FireMaster® Rigid Enclosure System (RES)

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FireMaster® Rigid Enclosure System

FireMaster® RES - Rigid Enclosure System

The FireMaster® Rigid Enclosure System consists of a stainless steel enclosure incorporating our high performance FireMaster® insulation products.

It is fire tested for jet fire protection of valves, actuators and pipe flanges to ISO 22899-1 standard for up to 60 minutes. Very low critical temperature items can be insulated due to the high performance insulation used in the enclosure.

The FireMaster® RES is custom-manufactured in sections designed to fit around the item requiring protection and can incorporate water drain and inspection hatch features if required.

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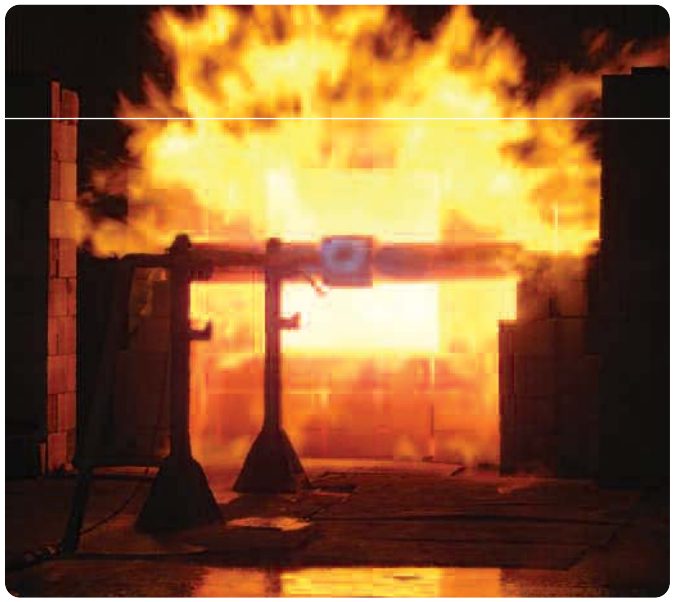
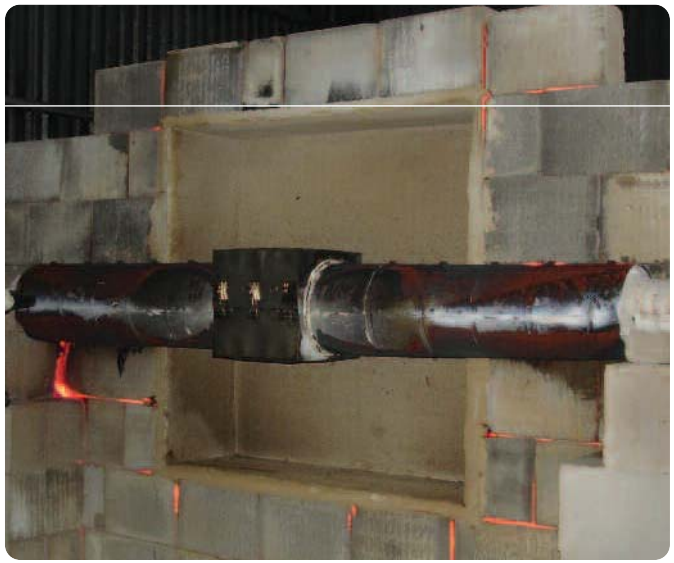
- Easy fitting and removal is ensured through a simple clip fixing system with fire sealing materials incorporated into the shells.
- The robust stainless steel casing is especially suitable for use in weather-exposed areas.
- The system has been demonstrated to have blast resistance to 0.5 bar overpressure. See page 65 for details.





