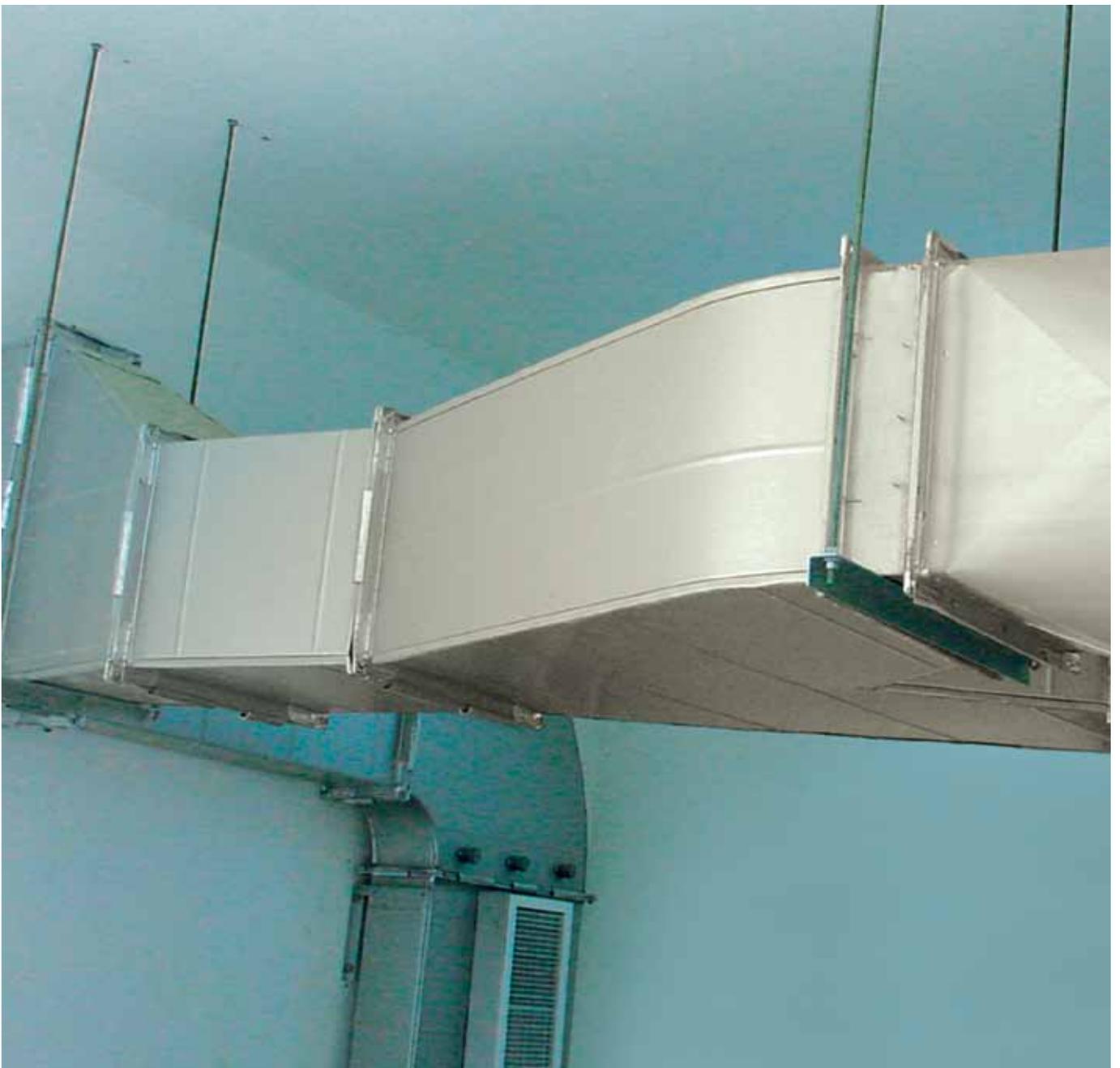


Promat



PROMAPAIN[®] FD
Water Based Intumescent Coating
For Steel Ducts



The relative complexity of any ductwork system passing through different fire compartments and the relevance of the system's function in ambient as well as fire conditions can make the selection of a suitable ductwork system difficult.

