



Solent Composite Systems

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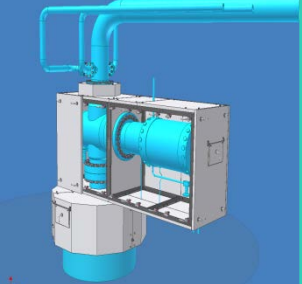
Regulatory Requirements & Certification of Composite Fire & Blast Protection Products for Offshore Applications

Matthew Chalk

E-LASS - January 2015

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- **Brief Introduction SCS**
- **ProTek® Fire & Blast protection**
- **Regulatory Requirements & Standards**
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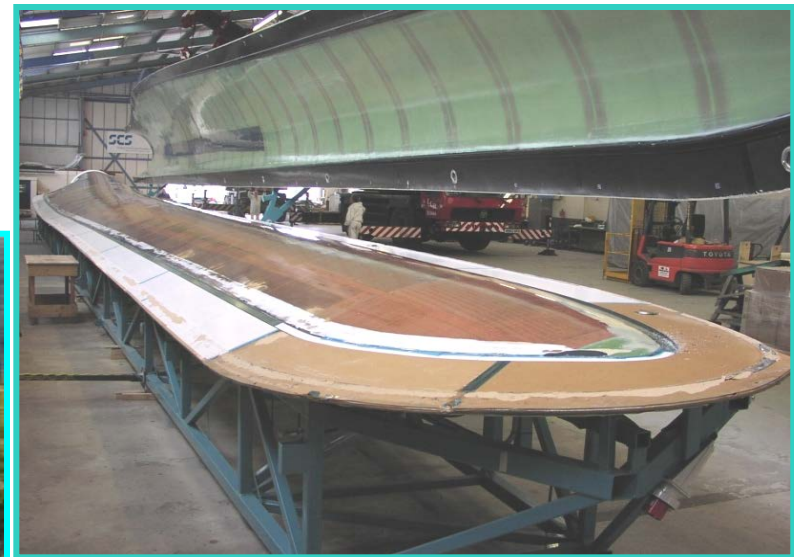
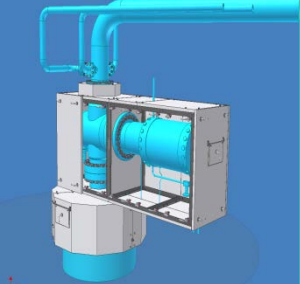


Industry Expertise



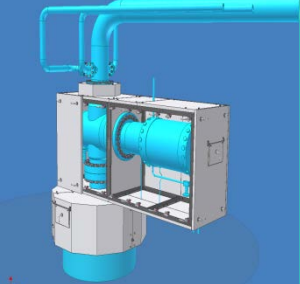
Markets Served

Oil & Gas
Subsea
Renewables
Marine
Construction
Automotive



Company Capability

Composites Technology Expertise
Custom Engineered Solutions
Project Management
Survey and Design skills
Structural Engineering Competence
Manufacturing Capability
Installation and Commissioning
Over 24 Years Track Record



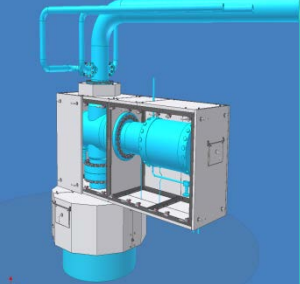
Quality and HSE Compliance

Integrated Management System

BS OHSAS 18001 – Health and Safety

BS EN ISO 9001 - Quality

BS EN ISO 14001 – Environmental



BUREAU VERITAS
Certification

SOLENT COMPOSITE SYSTEMS LIMITED

VICTORIA BARRACKS
ALBANY ROAD
EAST COWES
ISLE OF WIGHT
PO32 6AA

Bureau Veritas Certification certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standards

BS OHSAS 18001:2007

Scope of certification

DESIGN, MANUFACTURE AND INSTALLATION OF COMPOSITE SOLUTIONS FOR THE ENERGY INDUSTRY - SPECIFICALLY FIRE AND BLAST PROTECTION FOR THE OIL AND GAS INDUSTRY AND ROTOR BLADE MOULDS AND TECHNOLOGY FOR THE WIND AND RENEWABLE ENERGY INDUSTRY.

Certification cycle start date: **04 NOVEMBER 2014**
Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: **03 NOVEMBER 2017**
Original certification date: **04 NOVEMBER 2011**
Certificate No. UK003075 Version 1, Revision date: **25 SEPTEMBER 2014**

Ken Smith
Managing Director

Certification body address: 1st Floor, 66 Prescot Street, London, E1 8HG, United Kingdom.
Local office: 1st Floor, 66 Prescot Street, London, E1 8HG, United Kingdom.
Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.

To check this certificate validity please call: +44 (0) 207 550 8998

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Standards

BS EN ISO 9001:2008

Scope of certification

DESIGN, MANUFACTURE AND INSTALLATION OF COMPOSITE SOLUTIONS FOR THE ENERGY INDUSTRY - SPECIFICALLY FIRE AND BLAST PROTECTION FOR THE OIL AND GAS INDUSTRY AND ROTOR BLADE MOULDS AND TECHNOLOGY FOR THE WIND AND RENEWABLE ENERGY INDUSTRY.

