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November 2022

KEMWELL PFP
Fire protection and insulation

Kemwell Fire Rated **Duct** Solutions

Fire protection against internal and external fires in ducts for up to 240 minutes
Options for Fire**Kem** FP-900®.

SAVING LIVES | PROTECTING BUILDINGS & CONTENTS | MAINTAINING VITAL SERVICES

PASSIVE FIRE PROTECTION

Specialists for the construction, infrastructure, transport, energy, industrial and commercial sectors.

Fire**Kem** FP-900® Fire Rated Ventilation Steel Ducts

A High Performance non-combustible Fire Protection Board

Kemwell Fire Kem** FP-900® is an easy to install, clean and lightweight, non-combustible calcium silicate fire protection building board. It has multi-purpose applications and is commonly used for commercial and industrial building projects.**

As a versatile A1 non-combustible rated board, it is perfect for internal partitions, external walls, roofs, floors and ceilings, and is particularly suited for dry wall construction applications.

The inherent alkalinity of the board makes it anti-bacterial, meaning it is suitable for use in conditions where hygiene is of concern, such as hospitals or food-preparation areas.

It provides superior fire resistance performance and excellent dimensional stability under heat and severe moisture environments making it an ideal choice for a variety of projects.

You can specify Kemwell Fire**Kem** FP-900® with confidence.

COMPOSITION

Kemwell Fire**Kem** FP-900® is an environmentally-friendly 100% asbestos-free autoclaved lightweight calcium silicate, fire protection building board, manufactured from a homogeneous mixture of cement, organic cellulose fibres and selected mineral binder.

The autoclaving process promotes the crystallisation of the calcium silicate, which in turn contributes to the exceptional dimensional stability of the board.

It has a smooth sanded front face and an unsanded back face.

It is not classified as a dangerous substance and can be placed in an on-site skip with other general building waste.

SUPPORT

The Kemwell project team provides expert support services throughout all stages of any construction project, including:

- Technical advice
- Supply of data sheets and certification
- Product selection and application consultation
- Site-visits
- Installation advice

Please contact us to discuss your project or requirements further.

T: +44 (0) 333 344 0699 (UK)
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E: info@kemwell-pfp.com

APPLICATIONS

- Ceilings
- Cavity barriers
- Roofs and floors
- Partitions and external walls
- Tunnel linings
- Wind posts
- Electrical and mechanical services enclosures
- Smoke barriers
- Fire doors

SECTORS

- Industrial
- Commercial buildings
- High-rise construction
- Health and leisure
- Schools and Educational
- Restaurants and hotels
- Residential properties
- Infrastructure

FEATURES

Fire Resistance
Fire**Kem** FP-900® has superior fire resistance performance and the boards are approved for up to 240 minutes fire resistance according to BS 476: Part 22: 1987 depending on application.

Dimensional Stability
Fire**Kem** FP-900® has excellent dimensional stability under elevated temperatures and in severe moisture environments.

Moisture Resistant
Fire**Kem** FP-900® will not deteriorate when used in damp or humid conditions and will not encourage mould growth. The boards are also rot proof.

Performance characteristics are not degraded by age or moisture. Untreated surfaces will absorb water, which can cause some loss of strength, but full strength is regained after drying.

Chemical Stability
Fire**Kem** FP-900® is a chemically inert calcium silicate board, unaffected by contact with most chemicals and resistant to dilute acids and alkalis.

Acoustic Performance
Fire**Kem** FP-900® provides good acoustic reduction performance of between 26-49dB. It also provides thermal conductivity (approximately) at 20°C of 0.17 W/mK.

Easy Workability
No special equipment is required for cutting or drilling of Fire**Kem** FP-900® boards. It is recommended that cutting of the boards is carried out in well-ventilated situations, or the wearing of suitable dust masks to reduce the hazard of nuisance dust production, during the cutting or drilling process. Boards may be flat head nailed or pilot drilled, then screwed.

Smooth Surface
Fire**Kem** FP-900® has a smooth surface but due to their high suction should be first sealed prior to applying paints, plasters, or wallpapers.

Durability
Fire**Kem** FP-900® is a lightweight but strong building board. System performance is unaffected by the hazards and condition of its working environment it does not rot.

Vermin Resistant
Fire**Kem** FP-900® boards remain unaffected by rodent, termite and insect attack.