FireMaster® Rigid Enclosure System

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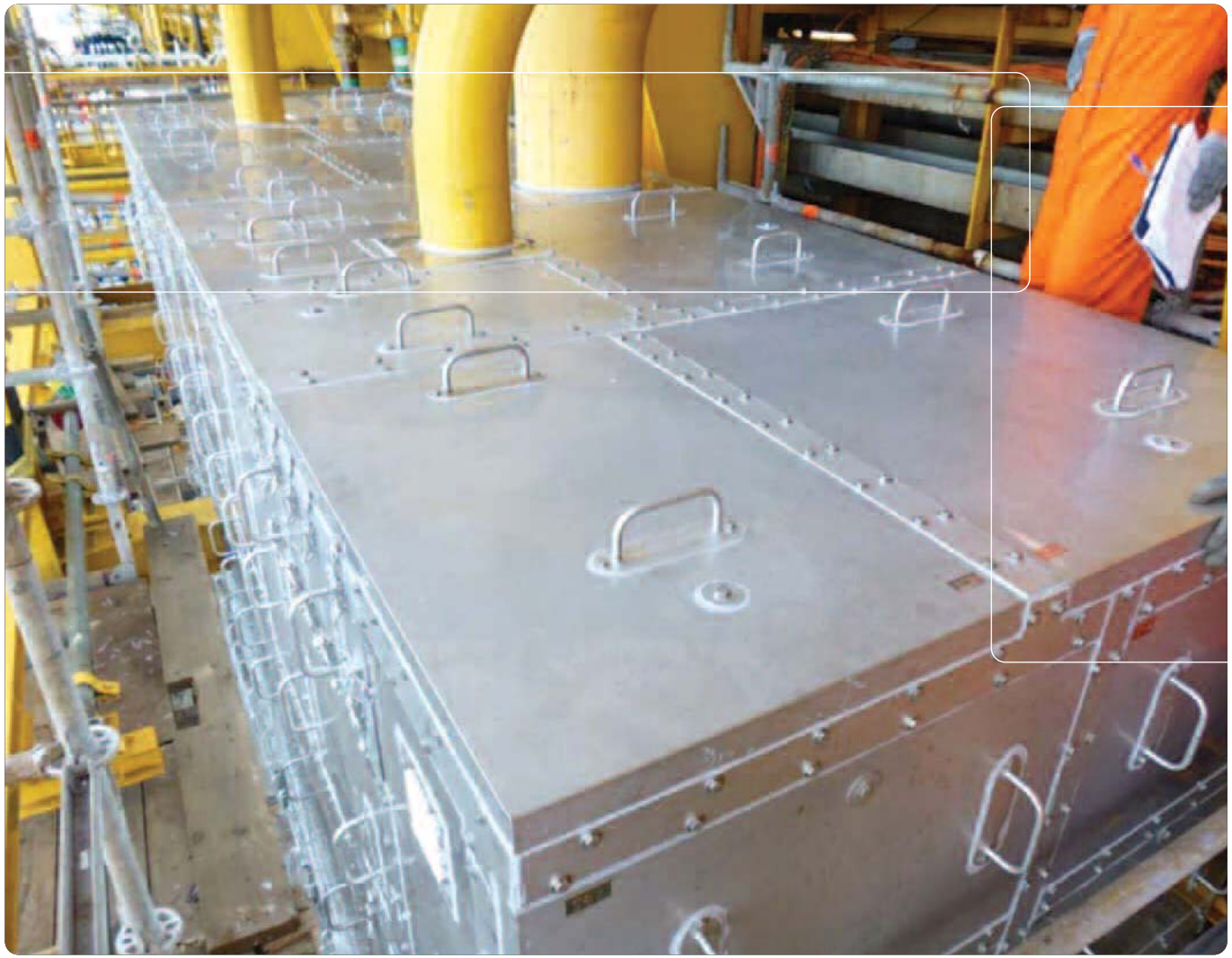

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For large units requiring fire protection, the RES System is installed as panels onto a supporting framework. Example shown in these photographs is a skid unit for actuators for 50 minute jet fire protection. Exterior unit dimensions were 4m long x 2.2m deep x 2.8m high. Access doors can be incorporated into the panel system.