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Standards

BS EN ISO 14001:2004

Scope of certification

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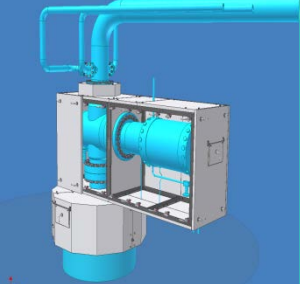
Solent Composite Systems



ProTek® Fire and Blast Protection



Why ProTekTM ?



Piper Alpha Legacy



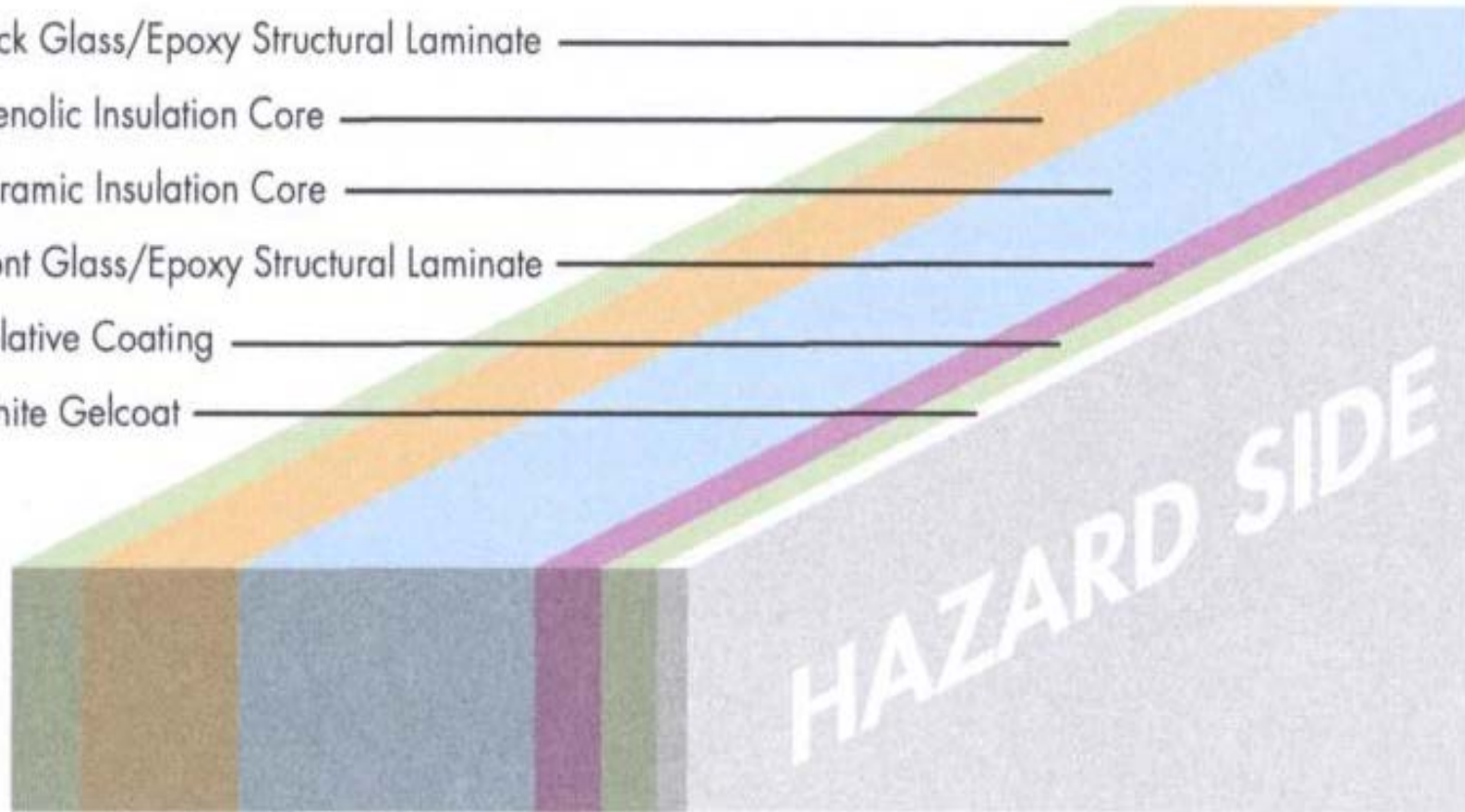
- **Safety Case – Facility Risk Assessment**
- **Risk Based Approach – Not prescriptive**
- **Alternative Technologies considered**



Composite Solution

ProTek™ Structure

Back Glass/Epoxy Structural Laminate _____
Phenolic Insulation Core _____
Ceramic Insulation Core _____
Front Glass/Epoxy Structural Laminate _____
Ablative Coating _____
White Gelcoat _____