TECHNICAL PERFORMANCE, FireKem FP-900®
HIGH PERFORMANCE CALCIUM SILICATE BOARD

TEST	STANDARD	RESULT	
Density		900 kg/m³ +/-10%	
Nominal Weight		8.9kg/m² - 9 mm 11.9kg/m² -12mm 13.8kg/m² -14mm 14.8kg/m² -15mm 17.8kg/m² -18mm 23.7kg/m² -24mm	
Size		1220 x 2440mm 1200 x 2400mm	
Surface Alkalinity		pH 7-10	
Flexural Strength		6.0 N/mm² transverse 9.5 N/mm² longitudinal	
Minimum Bending Radius		7200mm - 9mm 9800mm - 12mm longitudinal	
Moisture Movement	Ambient to saturated	0.05%	
Dimensional changes in length due to relative humidity	BS EN 318	+0.01% @20°C, RH 30%~85% - 0.02% @20°C, RH 85%~30%	
Moisture Content		Ex works - 15% in situ - 6%	
Thermal Conductivity	EN 12264	0.17 W/mK	
Linear Thermal Expansion	BS EN ISO 10515-8	-3.06 x 1E-6/°C	
Fire Rated Systems	BS 476: Part 20-24		
		BS EN1364-1 & 2	up to 240 minutes
Non-combustible	AS 1530.1 BS 476: Part 4 BS EN ISO 1182	Pass	
Heat of Combustion	BS EN ISO 1716	Pass	
Reaction to Fire - Classification	EN 13501-1	Euro Class A1	
Surface Spread of Flame	BS 476: Part 7	Class 1	
Fire Propagation	BS 476: Part 6	Class 0	
Ignitability	BS 476: Part 5	Class P	
Acoustic reduction (over range 100-3150 Hz)	AS 1276.1 & 1191 ASTM E90 & E413 EN iSO 10140-3 & 717-1	STC/rw (dB) 26 46 49	Steel framed partition 9mm 99mm 105mm
Green Labelled Building Board	HKGIS SGIS	No heavy metal & no harmful substance Singapore Environmental Council Hong Kong Green Council	
Organic Emission	ASTM D5116-06	Non toxic & No formaldehyde, satisfied the emission tests	
Recyclable Product	ISO 14001	Crushed down for recycle use, products made under ISO 14001 environmental management system	

***Note:** All physical performance values of products depicted in this technical handbook are averages based on the standard production. The figures may be changed dependent on the test method used.*

TECHNICAL PERFORMANCE

Kemwell FireKem FP-900® is an EN 13501-1: Class A1 non-combustible calcium silicate board. It has superior fire resistance performance and excellent dimensional stability subject to heat or severe moisture environments.

FUNCTIONALITY

FireKem FP-900® fire rated ducting systems, not only offer fire protection to building assets, but a complete functional solution too. It simplifies the installation work and avoids unnecessary maintenance for building owners.

FIREKEM FP-900® FIRE RESISTANT VENTILATION STEEL DUCTS

The prevention of fire spread through ducted systems is of critical importance. Fire must be contained in a compartment as the first and foremost priority in stopping the spread of fire in a building.

In particular, passive fire protection is an effective measure to defend against fire attack and uphold fire safety of the building.

As a leading provider of high performance fire resistant calcium silicate boards, Kemwell PFP works closely with our manufacturing partners, utilising advanced technologies and dedicated engineers in designing a range of sophisticated Kemwell Fire**Kem** FP-900® ventilation steel ducts among other fire barriers and offering passive fire solutions to meet the building regulations.

FIRE TESTING METHOD

A method for determination of the fire resistance of ventilation ducts BS 476: Part 24 -1987 (ISO 6944) specifies the criteria for fire testing and procedures for ventilation duct, smoke outlet and kitchen extract ducts. These involve a Duct B test – spread of fire through the ventilation duct inside from one compartment to another; and a Duct A test – fire attacks the duct outside only.

The document includes an explanatory Annex giving guidance on the fire performance criteria required for kitchen extract and smoke outlet applications, which differ from the requirements for ventilation ducts. It is important that the evaluation and suitability of any proposed system of fire resisting ductwork matches the requirements for the application; (e.g. a smoke outlet duct to maintain a minimum 75% of the original cross section when tested to BS 476: Part 24).

The size of ventilation duct 1000mm x 250mm was specified in the standard fire test, In practice, the use of large sized ducts in commercial buildings are commonly required. To ensure the stability of the large sized duct, a full technical assessment on the duct systems with respect to various applications should be conducted by an accredited fire testing consultant, as specified in BS 9999 –Ref 7.2.

FIRE RESISTANCE

The ability of a building element or a construction to satisfy, for a stated period of time, the appropriate criteria specified in BS 476: Part 20 and the following criteria are applied to fire resistant ductworks.

Stability: The ability of a duct, ductwork and the support system to remain intact and fulfill their intended function for a specified period of time, when tested to the requirements of BS 476: Part 24 (ISO 6944).

Integrity: The ability of a duct or ductwork to remain free of cracks, holes or openings outside the compartment in which the fire is present for a specified period of time, when tested to the requirements of BS 476: Part 24 (ISO 6944).

Insulation: The ability of a duct or ductwork to maintain its integrity without developing temperatures on its external surface, outside the compartment in which the fire is present, which exceed:

- 140°C as an average value above ambient and/or
- 180°C as a maximum value above ambient at any one point,when tested for a specified period of time to the requirements of BS 476: Part 24. (ISO 6944). For kitchen extract ductwork (duct A) these limitations also apply to the internal surface of the duct within the compartment in which the fire is present.

