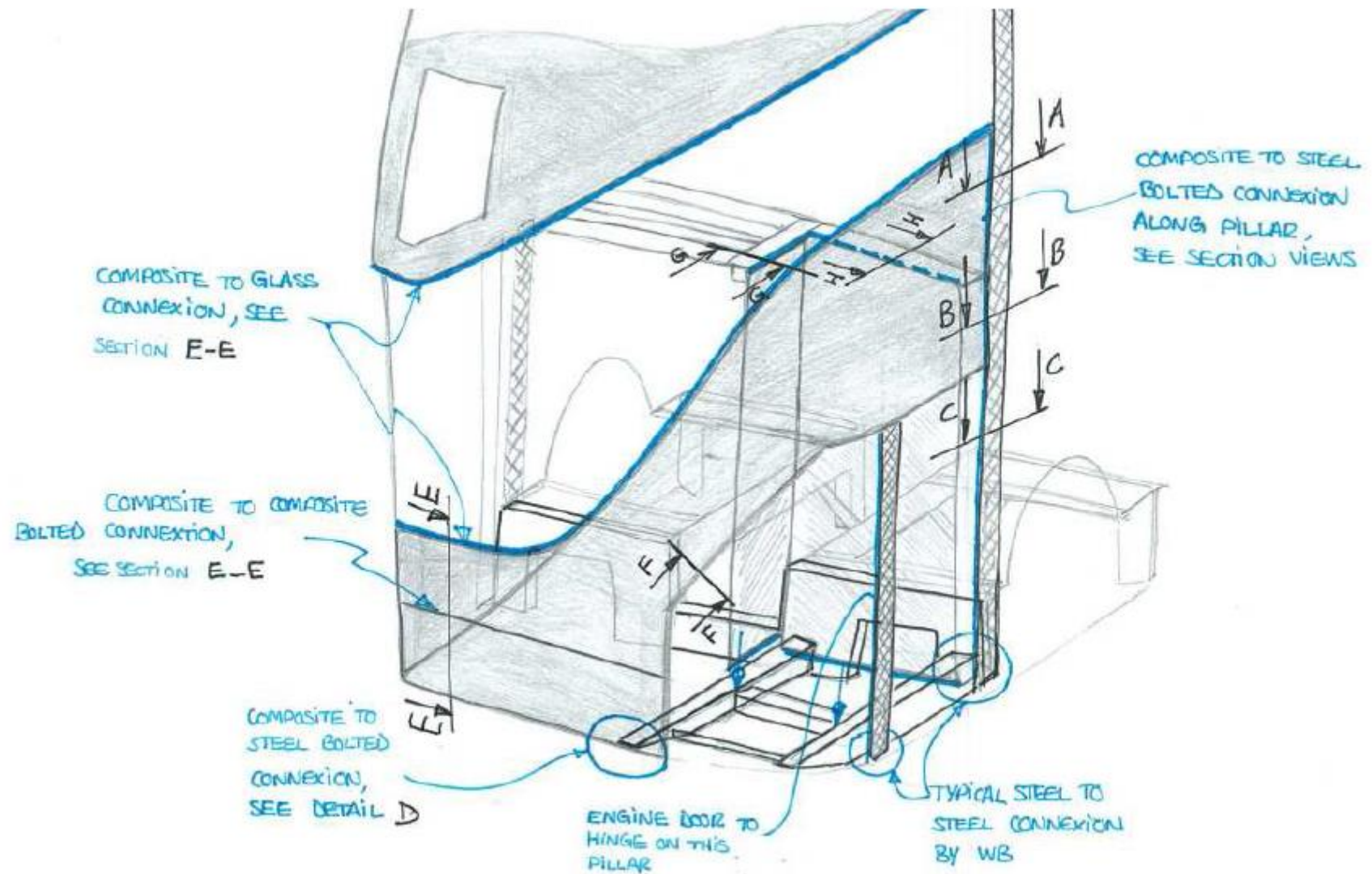
Gurit

