Contra Flame®
MS400 & C50 Underdeck & Bulkhead Insulation & Fireproofing Systems
Contra Flame
An Advanced Insulation Product
ContraFlame®

Better products for challenging situations

For further information about the ContraFlame® range of products, please visit www.advancedinsulation.com

Oil & Gas  Petrochemical  LNG
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ContraFlame®

Passive Fire Protection

ContraFlame® Underdeck & Bulkhead insulation materials are based on a unique phenolic syntactic foam, MS400 or C50

Advanced Insulation is a global supplier of Insulation (Topside and Subsea), Passive Fire Protection (PFP), Cryogenic Spill Protection (CSP), Blast and Fire Walls, Buoyancy Products and Cable Protection Systems.

The company designs, manufactures and installs ContraFlame® Passive Fire Protection (PFP) to provide significant weight savings, protect assets, maintain structural integrity and safeguard personnel working in challenging environments.

Certified by Lloyd’s Register, DNV and ABS, ContraFlame® is used across a broad range of industries; including offshore and onshore oil and gas applications, defence, marine and LNG.

ContraFlame® is used to protect a large range of equipment, including heat exchangers, vessels, saddles and skirts, welding nodes, risers and can be pre-formed into enclosures and half shells for use on piping, valves and flanges.

It has a higher temperature range than other materials on the market providing protection for cryogenic spill applications and elevated operating temperatures compared with intumescent type materials.
Benefits of ContraFlame®

ContraFlame® is extensively tested for use in saline marine environments

What makes ContraFlame® different?

+ Lightweight alternative system to fibrous insulation plus cladding saving of up to 70% in topside weight
+ Hydrocarbon pool fire rated up to H120 for decks and H60 for decks & bulkheads
+ Jet fire and High Heat Flux (HHF) jet fire capability of up to 60 minutes
+ Capable of withstanding up to 4.2 bar blast overpressure for C50 or 1.5 bar for MS400.
+ Excellent weather resistance using joint-less, seamless D2004 laminate system for marine, saline environments
+ Negligible smoke and fumes in fire conditions
+ Thermal conductivity comparable with cellular glass or mineral fibre insulation materials. 0.032W/mK for MS400 and 0.054W/mK for C50

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>Fire Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials for -162°C up to +185°C available</td>
<td>Protects assets for up to 2-hours fire duration</td>
</tr>
<tr>
<td>Up to 4.2 Barg</td>
<td>80% Weight Saving</td>
</tr>
<tr>
<td>Maximum peak overpressure</td>
<td>$100,000 saving per every tonne of topside weight</td>
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</tbody>
</table>

Find out more about ContraFlame® at: www.advancedinsulation.com
ContraFlame®

Designed to Protect, Built to Last

ContraFlame® Underdeck insulation is designed for life-in-field use within the harshest environments including the Arctic Circle

ContraFlame® Underdeck insulation is the product of years of investment and development in material chemistry, manufacturing processes, CAD and modelling capability, in-house and external testing to create a bespoke solution for harsh and challenging environments. The product has evolved from being a wet mix, hand-applied system of C50 phenolic foam to a lightweight MS400 preformed panel phenolic foam. This helps to increase application speed on site, whilst providing a safer, lighter material to handle and transport globally.

Each ContraFlame® Underdeck or Bulkhead installation is subject to site survey to verify the measurements and check for additional structural beams/stiffeners.

As a market-leader for robust passive fire protection, ContraFlame® is tested to outperform other insulation materials with regard to weather protection and fire performance.

ContraFlame® has been utilised by oil and gas operators including:

- Chevron
- ConocoPhillips
- Statoil
- INPEX
- NCOC
- BUMI ARMADA
- bp
- ExxonMobil
- MAERSK OIL
ContraFlame®

Certifications

ContraFlame® systems are subjected to a number of fire, weather and adhesion tests for use on offshore structures

Fireproofing

| Hydrocarbon pool and jet fire compatible systems |

Weatherproofing

| Test in extreme weather conditions |

ContraFlame® underdeck and bulkhead systems have undergone a range of fire tests for deck and bulkhead partitions:

+ IMO Resolution MSC.307(88) Annex 1: Part 3 Hydrocarbon Pool fire for horizontal partitions
+ HHF modified jet fire for offshore structures.

In addition the ContraFlame® top-skin D2004 has been tested to ensure UV resistance in harsh weather environments in accordance with ISO 4892-2:2013:

+ The test duration was 2,555 hours which equals to 5GJ/m² total radiant energy.
+ ISO 4892-2 specifies the methods for exposing specimens to xenon-arc light in the presence of moisture to reproduce the weathering effects (temperature, humidity and/or wetting) that occur when materials are exposed outdoors to sunlight. This specification is designed for polymer materials although xenon arc exposures for paints and varnishes are described in ISO 11341 which uses the same 102/18 test cycle.
Fire Performance

ContraFlame® MS400 and C50 options are available independently or combined depending on the fire specification

Extensive testing to ensure efficiency

ContraFlame® underdeck and bulkhead systems have been subjected to testing for a variety of applications and are one of the most extensively tested solutions on the market.