OTHER REQUIREMENTS

In additional to the standard fire tests and relevant assessments for the duct assembly, other criteria for quality certification to the duct or application pre-approval of government may be required in some countries since recent years. These ensure the duct designed, manufactured, installed strictly adhere to the specifications and designated fire safety functions for buildings.

- The duct is supplied and manufactured within a Quality Management System certified to ISO 9001: 2008.
- The duct is manufactured within a Factory Production Control (FPC), tested and assessed to a third party certification scheme
- The fire resistant duct is required to submit for an approval of local government in some countries.
- Materials of the duct assembly are manufactured within an Environmental Management System certified to ISO 14001: 2004 and a third party certification scheme for green labeling products.

The high performance Kemwell Fire**Kem** FP-900® fire resistant ventilation steel duct and Kemwell Fire**Kem** FP-900® fire barriers are made to the stringent criteria of the above-mentioned and have gained an approval of local government. Please contact Kemwell PFP for further information.

Supporting Construction

Kemwell FireKem FP-900® duct assembly shall be supported from appropriate masonry, concrete or steel construction that has a fire resistance not less than that required for the duct assembly and be able to support the assembly for the required period of fire resistance.

Steel Duct Assembly

The steel duct must be constructed with rolled steel angle flanged or equivalent roll formed steel sheet profile cross-joints. It is recommended that longitudinal seams formed using Pittsburgh Lock or Grooved Corner Seam Systems. The duct is constructed with minimum 0.6mm thick galvanised steel sheet. General guidance on the construction of steel ductwork is given in DW/144 "Specification for sheet metal ductwork - low, medium and high pressure/velocity air system" or equivalent specification.

Hanger Support

Kemwell FireKem FP-900® steel duct assembly is supported by a pair of threaded drop rods and an angle or a channel bearer under the steel duct. The spacing of the hangers and the size of steel hanger components must be adjusted so that the tensile stress in the rods does not exceed the stress to respective fire ratings. The fixings used to fasten the threaded rod hangers to concrete soffits must be all-steel expanding anchors with a penetration in the concrete of minimum depth to respective fire ratings.

Fire rating- minutes	Stress limit- N/mm²	Minimum depth of anchor - mm
60	15	40
120	10	50
180	8	60
240	6	60

Penetrations Through Walls & Floor Slabs

The duct assembly passing through wall or floor slab constructions where there are weak points of fire resistance. Gaps around Kemwell FireKem FP-900® duct and the construction at penetrations should be fully stuffed with stone wool and be sealed according to the specification.

Insulation

The stone wool insulation must be non-combustible to BS 476: Part 4 or equivalent; e.g. European Classification A1 of EN 13501-1. Kemwell stone wool insulation is available in the appropriate thickness and density to satisfy these requirements.

One, Two and Three Sided Ducts

A one, two or three sided Kemwell FireKem FP-900® can be constructed using the appropriate adjacent concrete/masonry walls and floor slab to support the assembly. The steel duct and hanger supports are the same as for the four-sided duct assembly. The steel channel collars around one, two or three sides of the steel duct, in a similar way to the four-sided duct system, except that the ends of the channels are fixed to the angles anchored to the wall or floor elements.

Vertical Ducts

The construction of vertical ducts is the same as for the horizontal ducts.

Two Tier Ducts

This system is for two tier adjacent steel ducts that have the same width, the protection system is installed around the ducts in the same way as for the four-sided duct system except that the channel collars are fitted around the outside of the group of ducts rather than around the individual ducts.

Multiple Side By Side Ducts

This system is for two or three adjacent steel ducts, independently supported, that have the same height. The protection system is installed around the ducts in the same way as for the four-sided duct system except that the channel collars are fitted around the outside of the group of ducts rather than around the individual ducts.

An Example For Calculating Steel Hanger Supports

Given:

- Fire rating = 120 minutes
- Density of board= 990kg/m^3 (with 10% allowance)
- Density of stone wool = 100 kg/m^3
- Density of steel = 7850 kg/m^3
- Steel hanger rod at 1000mm centres
- Maximum allowable steel stress ≤ 10N/mm^2 for 120 minutes fire rating

Checking:

1 Maximum allowable load applied on M10 steel hanger rod

= 10N/mm^2 x 58.08mm^2 = 581N

2 Total allowable load on 2 Nos. x M10 steel hanger rod

= 2 x 581 = 1162N

3 Total weight of Kemwell Fire**Kem** FP-900® ventilation duct enclosure system for each section supported by steel hanger at1000mm centre