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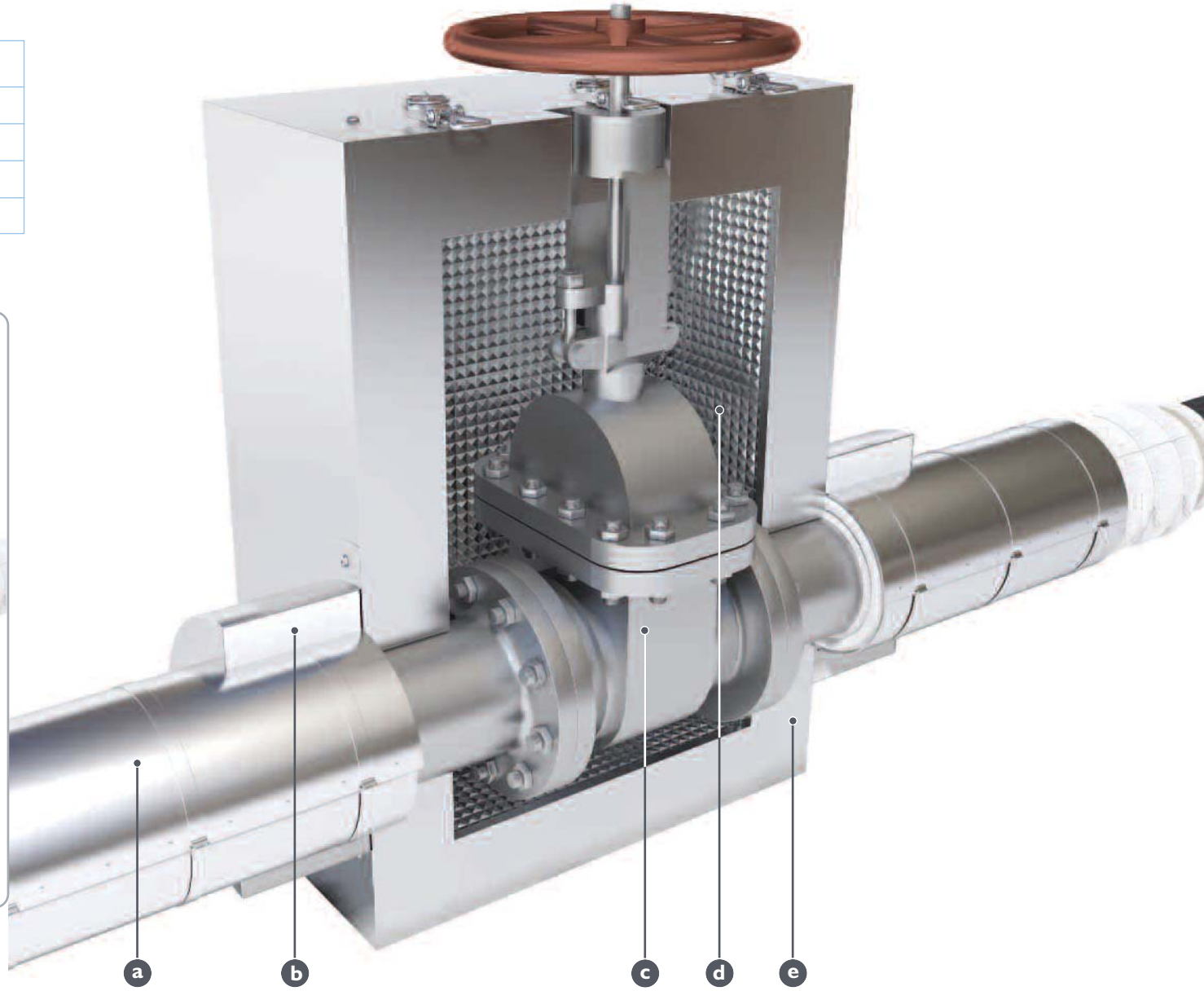
FireMaster® RES - Rigid Enclosure System. Explosion resistance to 0.5 bar

a	Pipe. The RES system is installed over the applied pipe fire insulation system where fire insulation is fitted.
b	Integral collar incorporating insulation.
c	Valve.
d	Internal lightweight stainless steel casing.
e	316 stainless steel outer casing.