OUR GLOBAL TRANSPORT FOOTPRINT

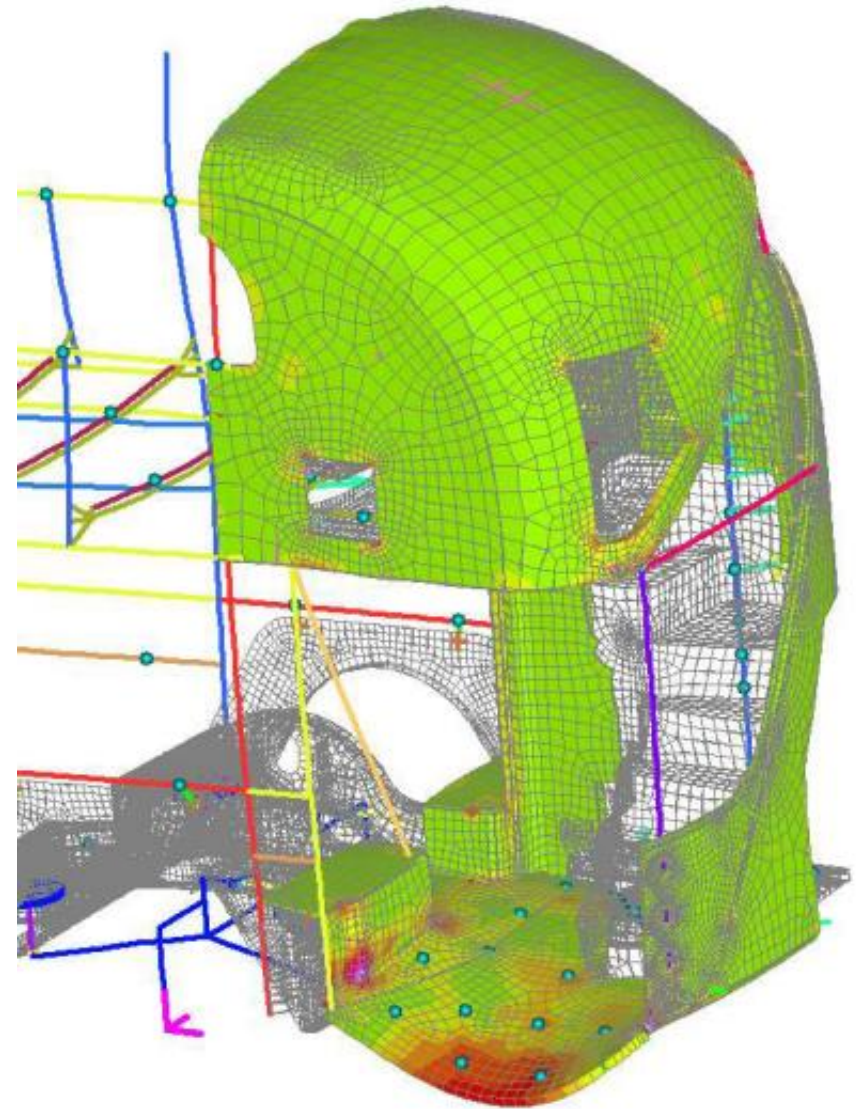