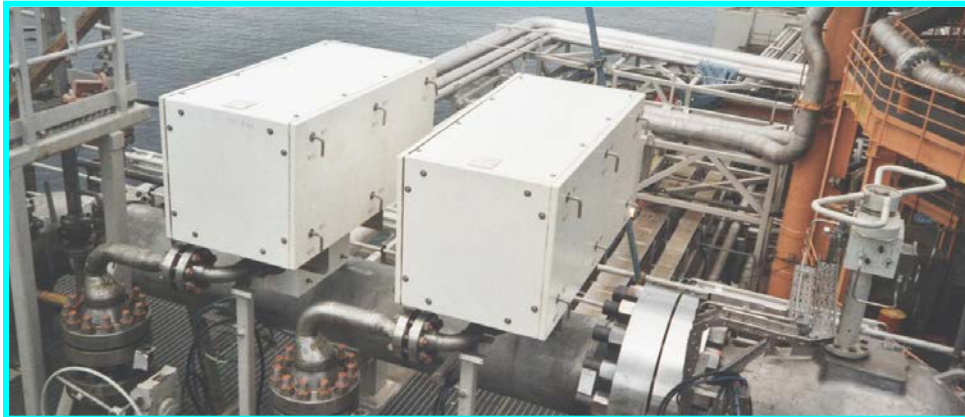
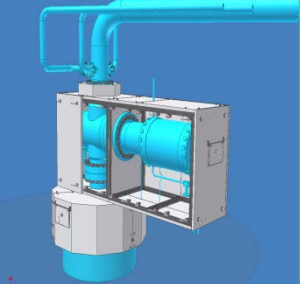


Technical Integrity



Benefits of Composites

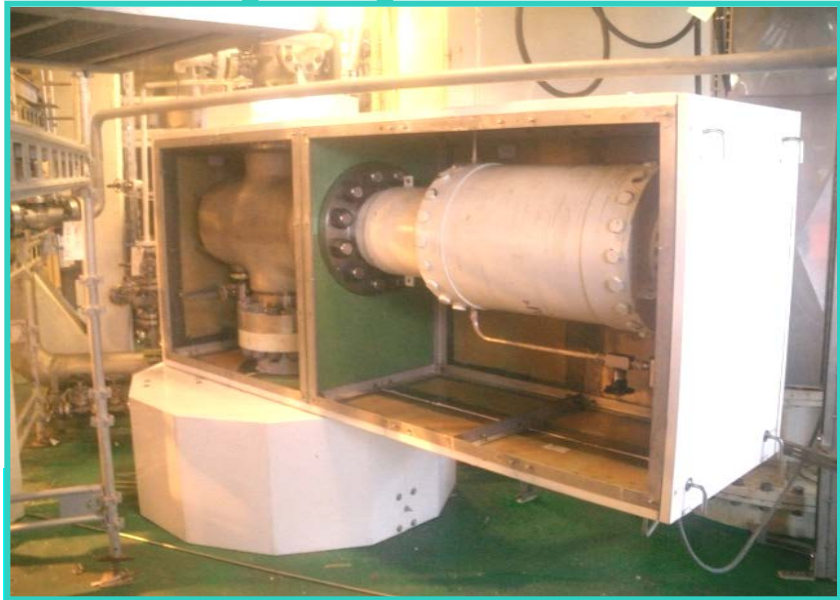
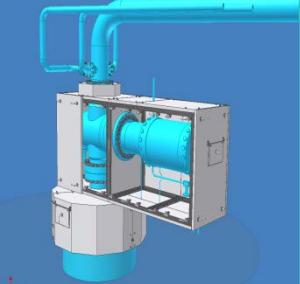
- ✓ Blast, Fire, Thermal & Acoustic (Noise) Protection
- ✓ Low Lifecycle Cost – Zero maintenance
- ✓ Simple installation – Zero hot work
- ✓ Low weight – HSE and Access
- ✓ Pre-made and trial assembled
- ✓ Versatile design
- ✓ Robust