Rigid Enclosed System - *system 1, showing stainless steel outer casing*



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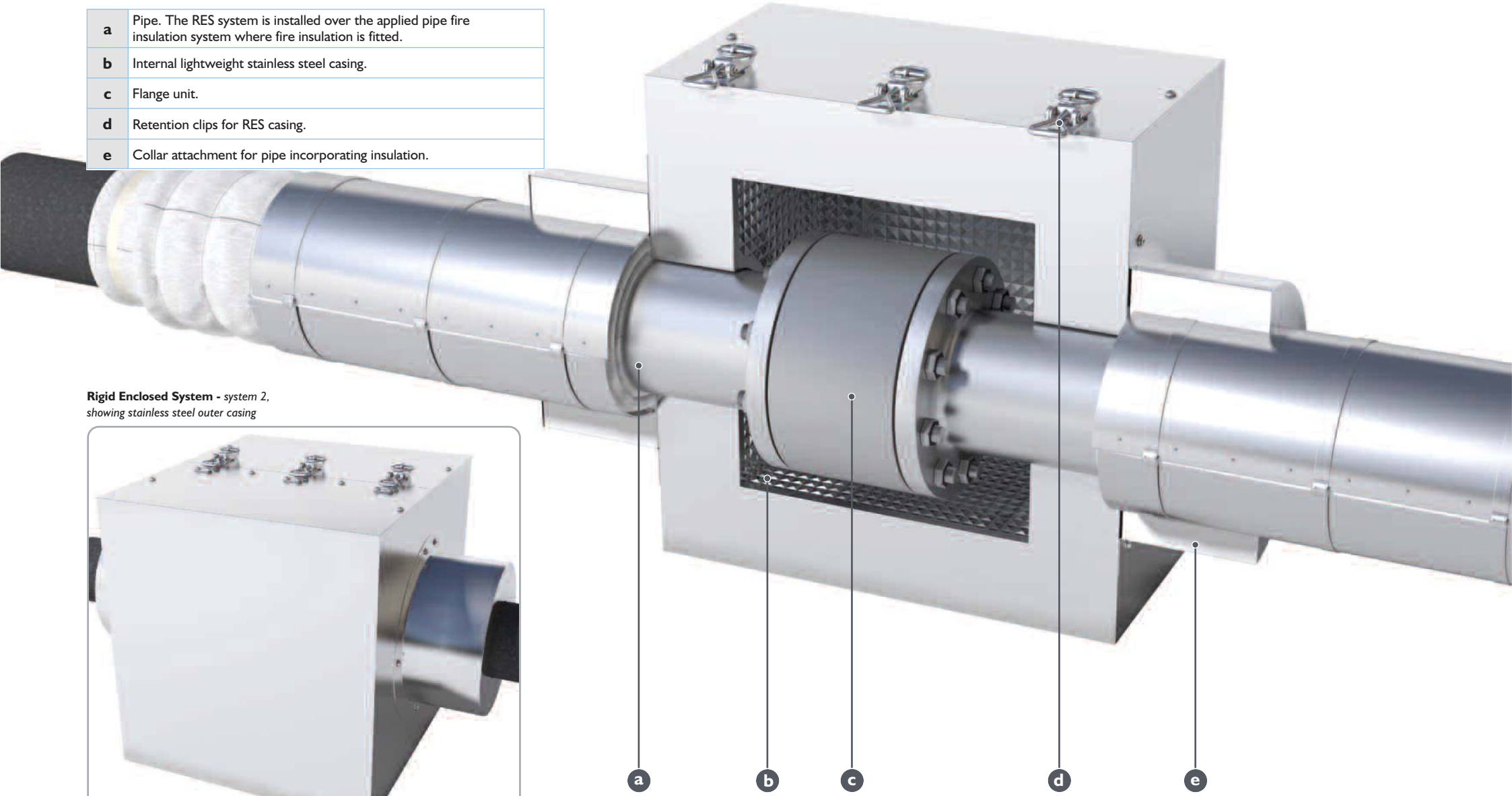
a	Pipe. The RES system is installed over the applied pipe fire insulation system where fire insulation is fitted.
b	Internal lightweight stainless steel casing.
c	Flange unit.
d	Retention clips for RES casing.
e	Collar attachment for pipe incorporating insulation.

