

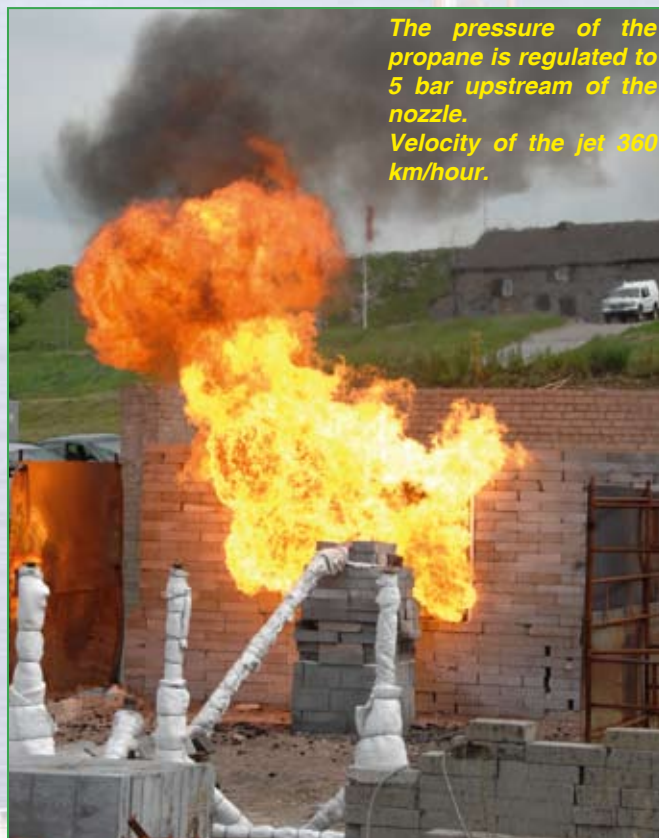
SAFETY DEVICES: CABLE & PIPE TRANSITS

Minimizing the risks of fire and water is the core business of BEELE Engineering. In our over 35 years of experience, we've developed a broad range of products that protect crew, assets and installations. Products that are a result of continuous hi-tech R&D efforts. Our customer-focused approach guarantees a continuous flow of new and improved products that respond to the demanding requirements of our customers. This, combined with our intensive testing programs in our recognized laboratories, is the best guarantee for product usability, ease of maintenance and long term safety. The most advanced system in our range of fire safe products is NOFIRNO. Now also successfully subjected to harshest JET FIRE tests.

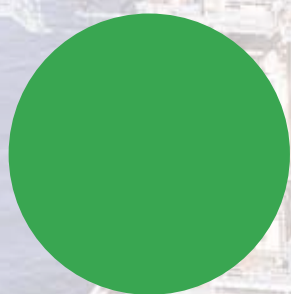
An uncontrolled discharge of combustible gas under pressure poses a serious fire hazard in areas such as petrochemical plants, offshore petroleum rigs and other environments that are sensitive to extreme fires. If high-pressure flammable gas, pressure liquefied gas or flashing liquid fuels are emitted at high velocity and ignited, the result will be a jet fire. Withstanding these jet fires is most demanding for a sealing system.

BEELE Engineering's NOFIRNO sealing system for multi-cable and pipe transits has successfully completed a jet fire test, in accordance with ISO 22899-1:2007 and ISO/CD 22899-2 for two hours at Health & Safety Laboratory at Buxton in England.

From a time/temperature perspective, jet fire tests are similar to hydrocarbon (H-Class) fire tests. During the hydrocarbon test, an instantaneous temperature rise up to 800 °C (1472 °F) takes place, with the overall exposure temperature rising to 1150 °C (2102 °F). However, during the hydrocarbon test, there are no extreme conditions imparted to the penetration seal, such as thermal and mechanical loads or severe erosive forces, as is the case with the Jet Fire Test. Jet fire tests simulate the most onerous conditions of a hydrocarbon fueled fire on an offshore oil rig, or a missile strike on a military warship.



The pressure of the propane is regulated to 5 bar upstream of the nozzle. Velocity of the jet 360 km/hour.



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The jet fire test was recorded on DVD; copies of the DVD can be ordered.

Jet fires give rise to high convective and radiative heat fluxes as well as high erosive forces. To generate both types of heat flux in sufficient quantity, a 0.3 kg/second sonic release of gas is aimed into a hollow chamber, producing a fire ball with an extended tail. The flame thickness is thereby increased and hence so is the heat radiated to the test specimen. Propane is used as the fuel since it has a greater propensity to form soot than natural gas and can therefore produce a flame of higher luminosity. Strong erosive forces are generated by release of the sonic velocity gas jet, 1 meter from specimen (bulkhead) surface. The jet velocity is ca. 100 meter/second at 0.25 meter from the back of the recirculation chamber (e.g. the front of the web of a structural steel specimen) and ca. 60 meter/second at the back of the chamber.