Technical Integrity



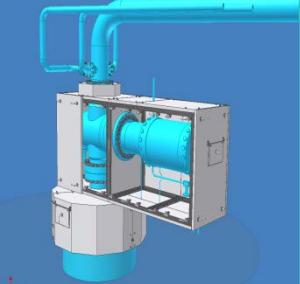
Equipment Enclosures



Industry Experience



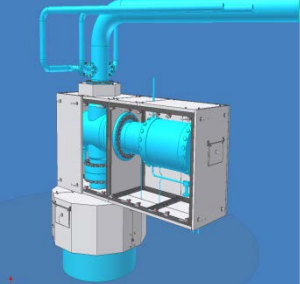
Fire and Blast Walls



Industry Experience

 **ProTek™**

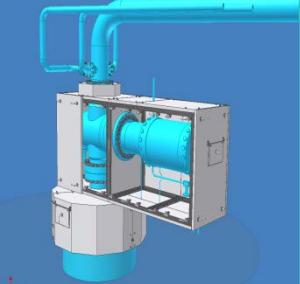
Structural Steel PFP Cladding



Industry Experience



Pipeline and Flange Protection



Industry Experience

 **ProTek™**



Solent Composite Systems



Regulatory Requirements & Standards

Regulatory Process

Government Influence / Response

Legislation – Company Compliance

Standards – Establish Acceptance Level

Classification Society

Specifications – Detail Requirements

Classification Society

Certification – Product Compliance

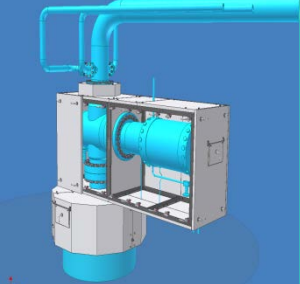
Classification Society - Certification

Quality Standards – Repeatability

Classification Society – Audit (QA)

Procedures – Traceability

Classification Society – Inspection (QC)



Regulatory Standards

International Standards eg. ISO, NORSOK

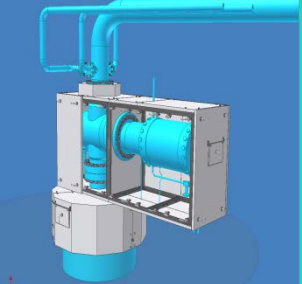
National Standards eg. ASTM

Test Methods & Classification

Company Standards & Specifications

Hierarchy of Requirements

Agreed interpretation = Key to Success



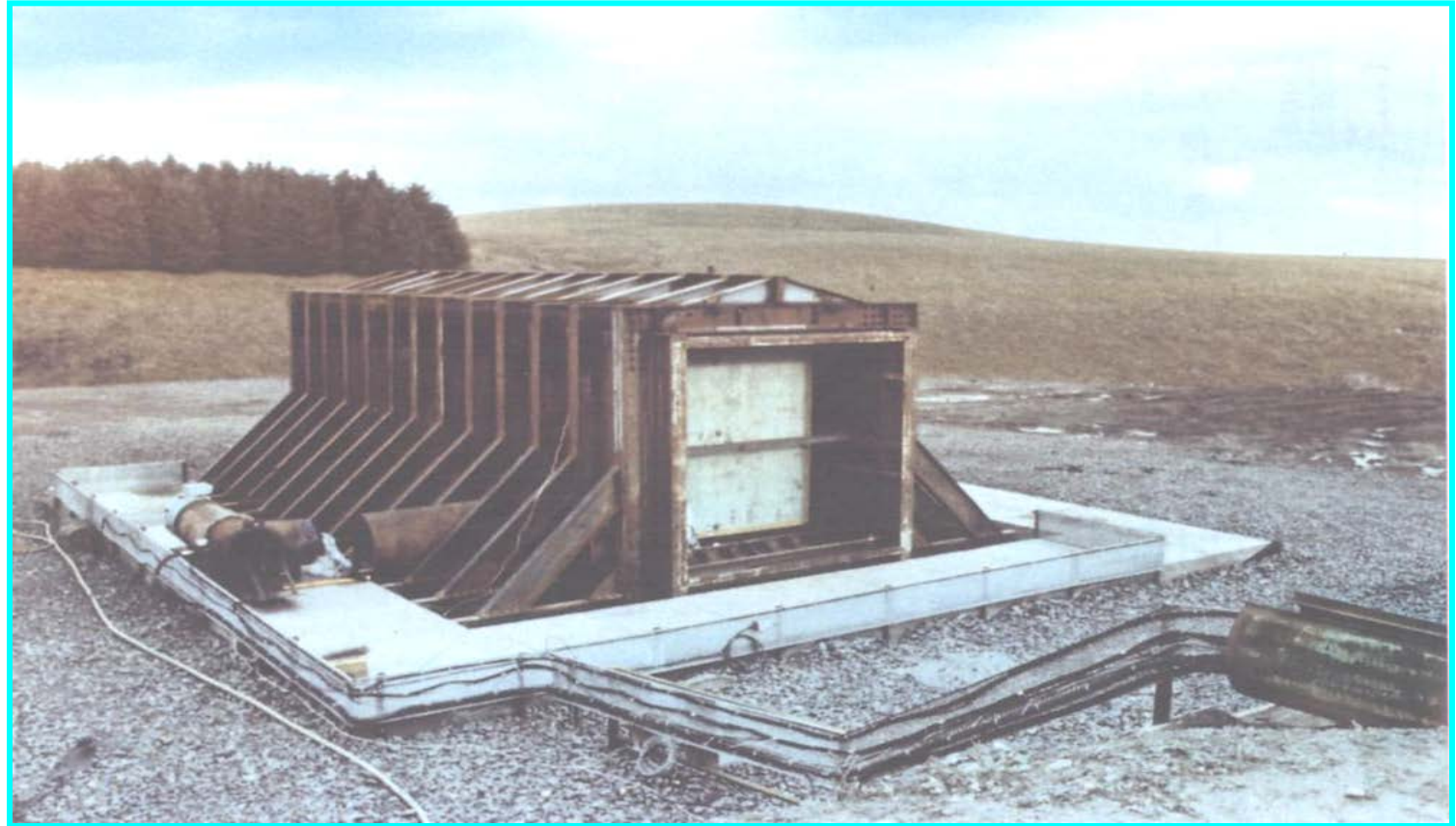
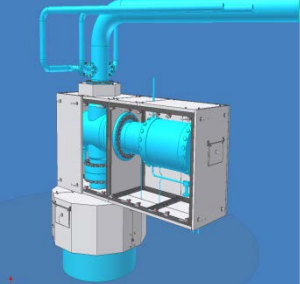