This document aims to give some guidance on the fire performance requirements of ductwork (ventilation ducts) and solutions for the protection of steel ductwork using PROMAPAIN[®] FD coating.

longer retain a duct in its intended position or when sections of the duct collapse. This requirement does not apply to the length of the duct exposed to internal fire (Duct Type B) within the fire compartment.

It should be noted that if a duct suffers extensive deformation, such that it can no longer fulfil its intended purpose, this would be classed as stability failure. For Duct Type A, loss of pressure within the duct during testing is also construed as stability failure.

Integrity failure occurs when cracks, holes or openings occur in the duct or at any penetrations within walls or floors, through which flames or hot gases can pass. The effects on integrity of the movement and distortion of both restrained and unrestrained ducts are also included in the standard.

Insulation failure occurs when the temperature rise on the outer surface of the duct outside the fire compartment exceeds 140°C (mean) or 180°C (maximum). The guidance in the standard also states that ducts lined with combustible materials or coated internally with fats or greases, e.g. kitchen extract, should also have this criterion for the inner surface of the duct within the fire compartment when the duct is exposed to external fire (Duct Type A).

Fire Testing Methods

To determine the fire resistance of ducts (without the aid of fire dampers) passing through or between compartments, the system should normally be tested or assessed in accordance with BS 476: Part 24: 1987 or AS 1530: Part 4: 2005 or BS EN 1366: Parts 1, 5 and 8.

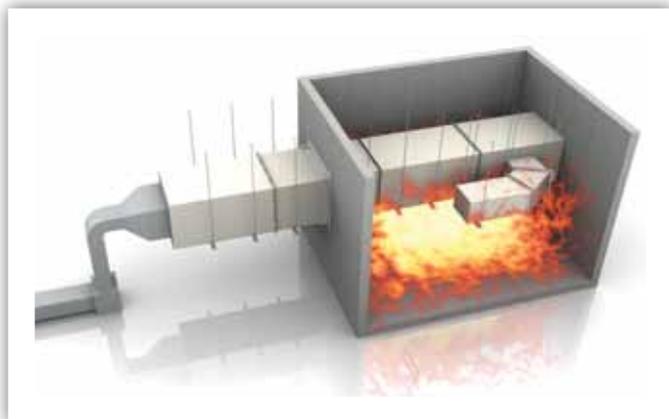
These standards have been written specifically for ventilation ducts, but guidance is also given in these standards on the performance requirements for "smoke outlet" ducts.

The following information refers to BS 476: Parts 20 and 24. As part of a standard fire test, duct systems are exposed to external fire (also known as Duct Type A) and one sample to both external and internal fire (also known as Duct Type B). Fans attached create a standard pressure difference and air flow and the duct's fire performance is assessed in both fan-on and fan-off situations. When testing horizontal ducts, a run of at least 3000mm is located within the fire compartment (the EN and revised ISO standards required a 4000mm length exposed) and a further 2500mm outside the fire compartment.

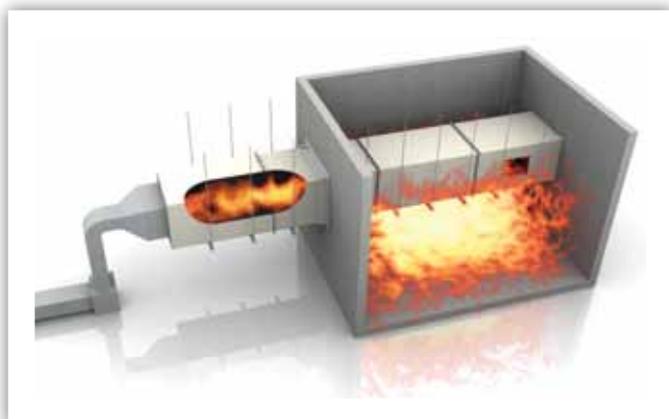
BS 476: Part 24 expresses the fire resistance of ducts without the aid of dampers, in terms of stability, integrity and insulation.



PROMAPAIN[®] FD undergoing fire testing



Fire testing for Duct Type A (Exposed to external fire)



Fire testing for Duct Type B (Exposed to both external and internal fire)

General Design Considerations

The following points are some of the factors which should be considered when determining the correct specification to ensure a ductwork system will provide the required fire performance.