MS400 boasts two panel thickness options, the first, 70mm provides H60 protection on bulkheads and decks. For H120, J120 and HHF60 protection a 107mm panel is available. MS400 is the lightest solution available with a density of just 80kg/m³.

C50 provides H60 underdeck protection at 55mm thick but is more dense at 300kg/m³ and applied in a wet putty form. C50 is the base to the acoustic underdeck system which provides H60 protection whilst providing 51dB of noise reduction across the deck.

C50 can be used in coat-back areas for jet fire protection on plate girders at a thickness of just 10mm for J30 and 30mm for J120 and can be combined with MS400 panels on the deck plate.

ISO 22899 modified HHF jet fire scenario with ContraFlame® MS400

<table>
<thead>
<tr>
<th>Protection Type</th>
<th>Protection Time</th>
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<tbody>
<tr>
<td>Hydrocarbon jet fire protection for MS400</td>
<td>Up to 120 Minutes</td>
</tr>
<tr>
<td>Hydrocarbon pool fire protection for C50</td>
<td>Up to 120 Minutes</td>
</tr>
<tr>
<td>High Heat Flux (HHF) jet fire protection for C50</td>
<td>Up to 60 Minutes</td>
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</tbody>
</table>

Find out more about ContraFlame® at: www.advancedinsulation.com
Additional Testing

ContraFlame® Underdeck insulation was designed with the markets ever-evolving demands in mind and tested accordingly.

ContraFlame® insulation materials provide maximum protection that can withstand the effects of a blast and continue to provide the required level of fire protection.

+ MS400 tested for a maximum peak overpressure of 0.97 bar.
+ C50 tested for a maximum peak overpressure of 4.2 bar.

As well as blast testing, ContraFlame® MS400 has been subjected to a wide range of additional fire testing including a loaded beam test where load was applied to the deck plate before a test sample covered in MS400 was placed into the furnace.

Each ContraFlame® installation is different in that the anti-corrosion coating used changes from yard to yard. ContraFlame® can be applied to a wide range of anti-corrosion coatings.

Advanced Insulation will provide pull-off test data where necessary and offer full technical support to ensure maximum compatibility. Pull-off data verifies the adhesive bond of the foam and laminate system to the substrate.

Accelerated age tests of ContraFlame® ensure prolonged life in marine, saline environments.

<table>
<thead>
<tr>
<th>Blast Protection</th>
<th>Weatherproof</th>
</tr>
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<tbody>
<tr>
<td>Up to 4.2 bar peak overpressure</td>
<td>Tested in extreme weather conditions</td>
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</tbody>
</table>

ISO 20340 Accelerated age test samples after cyclic on the D2004 laminate system.
ContraFlame®

Applications for Underdeck and Bulkhead PFP & Insulation

ContraFlame® Underdeck & Bulkhead protection is designed to save hundreds of tonnes in topside weight

+ Weather deck
+ BOP deck
+ Escape tunnels
+ ICU decks
+ Control rooms
+ Mezzanine decks
+ Instrument rooms
+ Drill support module decks
+ Stair-tower decks and perimeter
+ Accommodation module deck
+ Process module deck
What can ContraFlame® Protect?

ContraFlame® can be applied to a variety of applications to provide combined PFP and thermal insulation

- Risers
- Separators
- Decks
- Bulkheads
- Valves and actuators
- Welding nodes
- Man-ways
- Air receivers
- Process vessels
- ESDV, MOV and SDV
- Junction boxes
- Heat exchangers
- KO drums

Find out more about ContraFlame® at: www.advancedinsulation.com
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Site Application & Training

ContraFlame® PFP comes with a single point responsibility from Advanced Insulation; ensuring quality is measured at every stage during manufacture, shipping and on-site installation.

Advanced Insulation offer a single point responsibility on all ContraFlame® PFP and Insulation systems.

This means that application teams globally are trained and certified to apply and inspect ContraFlame® according to the application procedures.

Training packages include a demonstration rig, flat plate or piping along with ContraFlame® materials, tools and a supervisor. This allows hands-on experience with the materials at the start of any major project.

During the installation phase, trained applicators are supervised by Advanced Insulation to ensure the correct film thickness is applied and applicators understand each stage of the process. Supervisors will co-ordinate personnel across the installation areas to ensure efficient application phases.

Issued to each approved site applicator

Training Certificates

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MS400 & C50 Insulation
Types Available

Advanced Insulation is a market-leading provider of insulation types including PFP, thermal and acoustic

Advanced Insulation is a market-leading provider of phenolic passive fire protection to a variety of markets including oil and gas facilities, petrochemical plants and refineries.