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Certification Requirements & Testing

Explosion

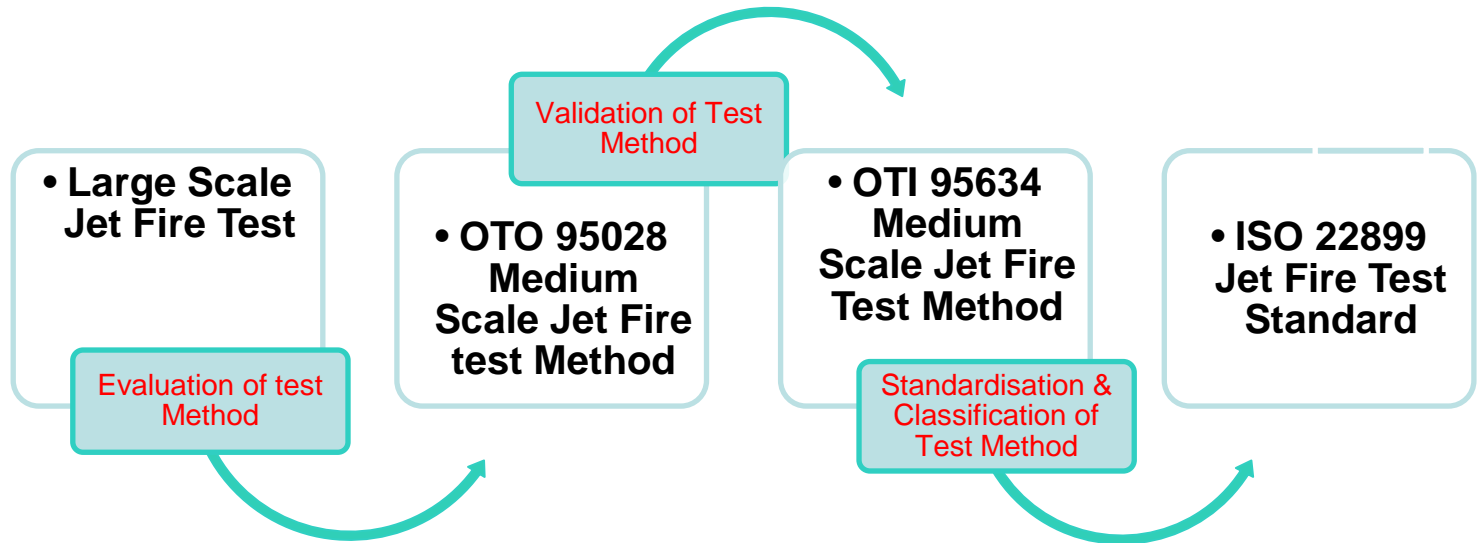
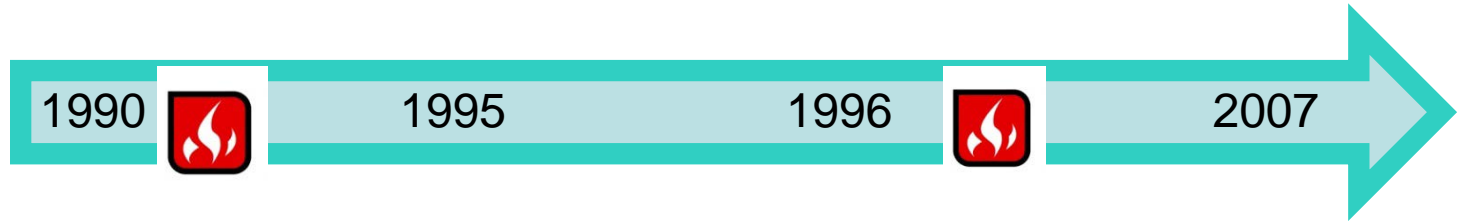
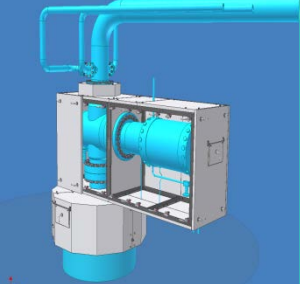


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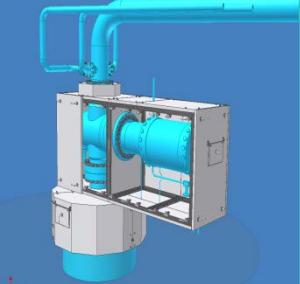
ISO 22899 Compliance