1 Required Fire Exposure

Ductwork systems which are located in more than one compartment should always be tested or assessed for their performance when exposed to the heating conditions described within BS 476: Part 20: 1987. Reduced heating curves are generally only acceptable for certain of the systems components, e.g. the fan.

The performance of a ductwork system will vary depending on whether or not a fire could have direct access to inside the duct through an unprotected opening. If in doubt, one should assume direct access, i.e. the prescribed Duct Type B scenario. The construction of PROMAPAIN[®] FD fire resistant ducts detailed in this document fulfil both Duct Type A and B requirements.

2 Required Fire Performance

It is a general requirement that the ducts must satisfy all the relevant performance criteria of stability, integrity and insulation (and maintaining a minimum 75% cross sectional area if a smoke extraction duct). However, the approval authority may accept exceptions on occasion. For example, if no combustible materials or personnel are likely to be in contact with the duct, the authority may accept a reduced insulation performance.

Stability failure occurs when the suspension or fixing devices can no

3 Supporting Structure

Care should be taken that any structural element from which the duct system is supported, e.g. a beam, floor or wall, must have as a minimum the same fire resistance as the duct system itself and must be able to support the load of the duct under fire conditions.

4 Hanger Support

The supporting steel hanger rods, channels and fixings should be appropriate for the load of the complete ductwork system including any applied insulation material or other services suspended from it.

For example, the length of the hanger support system should not exceed 2500mm unless appropriate insulation is provided to reduce the effect of thermal expansion. If the hanger supports are longer than 2500mm and unprotected, there is a likelihood that excessive expansion of the support system could place undue strain on the duct and lead to premature failure of the smoke extraction and ventilation system.

5 Steel Ductwork

The steel duct must be constructed in accordance with the requirements of DW/144, "Specification for sheet metal ductwork: Low, medium and high pressure/velocity air systems (published by the Heating and Ventilating Contractors' Association UK)" or equivalent specification, e.g. SMACNA. The steel ducts must be constructed with rolled steel angle-flanged cross joints. It is recommended that longitudinal seams be formed using the Pittsburgh lock system.

6 Penetrations Through Walls & Floors

Care should be taken to ensure that movement of the duct in ambient or in fire conditions does not adversely affect the performance of the wall, partition or floor, or any penetration seal. It should be understood that where a duct passes through any compartment wall or floor or other type of separating element, the aperture between the element and the duct must be sealed in accordance with the system approved for use with the specific duct system. In general this requires the use of a penetration seal constructed from materials and in such a manner to match the system used in the duct test programme. Penetrations seals are part of the tested duct system and the use of untested third party products or systems are not permitted.



Wall penetration of the PROMAPAIN® FD fire resisting duct system

7 Other Requirements

Acoustic performance, thermal insulation, water tolerance, strength and appearance can also be important considerations. Please refer to BS 8313: 1997 "Code of practice for accommodation of building services in ducts".

Selection of Fire Protection System

Traditionally all ductworks are fabricated from steel which normally had to be encased in a fire protection system when passing through a compartment wall or floor without the aid of a fire damper.

The stress allowance of the steel hanger rods for a 120 minute fire resistant duct should not exceed 10N/mm² and the centres of the hanger supports should not exceed 2500mm. These figures are based on work carried out by Warrington Fire Research Centre (now Exova Warrington) in the UK and European research projects into the stress and strains of steel members under simulated fire conditions.

The stress reduction ratio factors below are based on BS EN 1993-1-2: 2005. Similar figures can be applied from AS/NZS 4600: 2005/ Amendment 1: 2010.

Fire resistance period	Approximate temperature	Maximum permitted stress	Maximum permitted centres
30 minutes	840°C	18N/mm ²	2500mm
60 minutes	950°C	10N/mm ²	2500mm
90 minutes	1000°C	10N/mm ²	2500mm
120 minutes	1050°C	10N/mm ²	2500mm
180 minutes	1110°C	6N/mm ²	2000mm
240 minutes	1150°C	6N/mm ²	1500mm

It should be noted that the stress levels referred to above apply to the threaded rod hanger supports themselves. The horizontal members have a differing level of applicable stress. The maximum centres refer to the greatest allowable distance between hanger support systems. However it should be noted that in certain locations, bends for instance, additional supports at lesser centres should be considered.