ContraFlame® provides a weight saving solution, whilst delivering a significant reduction in installation time. A number of solutions are available depending on the application requirements:

- **MS400 H60/H120 Deck**
  - Providing A and H rated fire protection

- **C50 Acoustic Underdeck**
  - Up to 51dB noise reduction
  - C50 panel system

- **MS400 H60/H120 Bulkhead**
  - Providing A and H rated fire protection

- **C50 H60 Underdeck**
  - Providing A and H rated fire protection

- **MS400 J120/HHF60**
  - Providing jet fire protection up to 2 hours
ContraFlame® MS400 was developed in order to provide considerable weight savings and therefore cost savings for major oil and gas topside construction projects. Each tonne of topside weight equates to $100,000 in associated cost to support it structurally. By reducing the weight compared with conventional insulation methods by up to 80%, ContraFlame® is fast becoming the preferred product for both thermal insulation and passive fire protection. This has provided over £9m in cost savings for a recent project in 2015.

ContraFlame® MS400 is a dry-fit panel solution with a density of just 80kg/m³ and comes in two thickness options

+ 70mm panel for H60 protection on decks and bulkheads and U-Value of 0.45W/m²K
+ 107mm panel for H120 protection on decks and U-Value of 0.3W/m²K

MS400 is a high performing insulation material boasting a low thermal conductivity of just 0.032W/mK.

**ContraFlame® MS400 H60/H120 Underdeck & Bulkhead**

ContraFlame® is a robust, fast to install, lightweight system which saves millions in costs for offshore structures

- **80% Weight Saving**
  - $100,000 saving per every tonne of topside weight

- **Suitable in Cold Climates**
  - Track record in the Arctic Circle with lows of -50°C
Find out more about ContraFlame® at www.advancedinsulation.com
**ContraFlame®**

**MS400 J120 & HHF60 System**

*ContraFlame® Underdeck Insulation has adapted to encompass ever more stringent testing regimes including high heat flux jet fires and jet fire capabilities*

ContraFlame® MS400 was subjected to a new set of requirements during two major projects in 2016. The requirement stipulated coat-back areas with J0 (120-minutes of integrity after a fire scenario).

The system was able to withstand a J120 fire scenario with a maximum back-face temperature of 82°C after 120 minutes in the form of a modified, coloured MS400 HHF panel.

This allows MS400 to be applied on panel arrangements for bulkhead and jet fire barrier applications.

In addition, a project in the North Sea required HHF fire protection, a modified ISO 22899-1 test with a higher heat flux of 350kW/m$^2$ compared with a standard ISO 22899-1 heat flux of 250kW/m$^2$.

The test set up deviates from the ISO 22899 standard by increasing the sample surface size and optimising the air/fuel ratio.

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**J120/HHF60**

High performance jet fire protection
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C50 Acoustic Underdeck

Advanced Insulation provide better products for challenging scenarios and the acoustic underdeck system is a testament to that promise.

The acoustic underdeck solution came around where other materials failed to provide an H60 fire rating whilst reducing the noise by up to 51dB.

The material was developed in conjunction with a major Oil & Gas Operator where a processing platform was located in close proximity of an accommodation module.

Advanced Insulation developed a two panel system with an air gap between to accommodate an air gap used for effective sound reduction.

The system is fixed in place using adhesive on the first layer, suspended pins with an acoustic rated sleeve to ensure minimal transfer of vibration, before the final layer which is laminated to create a joint-less seamless finish.

This application ensures that there is no water ingress into the deck, ensuring no corrosion under insulation occurs.

The system was fire tested as a dual panel system for integrity after 2 hours, and was measured for temperature rise after 60 minutes duration.

Noise Reduction
Up to 51dB noise reduction C50 panel system

H60 Deck Protection
Providing A and H rated fire protection
Find out more about ContraFlame® at: www.advancedinsulation.com
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C50 Deck and Coatback

ContraFlame® C50 constituted for all underdeck enquiries up until early 2013 and is still used on coatback areas

ContraFlame® Underdeck protection started with the release of the ContraFlame® JF120 system which uses C50 hand applied phenolic foam. This system has been mostly replaced by MS400 for underdeck applications however, may still be preferred for some application areas.

For underdeck applications, C50 is applied at 55mm and provides H60 protection. The system is applied by hand as a putty material and finished using ContraFlame® D2004 GRP laminate applied in 4 layers.

For jet fire rated coatback areas, C50 is used at just 10mm to provide J30 protection or 30mm for J120.

The system has been installed on projects globally, from the North Sea, to the Arctic Circle as well as offshore Australia due to it’s suitability in saline, marine environments and low temperature capability.

H60 Deck Protection
Providing A and H rated fire protection

J120/HHF60
High performance jet fire protection
Find out more about ContraFlame® at: www.advancedinsulation.com
Advanced Insulation offers a fully comprehensive service that includes survey, design, manufacture and installation.

Requests for quotation and marketing enquiries should be submitted to: info@advancedinsulation.com.

With branches across the world, the company can offer organisations and businesses a comprehensive array of products including passive fire protection, topside and subsea insulation, cryogenic spill protection, blast and fire walls, buoyancy and cable protection systems.

A full technical support service is available for all products, at any location.
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