WT = W_1+ W_2+ W_3+ W_4+ W_5+ W_6+ W_7+ W_8

WT = 962N ≤ 1162N

4 So the steel hanger rod with size M10 is acceptable.

Component of Duct	Size	Weight - N	
Steel duct size:	1000mm x 250mm (width x height) 0.8mm thick of steel sheet	W_1	154.0
Steel channel collar	50 x 50 x 50 x 0.8mm thick at 600mm centres	W_2	46.2
Steel angle	50 x 50 x 0.8mm thick	W_3	24.6
Steel angle bearer	50 x 50 x 5mm thick	W_4	42.4
Fire**Kem** FP-900® board	14mm thick	W_5	402.2
Fire**Kem** FP-900® cover strip	100mm width x 12mm thick	W_6	81.7
Stone wool	50mm thick	W_7	142.2
Miscellaneous	steel hanger rods and self-tapping screws	W_8	68.7
	Total	WT	962.0

Hanger	Rod Root Diameter - mm	Cross Sectional Area - mm^2
M6	5.06	20.10
M8	6.83	36.63
M10	8.60	58.08
M12	10.36	84.29
M14	12.25	117.85
M16	14.14	157.03

FireKem FP-900® Fire Rated Ventilation Steel Ducts

FIRE RATING

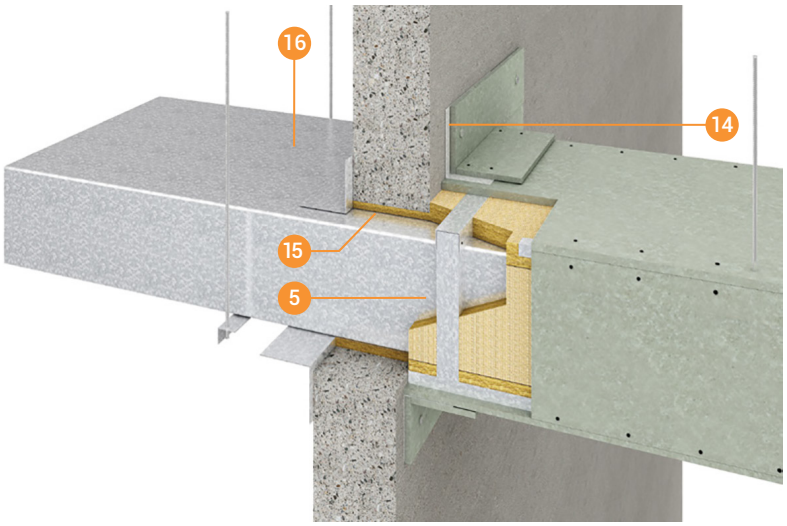
FRL	Up to 240/240/240
Standard	BS 476: Part 24-1987
	ISO 6944-1985
Approval	Exova 336212-2
	Fires FR-114-13-AUNE
	Fires FR-115-13-AUNE
	Fires FR-139-14-AUNE