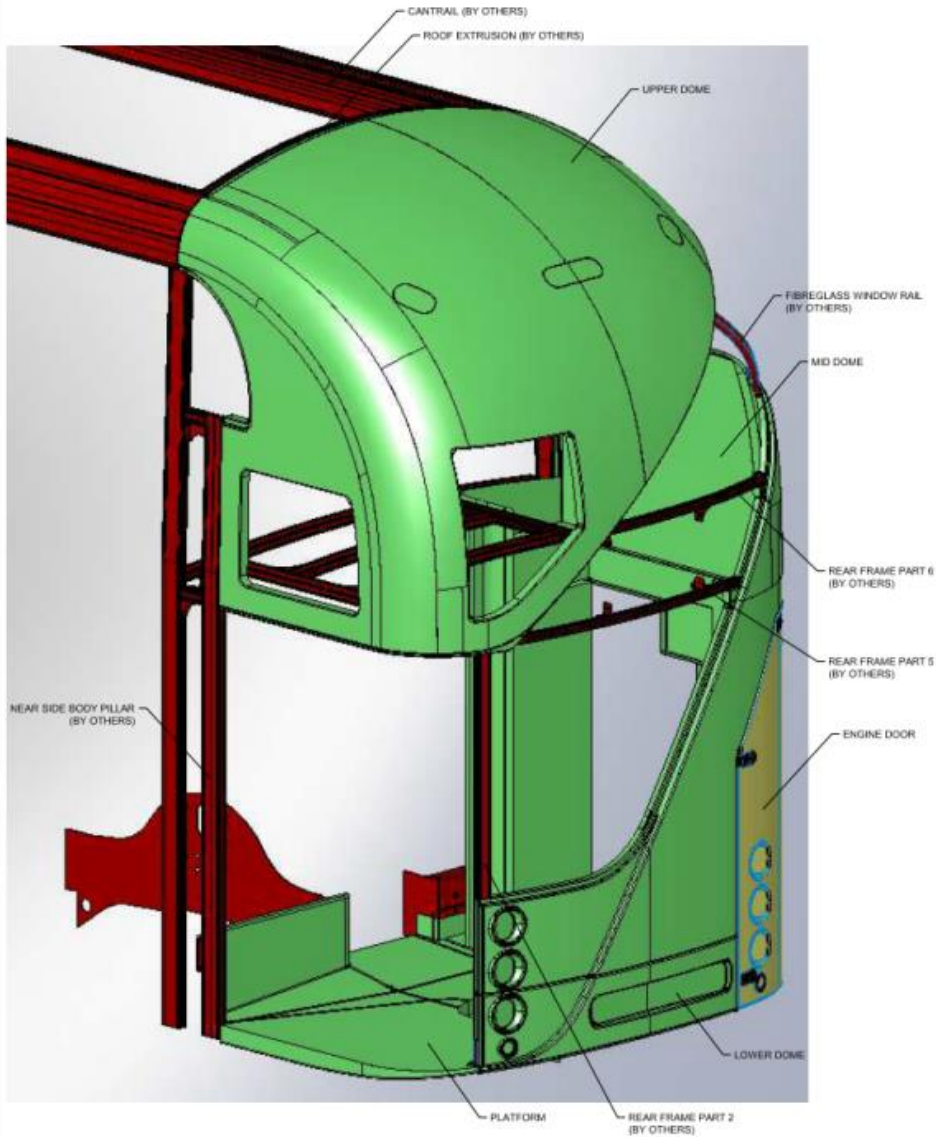