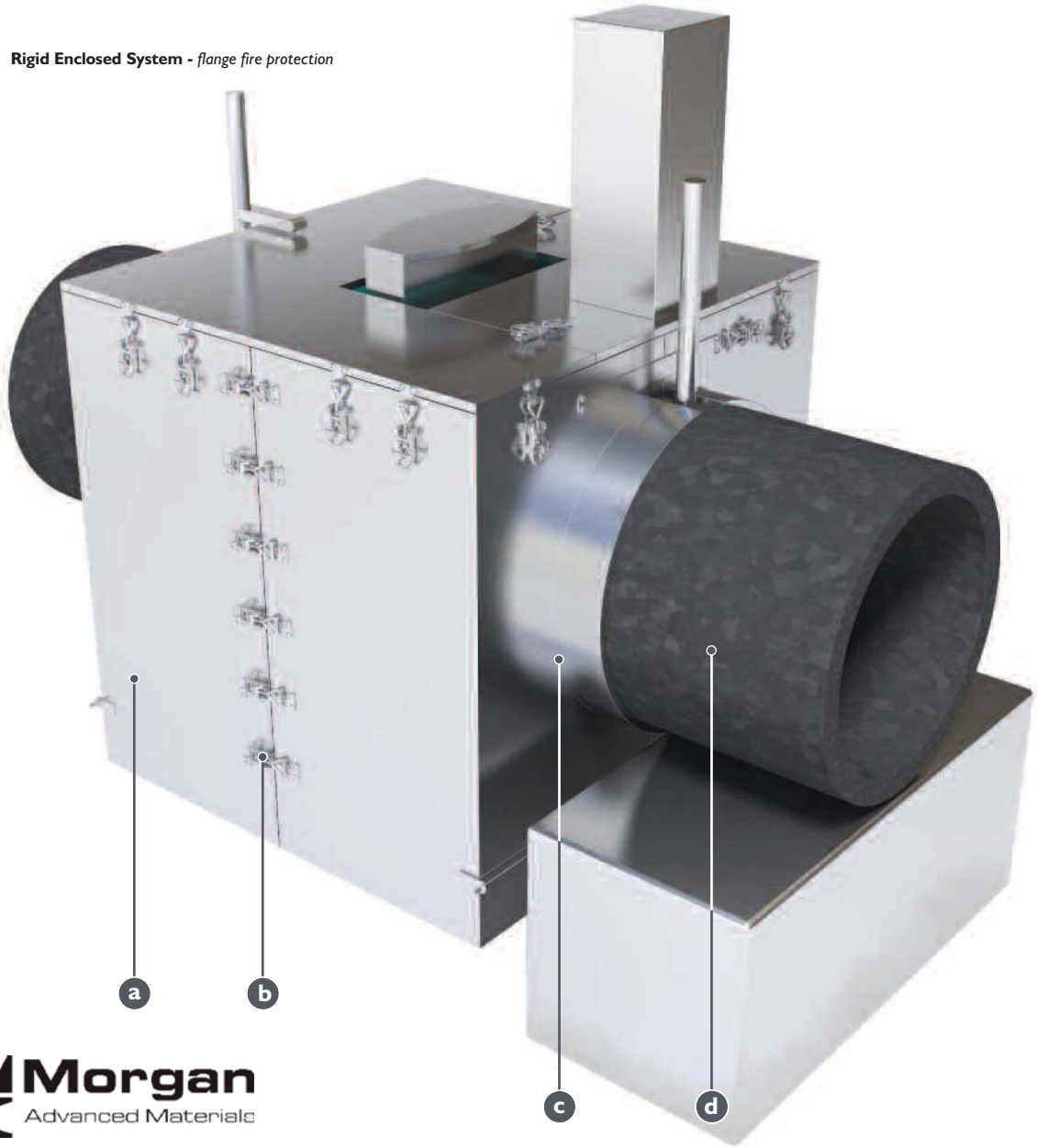


Rigid Enclosed System - *system 2, showing stainless steel outer casing*

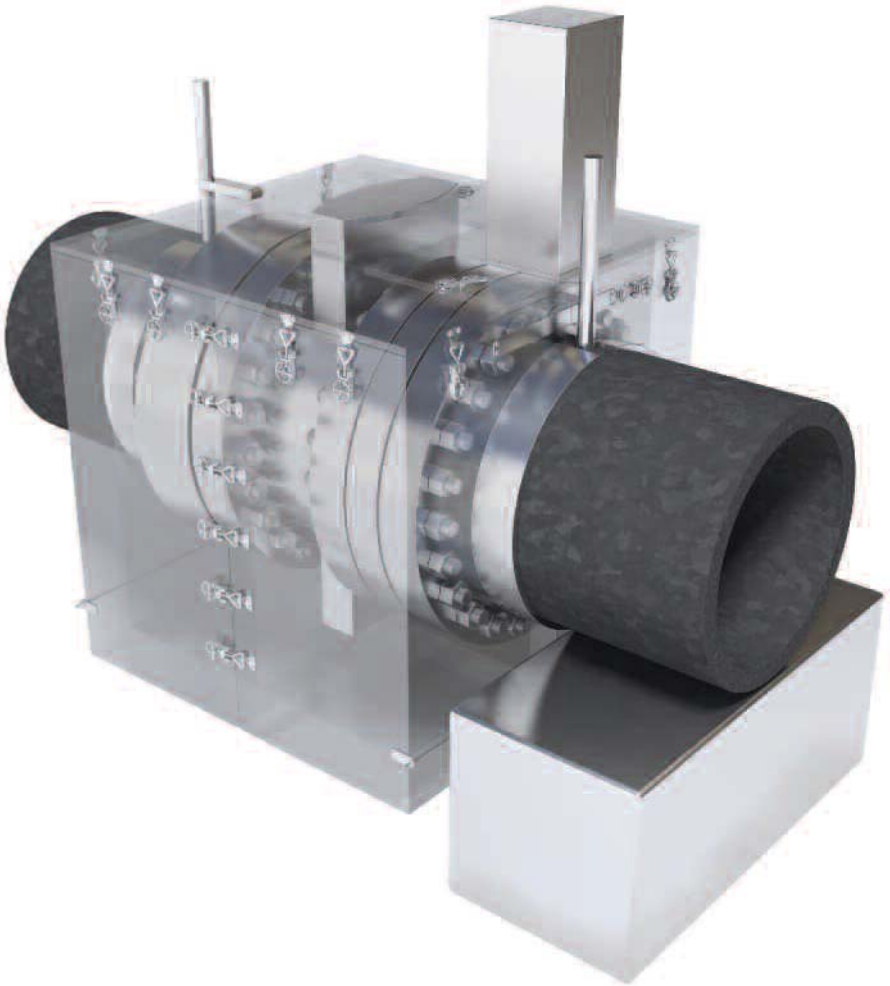
FireMaster® Rigid Enclosure System

FireMaster® RES - Rigid Enclosure System - flange fire protection

Rigid Enclosed System - *flange fire protection*



a	316 stainless steel outer casing.
b	Retention clips for RES casing.
c	Integral collar incorporating insulation.
d	Pipe. The RES system is installed over the applied pipe fire insulation system where fire insulation is fitted.



Valve and actuator fire protection

Commonly used standards for the specification or the fire testing of passive fire protection systems are usually based on ensuring the critical temperatures of structural elements such as steelwork or fire walls are not exceeded. Whereas structural steel sections may have a critical temperature of typically 400°C, the critical temperature limits of processing equipment such as valves or actuators or flanges is often much lower; for example less than 150°C.