Where the hanger support system may exceed the limits given in the table above, the remedial options are as follows:

- 1) increase the dimensions of the hanger support system, e.g. rod diameters etc,
- 2) reduce the centres of the hanger support system, or
- 3) protect the hanger rods.



Appropriate hanger support require for the ductwork system

General Description

PROMAPAIN[®] FD is a water based intumescent coating for the fire protection of steel ducting.

PROMAPAIN[®] FD is applied directly to a steel duct that has been manufactured in accordance with the requirements of DW/144 to provide fire protection for up to 120 minutes. In a fire, a chemical reaction takes place causing the PROMAPAIN[®] FD to expand and form an insulating layer which slows the temperature of the steel duct rising to a critical level.



Area of Applications

- Steel duct

General Technical Properties

Colour	White
Consistency	Liquid
Reaction To Fire	B1, slowly combustible
Expansion Rate	Approximately 1:25
Viscosity	Approximately 30 Pas
Content Of Solids	Approximately 75%
Slump Resistance	Approximately 1mm
Recommended Working Temperature	+10°C up to +40°C
Consumption	Approximately 1.9 kg/m ² (1mm dry)
Curing Time (20°C < 60% relative humidity)	Touchable after 12 hours
Complete Cure	1mm per 24 hours
Dilution	Water

GUARANTEE ADEQUATE VENTILATION DURING WORK. AVOID CONTACT WITH THE EYES AND SKIN AND AVOID INHALATION OF THE COATING BY WEARING APPROPRIATE PERSONAL PROTECTION GEAR (SAFETY GOGGLES, PROTECTIVE CLOTHING AND MASK). FOR MORE INFORMATION PLEASE CHECK THE MATERIAL SAFETY DATA SHEET, AVAILABLE UPON REQUEST.

Advantages

- Intumescent fire stopping coating.
- Provides fire resistance for up to 120 minutes in accordance with BS476: Part 24.
- Exposed to external and internal fire.
- Durable and decorative finish.
- Chemical and abuse resistant.
- Can be top coated to match surroundings.
- Easy application and clean up with water.
- Minor cracks do not effect fire performance.
- Fast drying time.

Application

- Coating should be applied in a controlled area, ideally in the factory of manufacture, to ensure the coating is applied in a consistent manner to the approved thickness and to ensure adhesion providing long term durability. Coating on site is not an ideal solution and is not recommended except for touch up areas.
- To ensure top quality adhesion and long term durability, steel ducts should be wiped down with a solvent and must be completely free of grease, oils, dirt or any contaminants picked up during manufacture.
- A good quality proprietary etching primer should be applied over the whole surface of the duct to a thickness of 75µm DFT within 2 hours of cleaning the surface (item 2).
- Once the primer coat is fully cured, the application of the PROMAPAIN[®] FD can commence.
- Stir PROMAPAIN[®] FD well (we recommend a mechanical mixer).
- PROMAPAIN[®] FD can be diluted (maximum 0.5 litre clean water to each 12.5kg container). Be advised that dilution will result in an increase in the WFT to meet the required DFT.
- PROMAPAIN[®] FD can be applied with a brush, roller, spatula or airless device. Best results in terms of adhesion and finish will be obtained by using airless spray.
- Once opened containers should be fully used as soon as possible. Reseal containers properly after use.
- Drying time: approximately 8 hours at 20°C and a relative humidity of 65% for 1mm.
- Clean tools with water after use.
- 1mm dry-film thickness (DFT) is equivalent to 1.38mm wet-film thickness (WFT) (approximately 1850g/m²).
- Overpainting is possible; adhesion and compatibility must be checked.

The steel duct shall be of at least 0.8mm nominal thick and must be constructed in accordance with the requirement of DW/144 (Specification for sheet metal duct work) to the required dimensions. A 35mm flange to be formed at each open end by folding back each duct face to crimp a nominally 1mm thick x 6m lipped x 108mm long angle plate at each corner. The flanges shall be drilled at up to 200mm centres to take M8 bolts & nuts all around.