- Key to successful project





Modelling and analysis



- Less weight - less energy - less emissions
- Total weight reduction from 11550kg to 8500kg (-35%)
- Structural Composite part with minimal supporting frame work
- Reduces emissions with a 8 litre engine
- Allows the effective use of Hybrid power
- Reduces inventory of parts
- Allows for more creative design
- Maximum road clearance



- Light weight for seismic resistance, transport and installation
- Durability, sustainability, low maintenance over lifetime
- Inherently good thermal and acoustic insulation properties
- Vandalism resistance
- Faster and lower cost installation



Villa Roof, Basel, Switzerland



Bendy masts - London & Blackpool





Dragon Wings Bridge, Foryd Harbour, Wales

Haramain High Speed Railway, Saudi Arabia



- Halogenated Resins are limited by the toxicity of the smoke they produce
- Almost all additives increase resin viscosity making hand laminating increasing difficult at high FST Level.
- High levels of Fillers needed to meet FR requirements increase parasitic weight.
- Solution –Prepreg Materials
 - Modified High Strength Phenolic
 - FR Epoxies with minimum loadings of mineral additives
 - Foam sandwich construction to minimise weight and cost of supporting frame work.



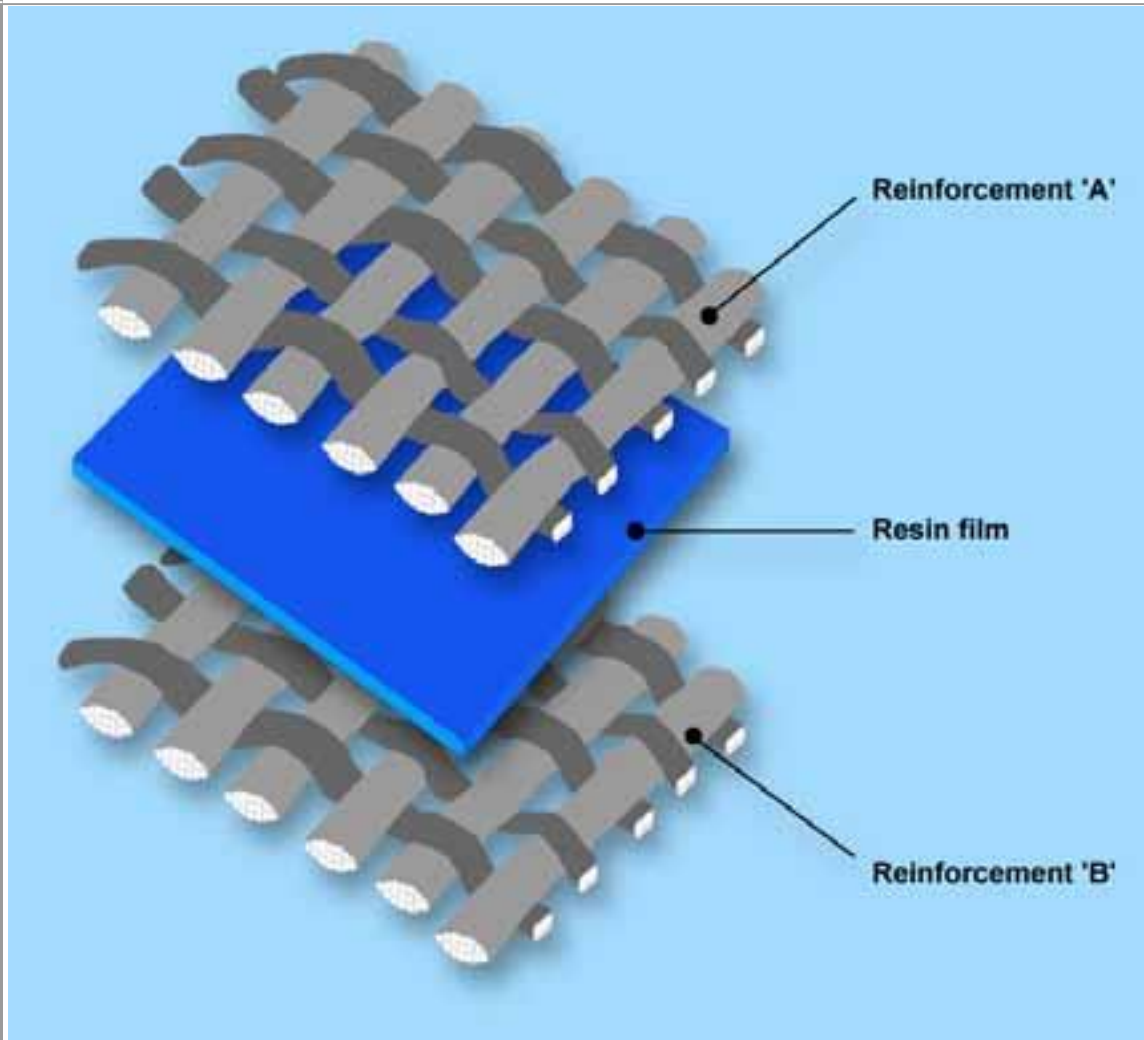
- Sandwich design as an alternative to monolithic laminates