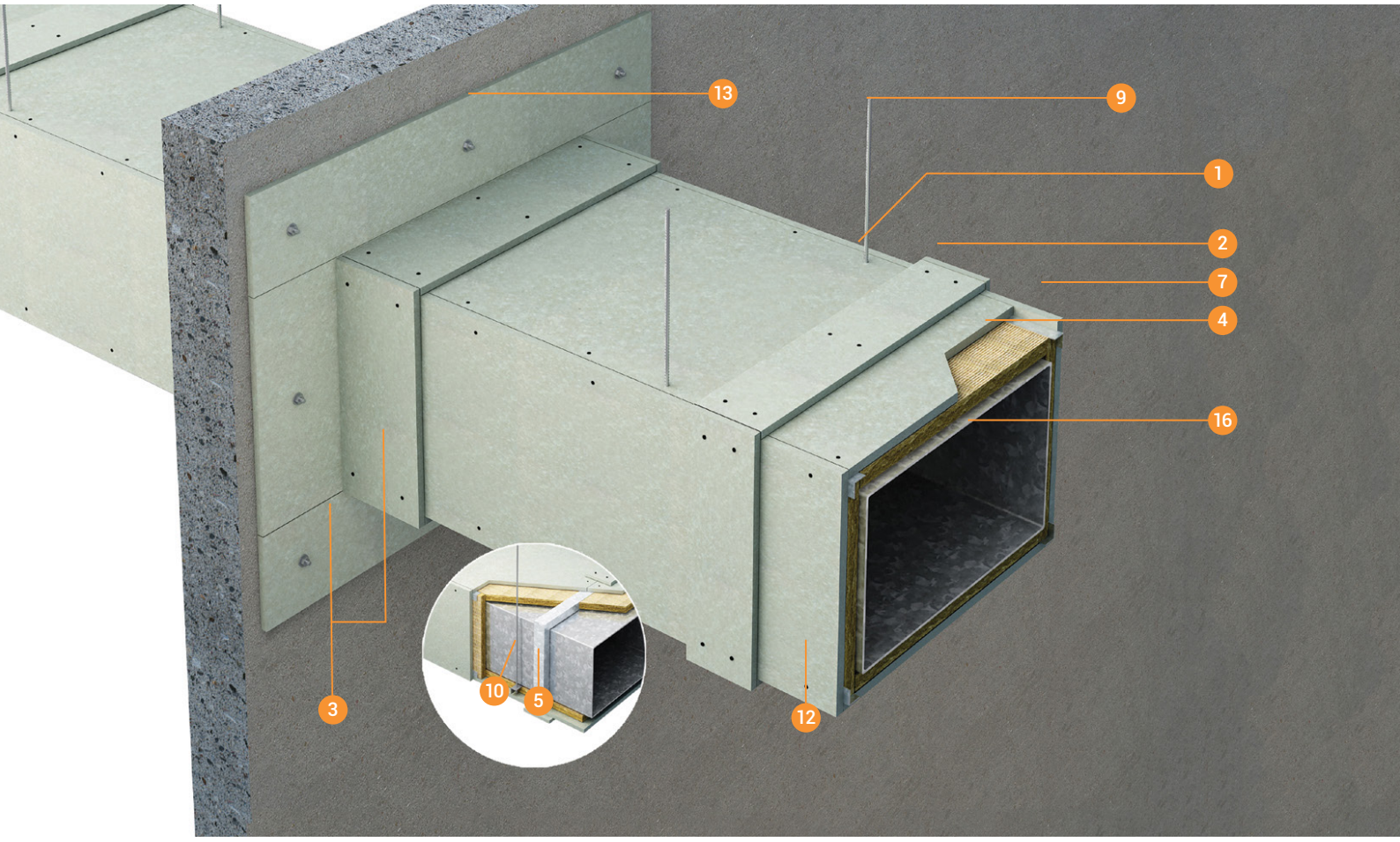
ACOUSTIC

STC / Rw *	23dB up
Standard	EN ISO 10140-2:2010
	EN ISO 717-1: 2013
Assessment	Marshall Day - INSUL