The steel duct surface should be grease-free and to be pre-coated with a layer of etch primer at minimum 75µm DFT. A layer of PROMAPAIN[®] FD intumescent coating with minimum 505µm DFT to be applied thereafter by means of roller, brush or spray; airless spray is the preferred method.

For insulated systems, after installation at site, the coated steel duct sections are then covered with a layer of 50mm x 100kg/m³ mineral wool throughout all surfaces and held in place by pre-welded steel pins and spring clips. 250mm wide 50mm thick x 100kg/m³ mineral wool cover strips are added to location where duct joints exist.

Ducts Joints

Duct joints painted with PROMAPAIN[®] FD intumescent coating and (for insulated ducts only) covered with additional 250mm width mineral wool cover strip.

Test & Standards

The complete system along with the material and framing is tested in accordance with the criteria of BS476: Part 24: 1987, including the maintenance of minimum 75% cross sectional area as required for smoke extraction duct systems.

Packaging

12.5kg plastic buckets, 550kg/pallet. Subject to change.

Storage Requirements

- Indoors in dry conditions between 10°C and 38°C.
- Protect from frost, excessive heat (above 45°C) and strong radiant sunlight.

Shelf Life

- Minimum 12 months in original sealed containers.
- Once opened, containers should be finished swiftly.

Environmental

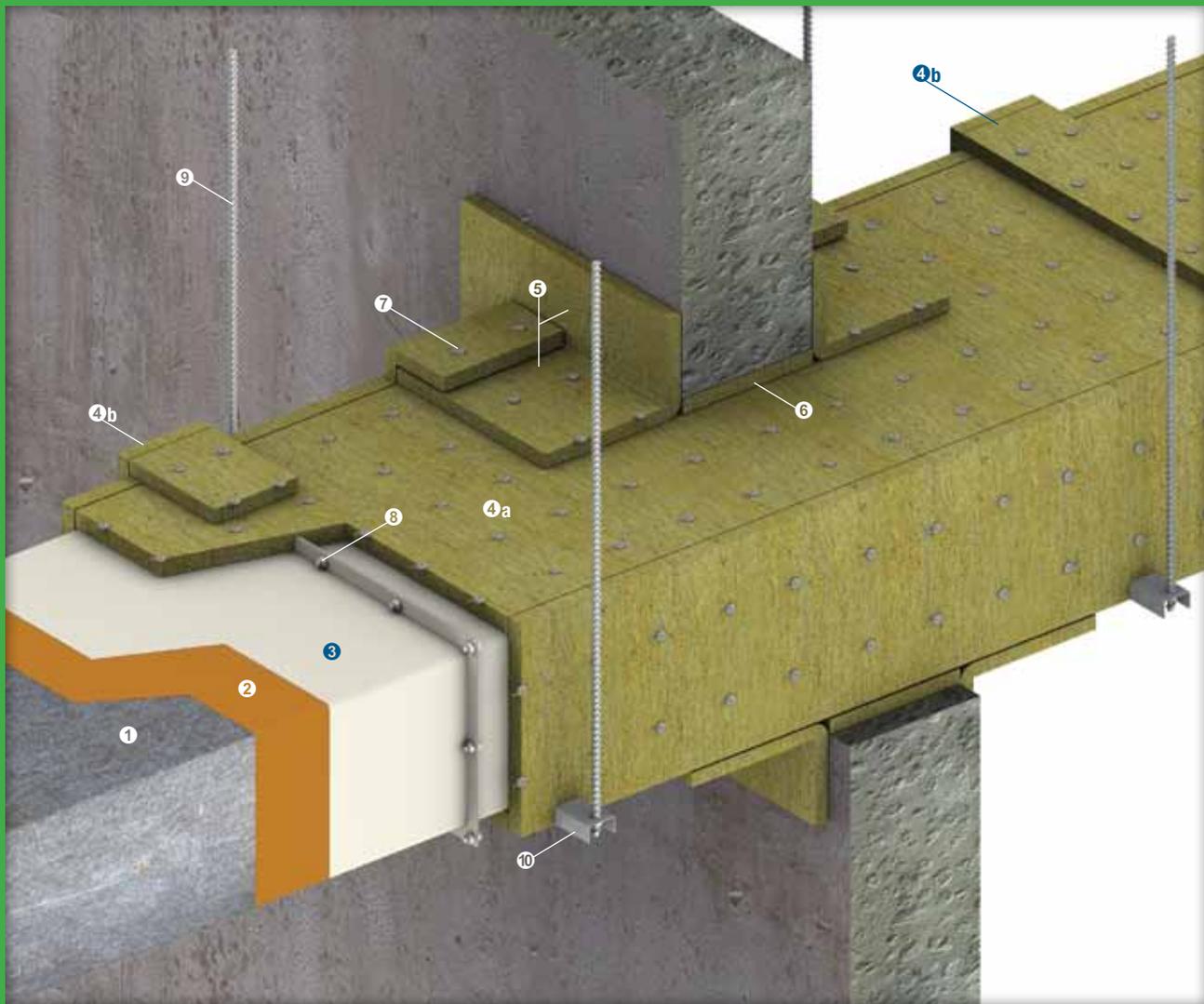
Do not discharge into drains, watercourses or soil.