Sandwich Window Panel - **PH 840**

Siemens AVE S103 Solid Cockpit Panels - **PH 840**





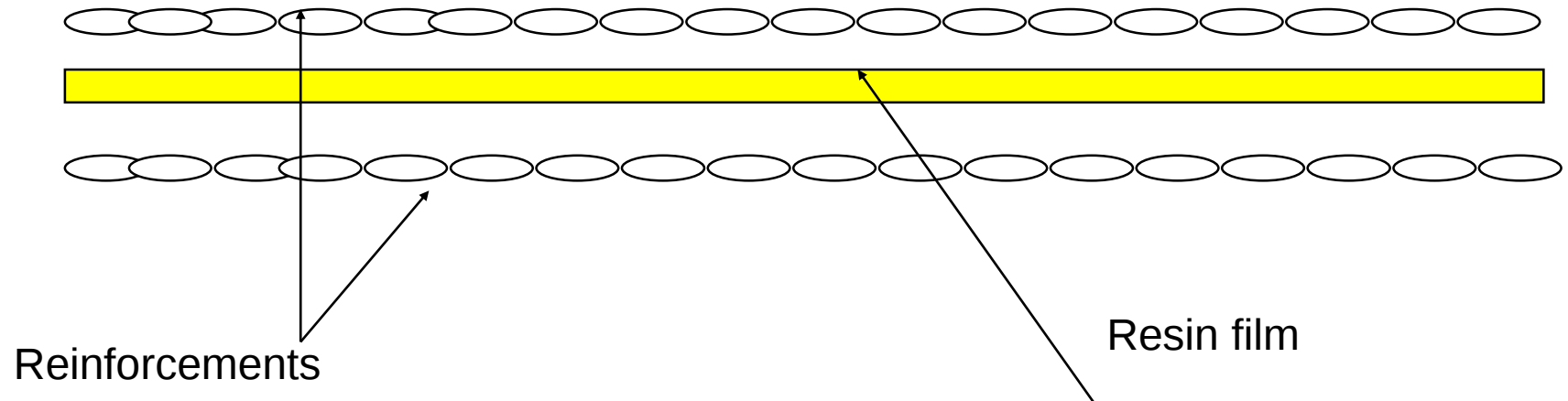
▪GURIT SPRINT ST70FR Application

▪Vacuum materials / general technology

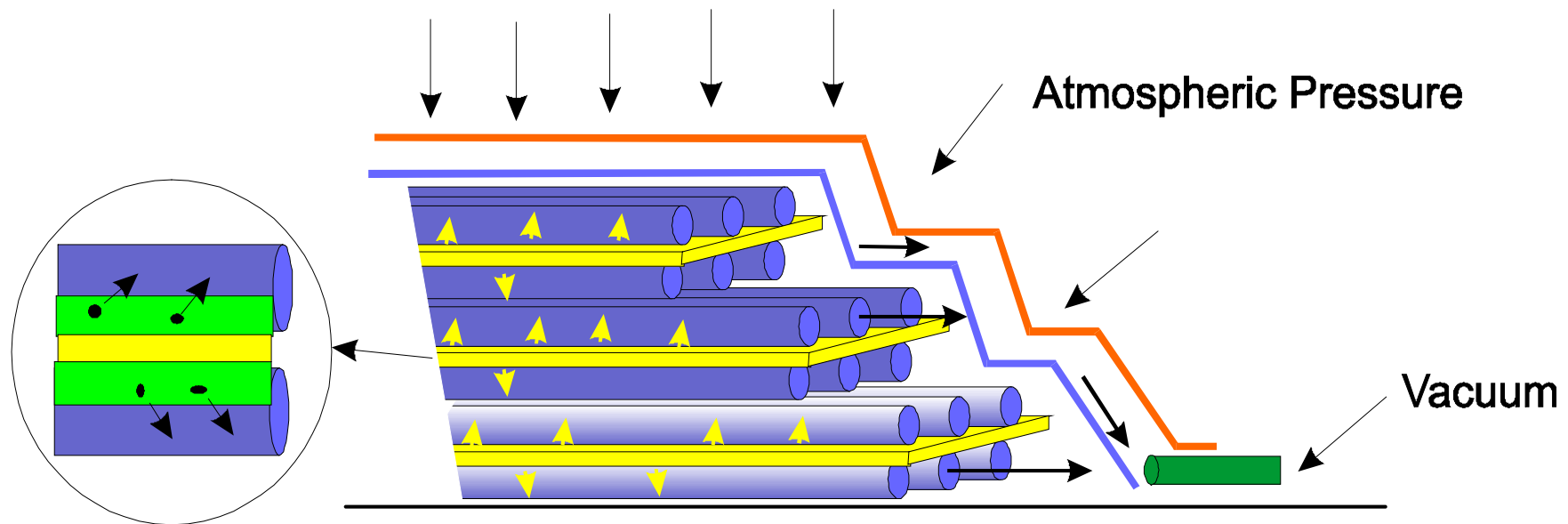
- Use of economic vacuum materials
- Usage of PeelPly at areas of secondary bonding
- Perforated release film with P98 bleeder holes
- Breather with 300-350g/m2
- Vacuum bag and TackyTape with max 120° C resistance
- Vacuum drag peripherically around mould or with punctual fittings
- SPRINT Technology available as DoubleSided or SingleSided version in multiple fibre and resin variants
- SPRINT – **SP Resin INfusion Technology**

What is SPRINT?