SYSTEM

Duct thickness	62mm up
Surface mass	19.00 kg/m² up



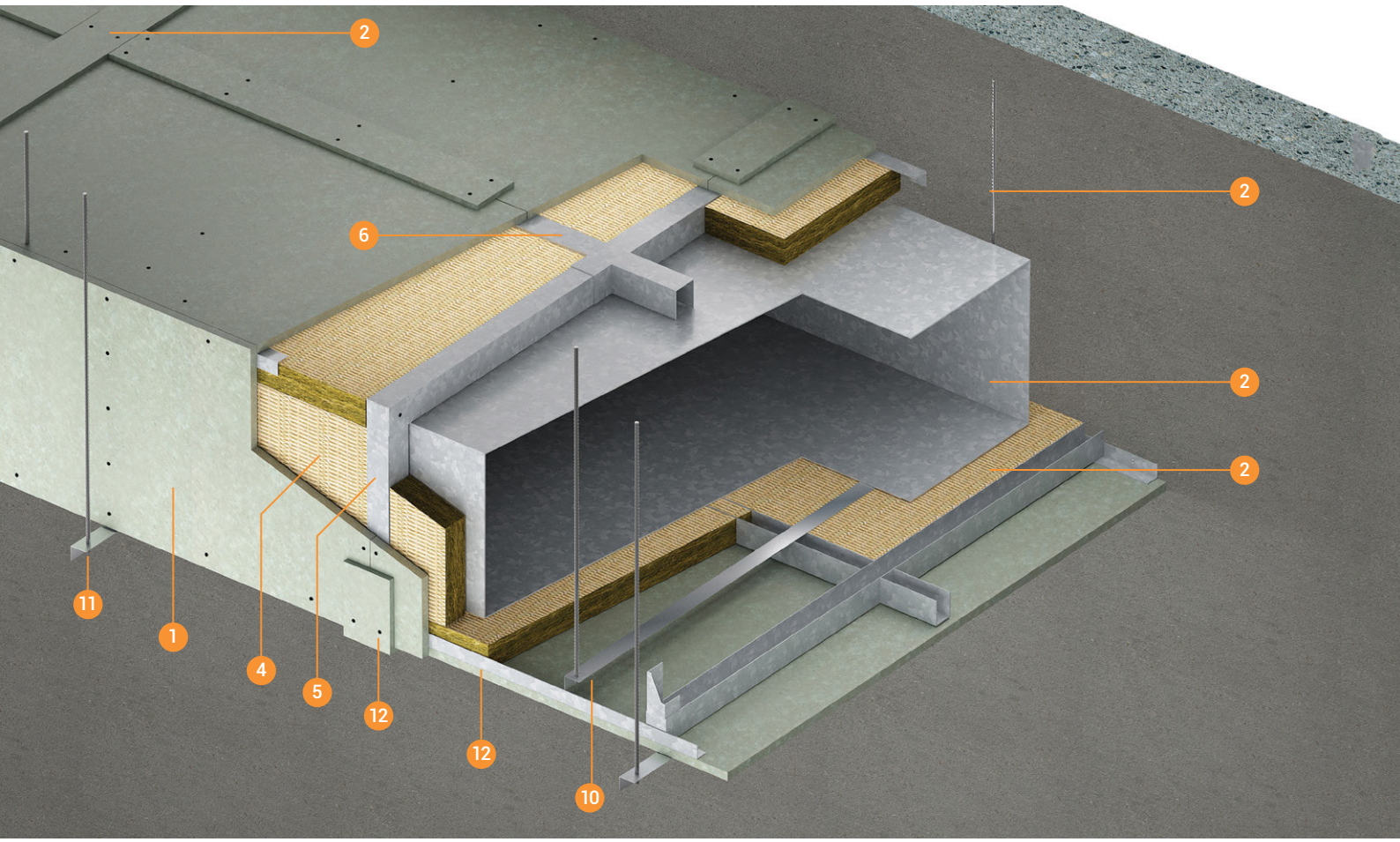


INSTALLATION

Kemwell Fire**Kem** FP-900® Fire Rated Ventilation Steel Duct systems should be constructed in accordance with the approved specification mentioned in the manufacturer's technical handbook and the local building regulations (if required).

TECHNICAL DATA

1. Kemwell Fire**Kem** FP-900® - 15mm thick for FRL: 120/120/120, (other fire ratings refer to table D1)
2. Kemwell Fire**Kem** FP-900® cover strip - 12mm thick x 100mm wide, except no cover strip for FRL 240/240/240 Duct A with 2 layers of 9mm thick board
3. Kemwell Fire**Kem** FP-900® collar 150mm x 15mm thick at wall or floor penetration
4. Stone wool - 50mm x 100kg/m^3 for FRL: 120/120/120, (other fire ratings refer to table D1)
5. G.I. channel collar minimum 32 x 50 x 32 x 0.8mm thick and depth of channel ≥ stone wool layer, the maximum area of unsupported board = 1.5 m^2
6. G.I. channel intermediate support
   • 50 x 50 x 50 x 0.8mm - duct width up to 3m
   • 40 x 50 x 40 x 0.8mm formed by back to back or boxed section - duct width up to 7.5m
7. G.I. angle 50 x 50 x 0.8mm thick
8. G.I. angle 50 x 50 x 1.2mm fixed to concrete/block structure
9. Steel threaded hanger rod minimum ø8 mm#
10. Steel angle support minimum 30 x 30 x 3mm thick#
11. Additional steel threaded hanger rod and steel support if necessary#
12. M4 self-tapping screw at 200mm centres
13. M8 metal anchor bolt at 400mm centres
14. G.I. angle collar 150 x 100 x 0.8mm thick at wall or floor penetration
15. Stone wool tightly packed into aperture and duct
16. Minimum 0.6mm thick G.I. sheet metal duct according to DW/144 Spec