Quality Assurance

Promat manufactures to a quality system in accordance with ISO 9001: 2008 and has received full accreditation to these standards.

Operating to these standards means that all activities, which have a bearing upon quality, are set out in written procedures. Systematic and thorough checks are made on all materials and their usage. Test equipment is subjected to regular checks and is referred back to national standards.

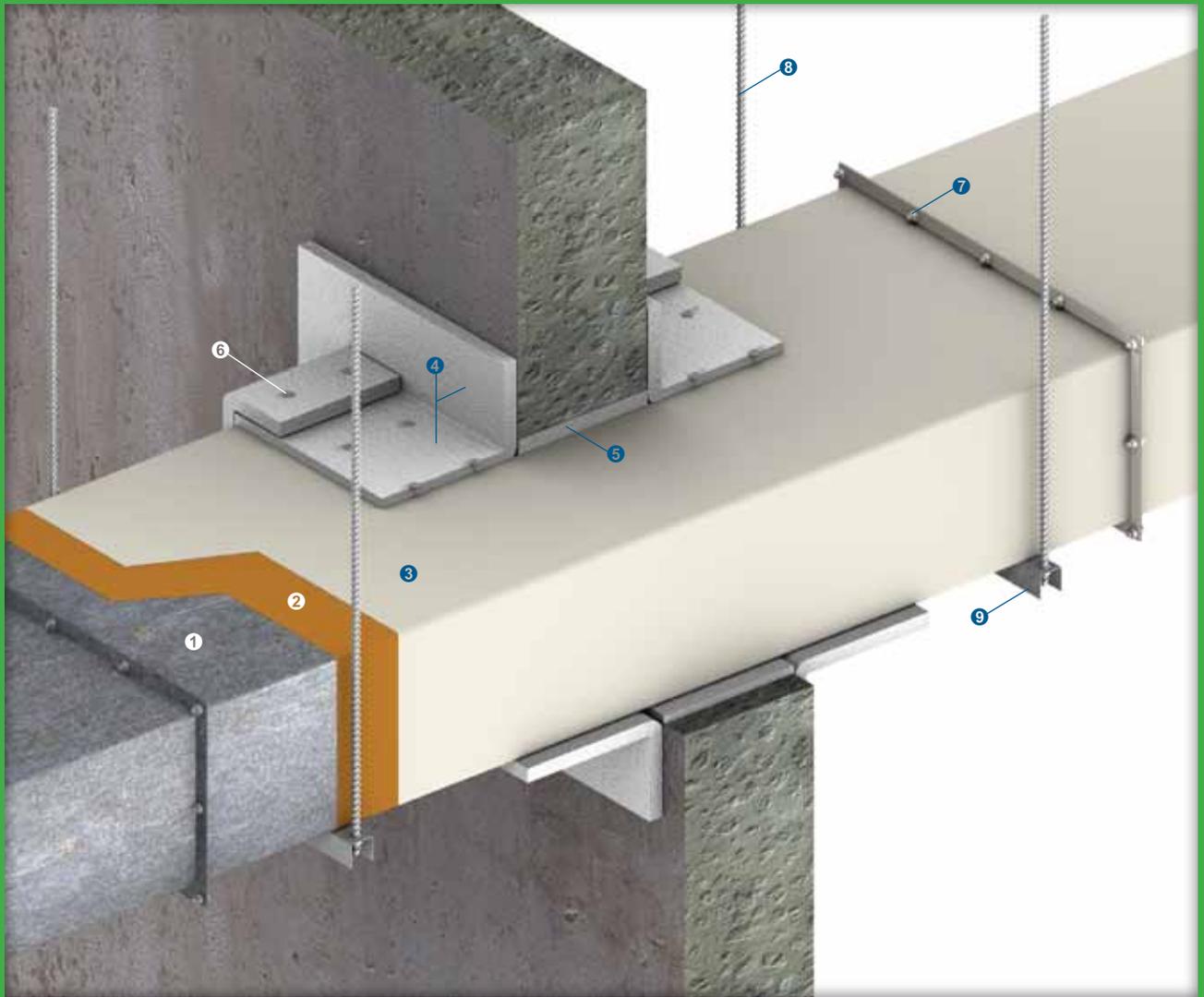
The information given in this data sheet is based on actual tests and is believed to be typical of the product. No guarantee of results is implied however, since conditions of use are beyond our control.