- SPRINT is a Technology not a single product
- SPRINT materials have a sandwich construction consisting of two layers of reinforcement with a pre-catalysed resin at the centre



- Resin film infusion - Dry fibre layers to provide air escape paths to evacuate air from a laminate stack



- Apply heat and vacuum
- The air is removed, the resin softens and infuses into dry reinforcement to form a low void content high quality component

SPRINT - Solutions for large Structures

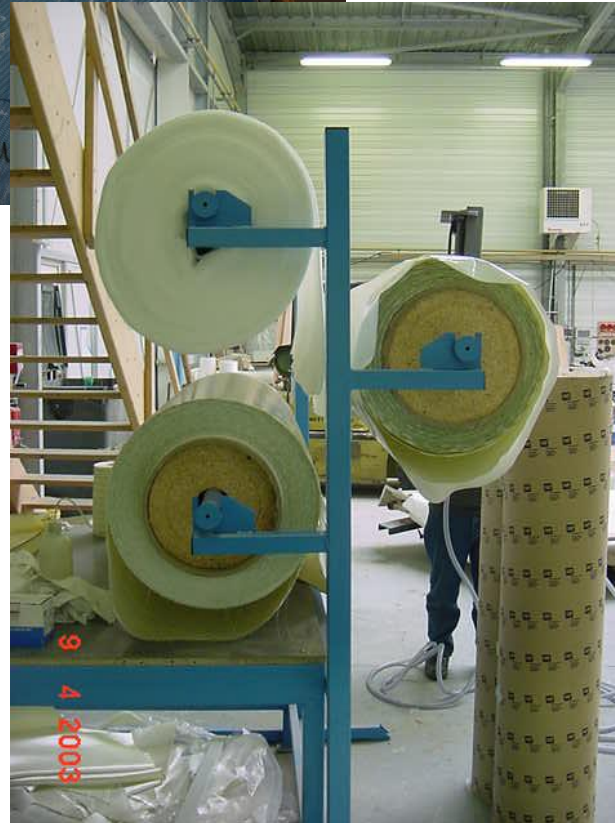


■ GURIT SPRINT ST70FR Application

- Example shows bus shell
- └ ST70FR with Corecell M foam
- └ Foam as Kit, Bonding with SA70 and Monocomponent for butt-joints
- └ Single hit process
- └ One time only vacuum
- └ No autoclave
- └ Very high practicability and drapeability of all materials – user friendly
- └ Cure at 85° C
- └ Cycles from 70° C to 120° C possible



SPRINT - Solutions for large Structures



■ GURIT SPRINT ST70FR Application

- Transportation ,Warehousing, Cutting, of ST70FR
 - 70° C Systems generally cooled transport and long-term storage
 - Storage at -18° C min 2 years
 - Storage and usage at RT max 1 week
 - Cutting easily by Hand or CNC table-cutter with oscillating knife
 - Rolls with 310mm inner diamtere, stored on stillage in hanging mode