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= SCS Certification Testing

Fire



Technical Integrity



Product Testing

PRODUCT TESTING & CERTIFICATION

Test	Standard	Testing Organisation	Product Type	Test Report No.	Level Achieved	Certification Details
Jet Fire	Large Scale Jet fire after blast Gas Release Rate 3kg/s (10Te / hr),	British Gas (Advantica)	ProTek™ Fire / Blast Wall Panel	ERS R. 4801	Pass	Lloyd's Register Ref. CSD/SVS/FIRE/D GG/2556
Jet Fire	OTI 95634 (now ISO 22899)	HSL Buxton	ProTek™ Enclosure Panel	PS/98/02	Pass	Lloyd's Register witness testing
Jet Fire	Large Scale	British Gas (Advantica)	ProTek™ moulded ESDV enclosure and Actuator box	ERS R. 4701	Pass	
Blast	0.5 to 1.7 bar Six blast tests	British Gas (Advantica)	ProTek™ Fire / Blast Wall Panel	ERS R. 4807	Pass	Lloyd's Register Ref. CSD/SVS/FIRE/D GG/2556
Fire	Lloyd's Register Classification for Offshore Installations NPD Hydrocarbon Fire Test Curve	SGS Yarsley	ProTek™ Fire / Blast Wall Panel	J88282/2	H120	Lloyd's Register Ref. SVGF92/272
Fire	Lloyd's Register Classification for Offshore Installations NPD Hydrocarbon Fire Test Curve	SGS Yarsley	ProTek™ Fire / Blast Wall Panel incorporates hatch closure and pipe penetration	J88282/3	H150	Lloyd's Register Ref. SOU 120851/1
Fire	BS476 Part 20: 1987 NPD Hydrocarbon Fire Test Curve	Warrington Fire Research	ProTek™ Fire / Blast Wall Panels with Double Butt strap joint	Warres No: R11927	H120	
Fire	Lloyd's Register Classification for Offshore Installations NPD Hydrocarbon Fire Test Curve	Faverdale Technology Centre	Thin Wall H60 Fire Wall Panel	FTCR/93/007 1	H60	Det Norske Veritas (DNV) Ref. F-12501
Fire	Hydrocarbon Fire Resistance Test FRS 14-84	SGS Yarsley	ProTek™ Fire / Blast Wall Panel	J92313/1	H60	Lloyd's Register Ref. SOU 320009/1
Fire	Hydrocarbon Fire IMO Res. A754(18)	BRE Borehamwood	ProTek™ Under Deck and Walkway Panel	TE 203966	H60	
Fire	Hydrocarbon Fire IMO Res. A754(18)	LPC, Borehamwood	ProTek™ Fire / Blast Wall Panel	TE91682	H60	

PRODUCT TESTING & CERTIFICATION

Test	Standard	Testing Organisation	Product Type	Test Report No.	Level Achieved	Certification Details
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Jet Fire	OTI 95634 (now ISO 22899)	HSL Buxton	ProTek™ Enclosure Panel	PS/98/02	Pass	Lloyd's Register witness testing
Jet Fire	Large Scale	British Gas (Advantica)	ProTek™ moulded ESDV enclosure and Actuator box	ERS R. 4701	Pass	
Blast	0.5 to 1.7 bar Six blast tests	British Gas (Advantica)	ProTek™ Fire / Blast Wall Panel	ERS R. 4807	Pass	Lloyd's Register Ref. CSD/SVS/FIRE/D GG/2556
Fire	Lloyd's Register Classification for Offshore Installations NPD Hydrocarbon Fire Test Curve	SGS Yarsley	ProTek™ Fire / Blast Wall Panel	J88282/2	H120	Lloyd's Register Ref. SVGF92/272
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Fire	Hydrocarbon Fire IMO Res. A754(18)	LPC, Borehamwood	ProTek™ Fire / Blast Wall Panel	TE91682	H60	

Technical Integrity



Proven Performance

- ✓ 2½ hour Hydrocarbon Jet fire – ISO 22899
- ✓ Spadeadam Jet fire after 1.3 Barg Blast
- ✓ Explosion Tests up to 2.5 Barg
- ✓ H150 Furnace Fire
- ✓ Impact Tests up to 5kJ energy
- ✓ 38 dB noise reduction
- ✓ Smoke & toxicity – Airbus Test
- ✓ Spread of Flame - BS476

Technical Integrity





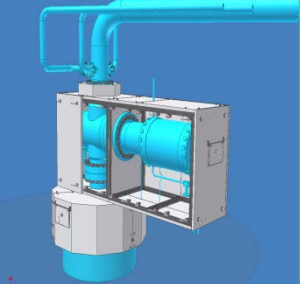
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Engineering Methodology

