Safety enhancement

An explosion inside a platform results in a huge blast overpressure, fragments and the spread of fire. A platform could be a ship, an offshore installation, a chemical plant, or a storage facility. The size of the damage and the danger can be significantly reduced by improving the structure of the platform, particularly the transverse bulkheads.

Explosion resistance requirements

We can assist you in specifying your explosion resistance requirements, related to the following threats:

- Explosion of a missile warhead
- Explosion of a naval shell
- Hull close-in explosion
- Explosion caused by accidents

We use vulnerability simulation codes, ranging from an overall system survivability answer to a detailed assessment of the local effects of blast, fragments and fire. All codes have been validated with full-scale tests.

We can offer several construction elements, proven to withstand a large blast overpressure:

- PriMa double bulkhead design
- PriMa single bulkhead design
- Membrane lightweight doors
- Upgrade of regular doors to a higher blast resistance.
**PriMa double and single bulkheads**

PriMa bulkhead concepts have been validated by tests. The designs will be tailored to customer requirements by means of a unique developed failure FEM tool. PriMa bulkheads can be fabricated at low additional costs and with only a small mass penalty.

PriMa double bulkheads have a proven high blast resistance. The two sides of the bulkhead are connected to the deck by means of a slender plate, to reduce the strain at the welds.

In the space between the two bulkhead sides, fragment resistant material can be applied.

**The membrane door**

TNO has developed an explosion resistant membrane door in co-operation with the Dutch door manufacturer ‘ZNS-Van Dam’. The weight of the membrane door called NADAM4, is comparable to a conventional ship door while the explosion resistance is at least 10 times higher, as proven by tests.

**PriMa single bulkheads**

PriMa single bulkheads have a nearly comparable blast resistance as the double bulkheads. The single plate structure is easier to fabricate. The single bulkhead has however a lower efficiency, when no bulkheads are located above or beneath. The fragment resistance of the single bulkhead can be improved by applying fragment resistant add-on panels.

**Implementation**

TNO’s explosive resistant products will be implemented in the F310 frigates for the RNoN, the type 45 destroyers for the RN and the LCF frigates of the RNLN. Implementation is being considered by various other navies for their new ship programs.

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**TNO Defence, Security and Safety**

‘TNO Defence, Security and Safety’ is the title under which TNO operates as a strategic partner for the Dutch Ministry of Defence and makes innovative contributions to enhancing the security of the Netherlands both at home and abroad. We also use our accumulated knowledge for foreign governments and for defence-related industries.

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**NADAM4 door specifications:**

- Manual operation with a single lever
- Watertight
- Width of door opening: 800 mm
- Height of door opening: 1750 mm
- Weight of turning part: 120 kg
- Dimensions can be tailored to customer specifications.