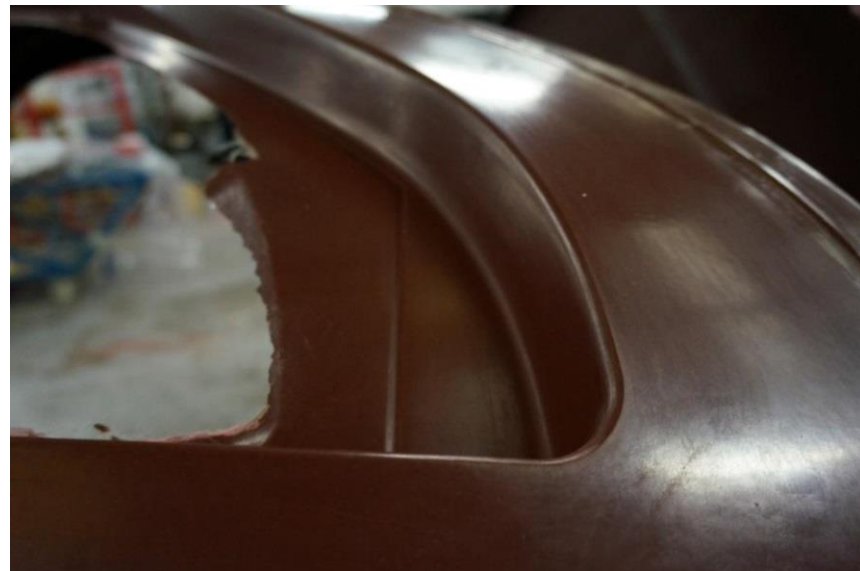
SPRINT - Solutions for large Structures



■ GURIT SPRINT ST70FR Application

■ Surface on finished article

- ▢ ST70FR as direct surface finish out the mould
- ▢ SF-80FROBL fire retardent surface film as first skin into mould
- ▢ Very easy to sand, easy to primer and varnish
- ▢ Surface close to Class-A category by using extra resin film
- ▢ SF-80FROBL works as intumescent fire barrier and enhances protection
- ▢ Both applications do not need debulking after first layer



Gurit's range of FST materials

FORMAT	SYSTEM	MAIN FEATURES	INTENDED APPLICATION	FIRE TEST STANDARDS	PAGE
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 91FR	- Outstanding compressive properties - Low void content vacuum bag processing - Controlled flow - Light tack – suitable for use in higher ambient temperature	Civil Structures	ASTM E84 UL94 BS476 Part 7	3
	ST 120FRSBL	95°C Curable 120°C Tg	Rail / Industrial / commercial marine craft	EN45545 ASTM E84	3
Prepreg	SE 120FRSBL	- Low smoke formulation - Excellent tack and flow - HL2 in R7 to EN45545			4
	SE 90FRBL	- Black finish resin - Outstanding compressive properties - Controlled flow - High tack	Civil Structures		4
Resin Film	SA 120FRBL	95°C Curable 120°C Tg	Rail / Industrial / commercial marine craft	EN45545 ASTM E84	5
Surface Film	SF 120FRSBL	- Low smoke formulation - Improves de-moulded surface finish - HL2 in R7 to EN45545			5
	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

Typical sandwich example

PANEL S1

ST 91FR WITH G-PET 75FR

Panel
Thickness

18mm

Weight/m²

2.6kg

Vacuum
Consolidated



LAY-UP AND MANUFACTURE METHOD

- Vacuum Bag consolidated, cured for 12h @ 90°C
- Breather Cloth
- Release film
- Peel ply
- 3 x plies ST 91FR / WRE 581T / 37%
- 15mm G-PET 75FR
- 3 x plies ST 91FR / WRE 581T / 37%
- Peel Ply
- Tool