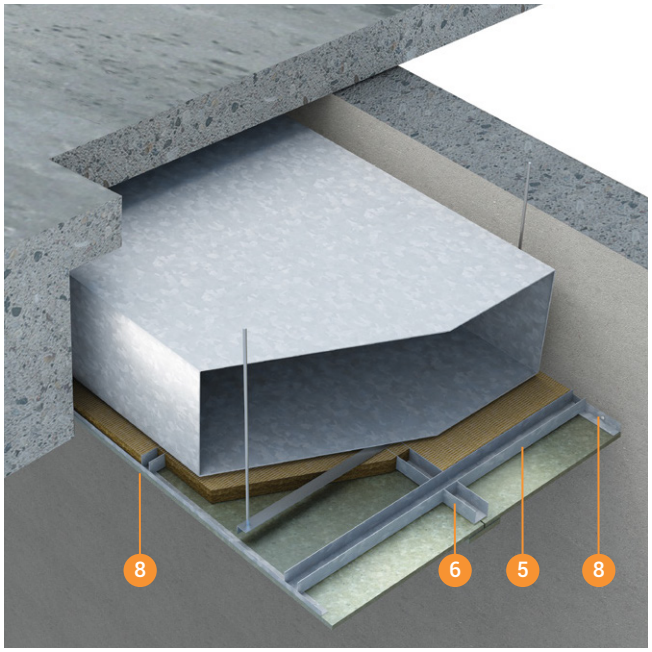


APPLICATION

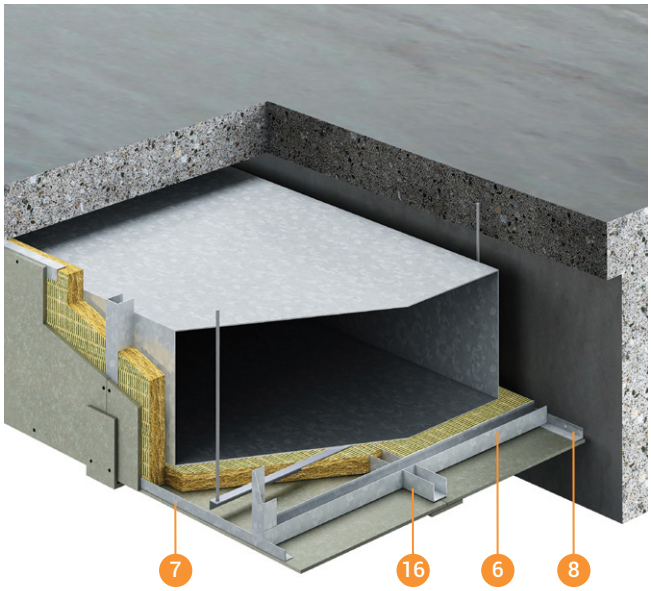
Kemwell Fire**Kem** FP-900® fire rated ventilation steel duct, smoke extract duct and kitchen extract duct systems provide great flexibility to meet different ventilation criteria of individual building.

These include large single duct of sizes up to 7.5m wide x 2.5m high for one, two, three and four sided protection, multiple side by side ducts and two tier ducts with modification for vertical and horizontal installation.

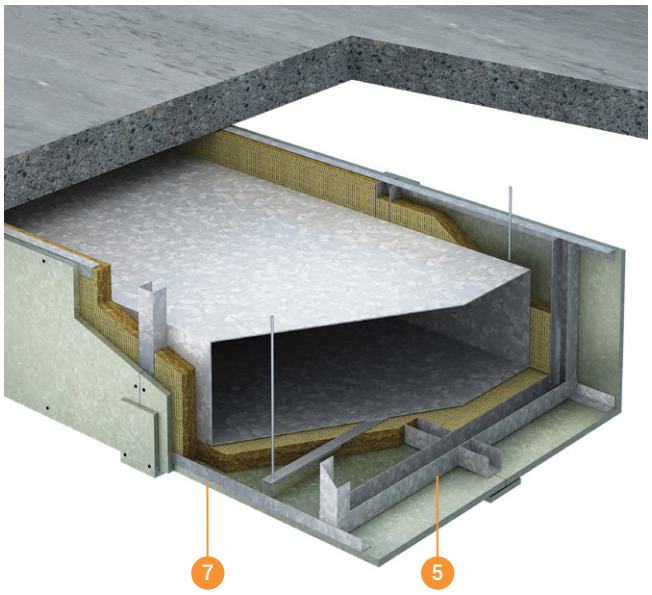
Typical installation methods are depicted below.



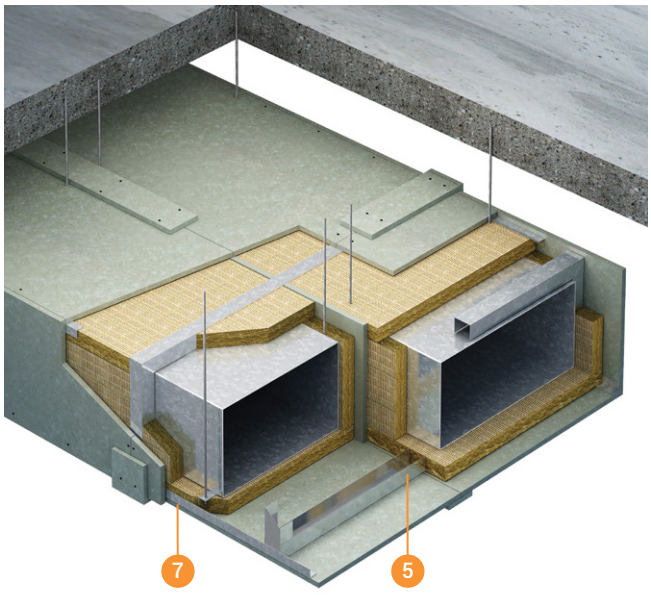
One sided duct



Two sided duct



Three sided duct



Multiple side by side duct

SPECIFICATION

Kemwell Fire**Kem** FP-900® duct systems have been tested to BS 476: Part 24 and demonstrated fire resistance of up to 240 minutes. A full appraisal of duct systems for various applications has been issued by Exova Warringtonfire UK, an accredited and internationally recognised fire testing laboratory.

The steel ventilation, smoke extract and kitchen extract duct systems clad with Kemwell Fire**Kem** FP-900® calcium silicate board provide a fire resistance of 60/120/180/240 minutes in terms of the stability and integrity criteria of BS 476: Part 24-1987 (ISO 6944-1985) and 0/30/60/120/180/240 minutes in terms of the insulation criterion of the standard, with fire attack from either inside (Duct B) or outside (Duct A) the duct.

The thicknesses Kemwell Fire**Kem** FP-900® and stone wool for the various fire resistance ratings are given in Table D1.