For FRL of 120 minutes Integrity and Insulation (Duct A & B) in accordance with BS476: Part 24: 1987

- ① Mild steel ventilation duct in accordance with DW144 or SMACNA construction requirements.
- ② Etching primer.
- ③ PROMAPAIN[®] FD intumescent coating, minimum 505µm DFT over pre-coated etch primer, minimum 75µm DFT.
- ④a 50mm x 100kg/m³ mineral wool slab held in place with steel pins.
- ④b Mineral wool cover strips, 250mm wide x 50mm thick x 100kg/m³.
- ⑤ Mineral wool 50mm thick x 100kg/m³, or equivalent, for wall penetration collar. The mineral wool is fixed to duct face using steel pin (item ⑦) and glued against wall using high temperature resistant silicate based adhesive.
- ⑥ Mineral wool 100kg/m³ or equivalent tightly packed into aperture of the wall or floor penetration between substrate and the surface of the steel duct.
- ⑦ Steel pin.
- ⑧ M8 bolts and nuts fixing, with spring washers, at nominal 200mm centres all around.
- ⑨ Duct hanger system, maximum permitted stress <10N/mm². Please contact Promat for details of stress calculation.
- ⑩ P100T Unistrut sections or similar minimum 41mm x 41mm x 2.5mm thick, or equivalent according to duct weight and size and maximum permitted stress levels.

The above construction of fire resistant coating around steel ducts is up to 3000mm wide x 1500mm high in accordance with the criteria of BS476: Part 24: 1987, exposed to external and internal fire. For larger dimensions of duct, please consult Promat Technical Department.



For FRL of 120 minutes Integrity only (Duct A & B) in accordance with BS476: Part 24: 1987

- ① Mild steel ventilation duct in accordance with DW144 or SMACNA construction requirements.
- ② Etching primer.
- ③ PROMAPAIN[®] FD intumescent coating, minimum 505µm DFT over pre-coated etch primer, minimum 75µm DFT.
- ④ Ceramic fibre 25mm thick x 96kg/m³, or equivalent, for wall penetration collar. The fibre is fixed to duct face using steel pin (item ⑥) and glued against wall using high temperature resistant silicate based adhesive.
- ⑤ Ceramic fibre 96kg/m³ or equivalent tightly packed into aperture of the wall or floor penetration between substrate and the surface of the steel duct.
- ⑥ Steel pin.
- ⑦ M8 bolts and nuts fixing, with spring washers, at nominal 200mm centres all around.
- ⑧ Duct hanger system, maximum permitted stress <10N/mm². Please contact Promat for details of stress calculation.
- ⑨ P1000T Unistrut sections or similar minimum 41mm x 41mm x 2.5mm thick, or equivalent according to duct weight and size and maximum permitted stress levels.

The above construction of fire resistant coating around steel ducts is up to 3000mm wide x 1500mm high in accordance with the criteria of BS476: Part 24: 1987, exposed to external and internal fire. For larger dimensions of duct, please consult Promat Technical Department.

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