TEST STANDARDS & RESULTS

EN4554

Achieves HL1 R1 and HL1 R7

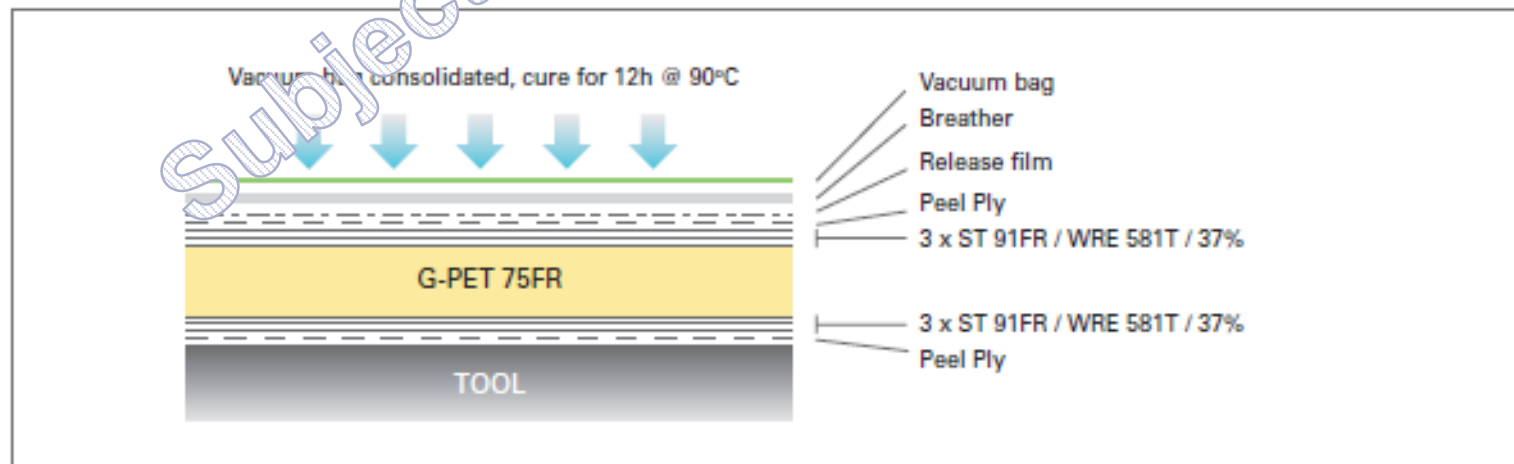
EN 1551 E84

Achieves Class B Rating

TYPICAL APPLICATIONS

Rail Exteriors

Large Civil structures, e.g. Roofing.



Typical monolithic panel

PANEL M2

ST 91FR MONOLITHIC LAMINATE

Panel
Thickness

3mm

Weight/m²

5.5kg

Vacuum
Consolidated



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

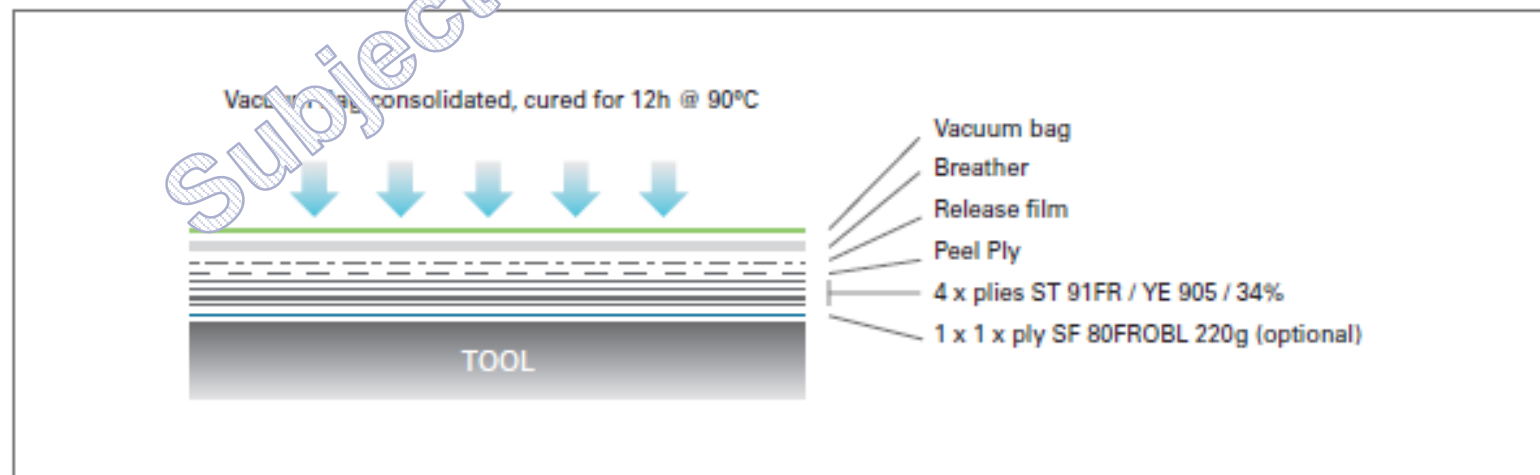
TEST STANDARDS & RESULTS

BS476

Achilles Class 1

TYPICAL APPLICATIONS

Large civil structures where class A finish may be required.



Thank you!



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