Table 1d

System	FIRE RESISTANCE - MINUTES			DUCT A	
	Stability	Integrity	Insulation	Fire**Kem** FP-900 - mm	Stone wool - mm x kg/m^3
A1	60	60	-	12	-
A2	60	60	60	12	30 x 60
A3	120	120	-	12	-
A4	120	120	30	12	25 x 60
A5	120	120	60	12	30 x 60
A6	120	120	120	12	50 x 60
A7	180	180	-	12	-
A8	180	180	180	15	50 x 100
A9	240	240	-	12	-
A10	240	240	30	15	25 x 60
A11	240	240	60	15	30 x 60
A12	240	240	120	15	50 x 60
A13	240	240	180	15	50 x 100
A14	240	240	240	18 or 2 x 9	50 x 120

System	FIRE RESISTANCE			MINUTES DUCT B	
	Stability	Integrity	Insulation	Fire**Kem** FP-900 - mm	Stone wool - mm x kg/m^3
B1	60	60	-	12	-
B2	60	60	60	12	50 x 60
B3	120	120	-	12	-
B4	120	120	30	12	30 x 60
B5	120	120	60	12	50 x 60
B6	120	120	120	15	50 x 100
B7	180	180	-	15	-
B8	180	180	180	24	80 x 100
B9	240	240	-	15	-
B10	240	240	30	24 or 2 x 12	-
B11	240	240	60	24 or 2 x 12	50 x 60
B12	240	240	120	24 or 2 x 12	50 x 100
B13	240	240	180	24 or 2 x 12	80 x 100
B14	240	240	240	24 or 2 x 12	100 x 100

System	FIRE RESISTANCE - MINUTES KITCHEN EXTRACT			DUCT (1)	
	Stability	Integrity	Insulation	FireKem FP-900 - mm	Stone wool - mm x kg/m³
4K1	120	120	30	12	50 x 60
5K1	120	120	60	12	50 x 80

Note: non-mandatory annex to BS 476: Part24: 1987 required for kitchen extract duct

System	FIRE RESISTANCE - MINUTES KITCHEN EXTRACT			DUCT (2)	
	Stability	Integrity	Insulation	FireKem FP-900 - mm	Stone wool - mm x kg/m³
2K2	60	60	60	12	50 x 60
6K2	120	120	120	15	50 x 100
8K2	180	180	180	24 or 2 x 12	80 x 100
14K2	240	240	240	24 or 2 x12	100 x 100

Note: non-mandatory annex to BS 476: Part24: 1987 not required for kitchen extract duct

Processing
As for all other building materials, safety precautions must be taken into account and local laws and regulations must be observed. Working with board at well-ventilated area, cutting and drilling are subject to dust development, and proper precautions must be taken by using appropriate dust extraction equipment. Horizontal boards or ceiling boards must not be walked on as they are not designed to take additional loads between supports. If there is a risk as this occurring, warning notices should be displayed. Installers must ensure that they work from adequate and safe platform where necessary.

Cutting
Cutting to size may be done with normal slow or fast running hand tools or stationary equipment. When using fast running tools, dust exhaustion must be employed. All Kemwell PFP's board products may be cut with a circular saw or a jigsaw equipped with tungsten carbide or diamond tipped blade.

Applications instructions
Further information is available from our website **www.kemwell-pfp.com.**

HANDLING AND STORAGE

Manual Handling
European or local manual handling regulations applies for any heavy loading practices in order to minimize the risk of accidents to the handlers and also the possible damage to the product.

- Always lift boards off the board below, never slide board on board or drag the stack.
- Always carry the boards on edge, but do not store on edge.
- Never carry the boards on edge horizontally, it may cause the board broken easily

Mechanical Handling
Mechanical handling is preferred. If machine is not available, boards can also be removed manually.

Personal Protective Equipments
The best practice for work safety & occupational health should be for workers to use dust masks to prevent dust inhalation. Working clothes is preferred to be long sleeve shirts, trousers and hats to prevent direct contact with skin. Gloves should be worn at all time to prevent cuts.

Storage
Kemwell PFP's board products are delivered with plastic protection cover on the pallet against weather conditions during transportation. They are preferred to be stored inside and undercover in a dry and flat level surface on pallets or sleepers with maximum 400 mm distance, maximum 3 pallets in a stack. Stacks of loose boards should not exceed 1m (height).

If the products have to be stayed outdoor temporarily, a weatherproof tarpaulin is recommended to wrap over to provide protection.

When the products get wet, moved them to a dry area with good ventilation and let them dry out naturally. It will not degrade the board themselves.

INFORMATION

Please, ensure that you have the latest version of this publication by checking that the publication date corresponds with the downloadable version from our website. In case of doubt, please contact our techical deparment.

Kemwell PFP shall be under no liability whatsoever any loss or damages which may arise as a result of the failure to adhere to such recommendations in all aspects. Nothings in these Conditions, nor any compendiums, brochures, instructions, method statements or other documents or designs issued by or on behalf of Kemwell Fire International shall create or to be deemed to create any obligation.

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Fire protection and insulation

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