It is therefore advisable to ensure that systems offered for the fire protection of such critical components are independently tested and approved to provide adequate protection, i.e. that they ensure the specified critical temperature of the component will not be exceeded. In addition, all components (fixings, sealants etc) of the assembly as fitted on site should also have been demonstrated to be suitable through relevant fire testing. Where enclosures are used that are different in size to those that have been fire tested, their design (e.g. joint type and locations) should be authorized within a Type Approval.

A fire test on an enclosure system demonstrates both the integrity of the enclosure and its insulation capability. Careful consideration must be made of the limitations of size or mass of the contents of the enclosure as tested, as changes to the fire insulation fitted into each enclosure may be required for contents that have a lower critical temperature or less heat capacity. In such cases, certification for the enclosure system may place a maximum limit of the surface area to mass relationship (or 'section factor') of the contents or alternatively encompass an approved method for changing the insulation specification to suit contents with varying mass, section factors or critical temperatures.

FireMaster® RES independent fire test results and Type Approval

Two alternative designs of the FireMaster® RES passive fire protection system have been fire tested incorporating inspection hatches, drain plug and alternative insulation designs.

The tests utilise the RES system as protection for a tubular steel specimen with a central steel section constructed to represent the body of a valve or actuator of maximum section factor 80m^{-1} protected by the enclosure.

60-minute duration

The RES enclosure has been fire tested in 2 impinging jet fires tests witnessed by Lloyds Register and carried out at DNV-GL, Spadeadam, UK in accordance with the ISO 22899-1 test method for tubular specimens.

FireMaster® RES has Lloyds Register Type Approval as follows

Maximum Section Factor of item to be protected: 80m^{-1}

Insulation System 1
JF/Pipe System Components/125/60
JF/Pipe System Components/75/45
JF/Pipe System Components/35/30

Insulation System 2
JF/Pipe System Components/220/60
JF/Pipe System Components/130/45
JF/Pipe System Components/50/30

Explosion Resistance

The RES system has been tested at DNV-GL Spadeadam laboratory for resistance to gas explosion overpressure to 0.5 bar. See page 65 for details.

Explosion resistance testing of FireMaster® Process Equipment fire protection systems

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The following systems were tested for explosion resistance at the DNV-GL Spadeadam test site in 2015:

- FireMaster Vessel Fire Protection System
- FireMaster RES System installed onto a 3 inch schedule xxs pipe
- FireMaster Pipe Fire Protection System
  - 3inch schedule 40 pipe insulated with two alternative insulation specifications:
    - 76mm FireMaster Marine Plus Blanket + 40mm of Microporous flexible (total outside diameter of pipe 322mm)
    - 38mm FireMaster Marine Plus Blanket + 76mm Microporous flexible (total outside diameter of pipe 306mm)

Pipes and RES system installed in explosion chamber prior to explosion testing.

FireMaster vessel system installed on back wall of explosion chamber prior to explosion testing.

Explosion resistance testing of FireMaster® Process Equipment fire protection systems

The specimens were subjected to two consecutive explosions with the following overpressures

Test	Average Overpressure (mbar)	Average Duration (ms)
1	430	170
2	500	170

After each test the specimens were examined and assessed for integrity of the fire protection system.

Test Sample	Assessment of Damage	
	Test 1	Test 2
FireMaster Pipe 1	Some deformation of the end caps	Some deformation of the end caps
FireMaster Pipe 2	Some deformation of the end caps	Some deformation of the end caps
FireMaster RES	Some deformation of the end caps RES box rotated 90°	Some deformation of the end caps. Loss of some rivets near centre of pipe
FireMaster Vessel System	No damage or deformation of FireMaster blanket	No damage or deformation of FireMaster blanket

RES system after second explosion test.

FireMaster Vessel system after 2nd explosion test. No damage occurred to the cladding. An inspection of the insulation was made after removal of the cladding and no damage or compression of the insulation thickness was noted.

Pipe system after second explosion test.

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