The Jet Fire test incorporated a cable penetration with dimensions 600x300 mm with armoured and non-armoured cables up to 3x400 mm² (105 mm OD) and bundled LAN data cables, representing a shipboard cable installation, and a pipe penetration consisting of a conduit sleeve with an ID of 406.4 mm and a ducted steel pipe with an OD of 273 mm.

Both penetrations maintained their integrity for the full two hours.

EXPERTISE-DEDICATION-QUALITY-DURABILITY

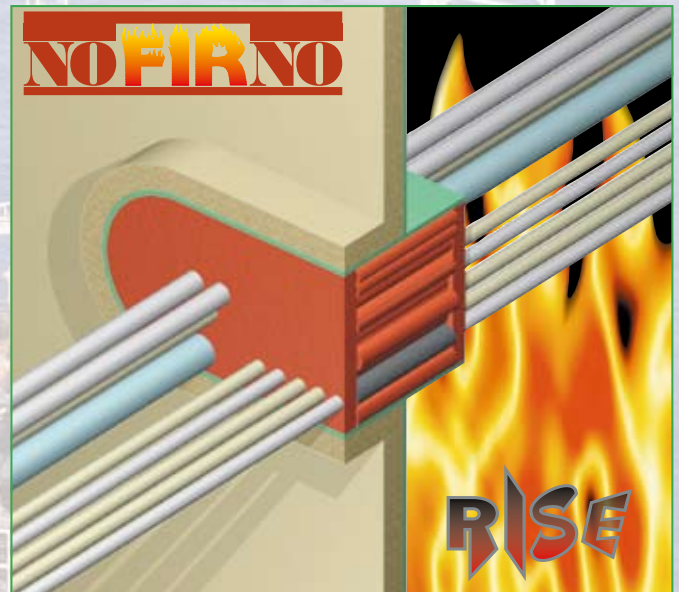
Our development, test and production facilities are among the most advanced in the world. The factory is equipped with state of the art machines, which are tailor made to the requirements of our company. We work to a high-level ISO system, with unmatched involvement. Continuous investment in design technologies combined with highest quality polymers, is our guarantee for the safety of lives and equipment. That is why BEELE Engineering is internationally recognized by all relevant certification institutes and classification societies. Based on our long experience, we offer sealing technologies covering a wide range of applications. We provide safety for today, tomorrow and for the entire service life of your project.

Despite the jet speed of about 360 km/hour (225 miles/hour), causing high erosive forces, and the flame temperatures of about 1200 °C, the temperature rise measured on the surface of the NOFIRNO sealant at the unexposed side was only max. 160 °C. This proves the high thermal insulation values under fire load of the NOFIRNO sealing system. After dismantling it was noticed that the NOFIRNO filler sleeves were not consumed or in fact hardly affected by the fire.

NOFIRNO is one of BEELE Engineering's 'rapid sealing systems' for use on board ships, on offshore installations, in building and construction and other environments where the safety of people and installations has to be guaranteed. NOFIRNO offers the ultimate fire safe sealing solution.

NOFIRNO is also tested on full scale bulkheads and decks in accordance with IMO Res. A.754(18). Based on these tests Det Norske Veritas has issued EC (MED) certificates according to the European Union Council Directive 96/98. The system is also tested for H-class partitions. A Type Approval Certificate for H-class is issued by Det Norske Veritas as well. It is important that for both A-0 and H-0 class the system is tested without the use of any insulation.

NOFIRNO has been developed for a service life of over 20 years and offers the best Total Cost of Ownership on the market of sealing systems. The sealing system is weather, UV and ozone resistant and is capable of absorbing temperature changes. In addition, NOFIRNO is also shock and vibration proof and can be used in wide range of temperatures (-50 °C up to +180 °C), offers a high degree of watertightness and is also accepted for the use in blast walls.



Our philosophy - your advantages

BEELE Engineering's market leadership position is due to our specific philosophy in which quality, know-how, technology transfer and service play key roles.

Your advantages:

- *Ultimate safety and survivability*
- *Savings on material, labor, space and weight*
- *Ease of installation and maintenance*
- *Approvals by all major class societies*
- *Best total cost of ownership*

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