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# Det Norske Veritas

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## **DESIGN VERIFICATION REPORT** **(APPROVAL OF DESIGN METHODOLOGY)** **For** **Fire and Blast Enclosures**

This is to confirm that the design methodology and supporting design documentation of the Fire & Blast Enclosures 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.

The objective of the fire and blast enclosures is to provide for safety critical equipment protection against blast overpressure and prevent the temperature of the equipment from rising above operational limits when exposed to a 2 hour jet fire impingement.

The verification of the design has been performed by

I. reviewing:

- Testing and certification documentation of the Protek™ Panels,
- Thermal analyses performed on specific projects that have been verified by DNV,
- Mechanical properties of the panels,
- Typical general arrangement drawings,
- Typical fabrication details

II. taking into account past experience which DNV gained from the verification of fire and blast enclosures designed and constructed by Solent Composite systems Ltd. for a number of projects for the petrochemical 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.

Section A of the report lists the range of design parameters that have been assessed, section B lists the documents used and 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	Max.1.3	barg
Blast Duration	80 - 120	ms
Drag Pressure	Max 0.5	barg
Jet Fire – Heat Flux	250 - 320	kW/m <sup>2</sup>
Jet Fire Duration	140	min
Norsok Standard R-004 Insulation Class	5	-

### Codes & Standards

AISC Specification for Structural Steel Buildings

Design of Blast resistant Buildings in Petrochemical Facilities – ASCE Report

Norsok R-004, 3<sup>rd</sup> 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 & Production

General specification – GS SAF 337 Rev 0P1

Safety – Passive Fire Protection

Statoil – TR 0060 Final Ver. 3, Technical & Professional Requirements

Hydro – Ormen Lange Project

Doc. 37-1A-AK-F15-00002 Rev 07F

Design accidental Load Specification

## B. Documentation used

Document Id	Document Title	Rev
Lamina&v1c.xls	SP Technologies Ltd.: Laminate Panel 2 Mechanical Properties	-
R.4807 March 1992	British Gas plc. Report: Blast Loading Tests on Protek Firewalls	-
CSD/SVS/FIRE/DGG/2556	Lloyd's Register of Shipping: Protek Ila Single Sided Panel Jet fire Test after Blast	-
SVG/F92/272	Lloyd's Register of Shipping: Protek I single Sided H120 Panel	-
F-12501	DNV: Type Approval Certificate Thin H60 Panel	-
DVR-700-99-0218	DNV: SP Offshore Composites Ltd. Protek II Panel for Esso Jotun Main Bearing	-
DVR-700-99-0411	DNV: SP Offshore Composites Ltd. 4 inch and 2 <sup>1</sup> / <sub>4</sub> inch Panels for Phillips Petroleum Company Ekofisk B11 Phase III	-

Document Id	Document Title	Rev
CFR/LUSAS/4394	Lusas report: Thermal Analysis of Protek Panels and Enclosures for Hammerfest LNG Plant for Solent Composite Systems Ltd.	2
TNO-2006-DIANA-R012	Heat Transfer Finite Element Modelling of Valve Equipment for Sisi-Nubi Project	1
DRR TEUUK312194.01	DNV: Design Review Report – Valve Enclosures Snøhvit project	1
PT/1120-D-04974	Typical - Blast Calculation Report	E02
PS-98-02	Jet Fire Resistance Test on the Protek II Panel Specimen – Health and Safety Laboratory – 4 <sup>th</sup> March 1998	-

### C. Conditions

This verification report has been issued based on the following conditions which have to be addressed prior to the approval of a specific application for the fire and blast enclosures:

1. The steel frame is constructed with materials that are suitable for the operating conditions of a specific application that are specified by the Purchaser of the enclosures.
2. The structural design calculations demonstrating that the selected configuration of the enclosures has the capacity to sustain the blast loads specified by the Purchaser of the enclosures have to be submitted for approval.
3. Thermal analysis demonstrating that the selected configuration can meet the temperature limits that have been specified by the Purchaser of the enclosures have to be submitted for approval.
4. Detail drawings of the enclosures for a specific application have to be submitted for approval.

**DET NORSKE VERITAS**  
**LONDON TECHNOLOGY SERVICES**  
**LONDON –25<sup>TH</sup> NOVEMBER 2013**



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