Engineering Methodology

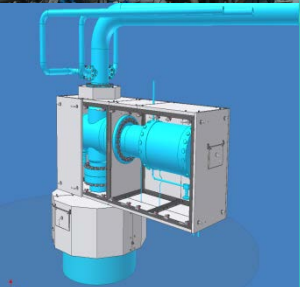
- ✓ **Guided by specifications**
- ✓ **Not ruled by standards**
- ✓ **Plenty of test data available for use**
- ✓ **Blast, Impact & Fire protection rating**
- ✓ **FEA Modelling – validated**
- ✓ **Classification Society Certification**
- ✓ **Update regularly – development**



Industry Expertise



Methodology Certification



DVR No.FGBUK-PP022200.02 Rev.1

Det Norske Veritas

DESIGN VERIFICATION REPORT (APPROVAL OF DESIGN METHODOLOGY)

for Fire and Blast Barriers

This is to confirm that the design methodology and supporting design documentation for the Fire and Blast barriers manufactured by Solent Composite Systems Ltd have been examined and found to comply with the codes and standards listed in section A and with current practices of the oil and gas industry.

In DNV's opinion the ProTek® Composite Materials Fire & Blast Panels are suitable as barriers against fire and blast loads and can be engineered, if appropriately supported by a suitable structure, to act as an enclosure or a blast wall.

The objective of the fire and blast barriers is to provide protection to people and/or safety critical equipment against blast overpressure and prevent the temperature of the protected area from rising above unacceptable limits when exposed to a 2 hour jet fire impingement.

The assessment of the design methodology was based on:

- I. Reviewing:
 - Testing and certification documentation of the ProTek® Composite Materials Fire & Blast Panels
 - Thermal analyses performed on specific projects that have been verified by DNV
 - Mechanical properties of the panels
 - Typical general arrangements drawings
 - Typical fabrication details
- II. Taking into account past experience which DNV gained from the verification of the ProTek® Composite Materials Fire & Blast Panels designed and constructed by Solent Composite Systems Ltd to function as enclosures for a number of projects for the Oil & Gas industry for onshore and offshore applications.

This Design Verification Report has been updated to take into account the replacement of OTI 95 634 by ISO 22899-1.

Based on the review of the gap analysis of the two standards the previous testing program can be considered in compliance with ISO 22899-1.



DVR No.FGBUK-PP022200.02 Rev.1

The design parameters that have been considered are listed in section A. Section B lists the documents used whilst section C lists the conditions attached to this statement.

A. Design Parameters, Design Codes & Design Specifications

The design of the enclosures has been assessed for the following conditions and with respect to the requirements of the design codes as applicable.

Parameter	Magnitude	Unit
Blast Overpressure, followed by Hydrocarbon Jet Fire	Max 1.3	barg
Blast Duration	80 - 120	ms
Drag Pressure	Max 0.5	barg
Jet Fire – Heat Flux	250 – 320	kW/m ²
Jet Fire Duration	140	min
Hydrocarbon Fire	H150	min
Norsok Standard R-004 Insulation Class	5	-

Codes and Standards

- DNV RP C204 Design against accidental Loads
- API RP 2FB Recommended Practice for the Design of Offshore Facilities against Fire and Blast Loading
- Design of Blast resistant Buildings in Petrochemical Facilities – ASCE Report
- Norsok R-004, 3rd Edition – Piping and Equipment Insulation
- ISO 22899-1 2007 - Determination of the resistance to jet fires of passive fire protection materials.

Design Specifications

- TOTAL FINA ELF EXPLORATION AND PRODUCTION, GENERAL SPECIFICATION – GS SAF 337 REV 0P1 Safety – Passive Fire Protection
- Statoil – TR 00650 Final Ver. 3, Technical & Professional Requirements
- NRF-072-PEMEX-2009 (*) Fire Walls Rev 0
- Hydro – Ormen Lange Project Doc. 37 – 1A-AK-F15-00002 Rev 07F Design Accidental Load Specification

(*) English Translation provided by Solent Composite Systems Ltd.

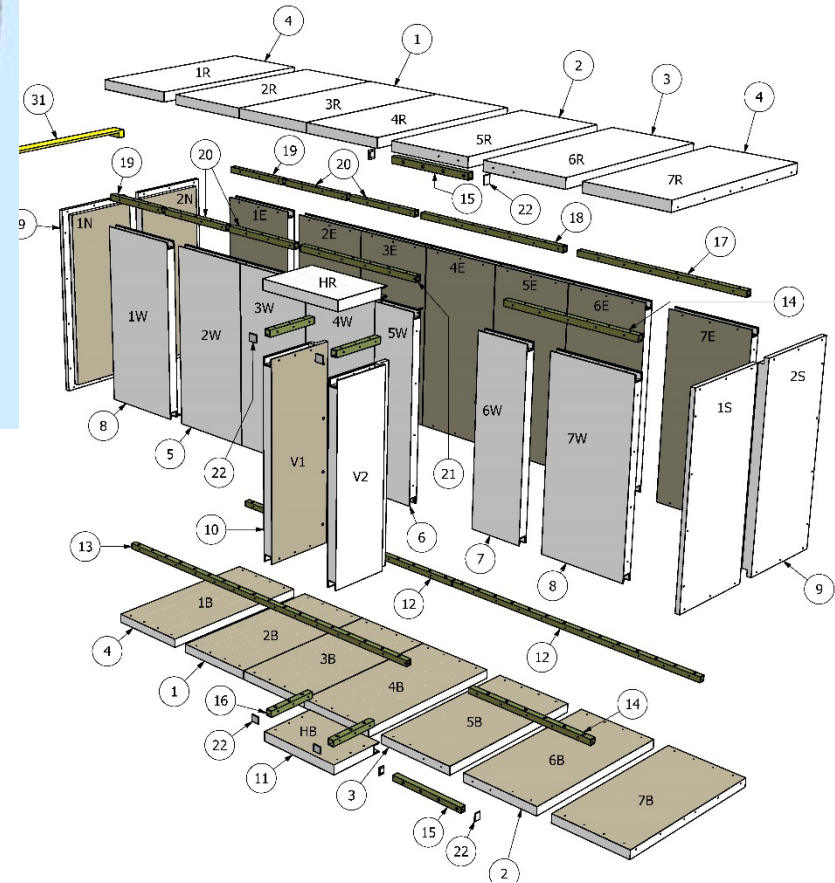
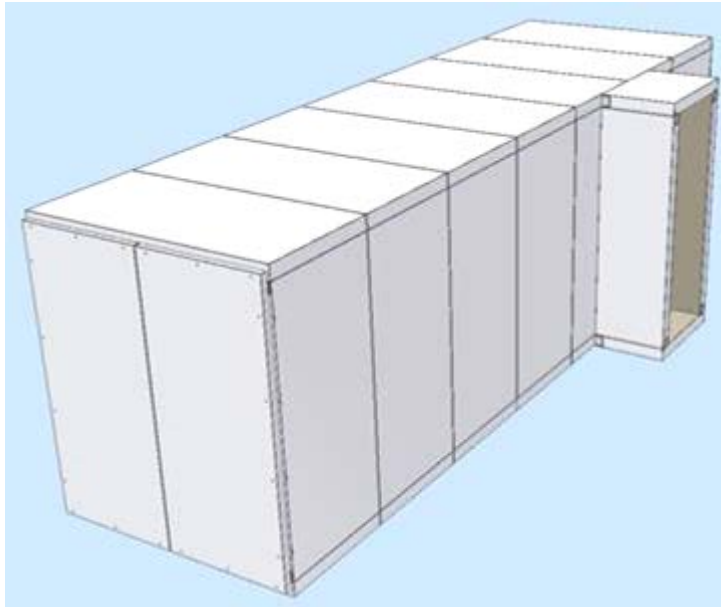
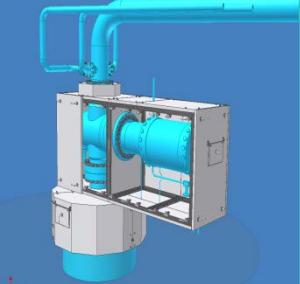


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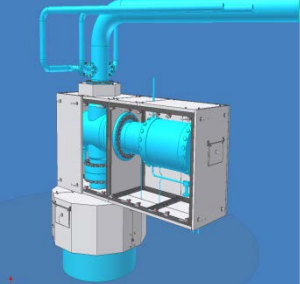


Certification Example


Freezer Module



Freezer Module



DVR No.FGBUK-PP005257.01 Rev.0
Page 1 of 4



Det Norske Veritas

DESIGN VERIFICATION REPORT (INDEPENDENT REVIEW CERTIFICATE)

Equipment	: Freezer Container
Customer/Manufacturer	: Solent Composite Systems Ltd
	: Statoil / Aker Solutions
Project	: Gullfaks
DNV Project Number	: PP005257

This is to confirm that the design for the Freezer Container to be installed on the Living Quarters of the Gullfaks Platform has been verified and found to satisfy the conditions described in section A. The verification has been based on the requirements of:

- DNV-OS-C101 "Design of Offshore Steel Structures" – Section 7, Oct 2009
- DNV-RP-C204 "Design Against Accidental Loads" - Section 2.2, April 2005
- Documents listed in Section B of this statement.

The verification of the design has been performed by reviewing:

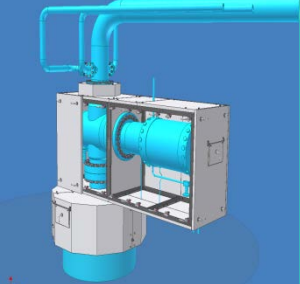
- Testing and certification documentation of the ProTek™ Panels,
- Customer's specifications
- Mechanical properties of the panels
- Detail drawings of the Enclosure Panels
- The design documentation of the Enclosure Panels

Section A of the verification report lists the design parameters that have been considered, section B lists the documents used in the verification and section C lists the conditions attached to this statement.



Summary

- Regulatory Requirements & Standards
- Certification & Testing
- Engineering Methodology
- Novel products need novel approaches



Industry Expertise





Solent Composite Systems



Thank You - Any Questions?

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