

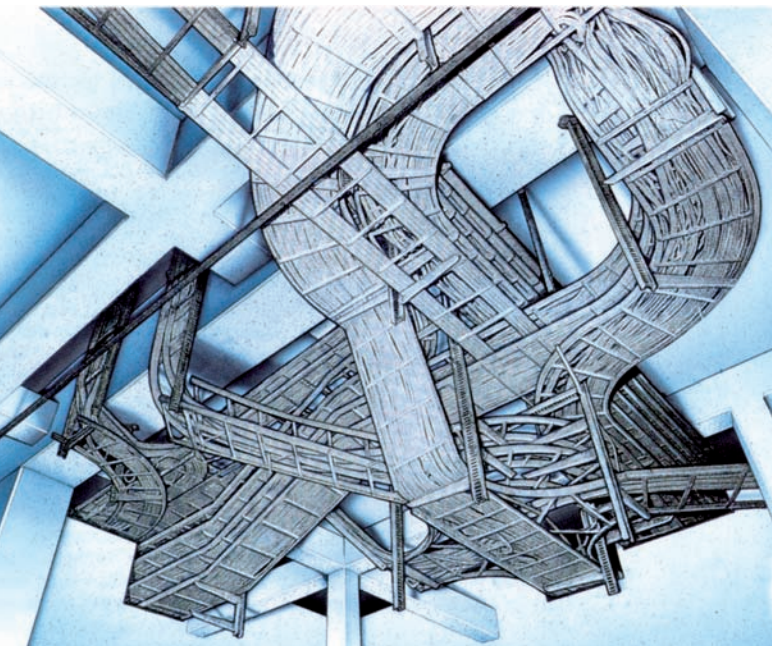
KBS® Coating

Fire protective coating
for electrical cables
and penetration seals



 **BASF**

The Chemical Company



KBS® Coating prevents flame propagation along cable ways

General Information

KBS® Coating is a water-based, ablative fire protective coating, especially developed for the fire protection of grouped or bundled electrical cables and for penetration seals.

The main function of **KBS® Coating** is to prevent flame propagation along vertical and horizontal cable ways. **KBS® Coating** will also delay short circuit, whereby circuit integrity depends on the distance of the cables from fire and the incurred temperature. **KBS® Coating** is easily applied by conventional methods such as spray and brush, as well as by hand (see application data). **KBS® Coating** is also available free of halogens – named **KBS® Coating CLF**.

KBS® Coating has been tested to all recognized international standards and is used worldwide, from the arctic circle to the tropics. Its effectiveness has been proven in several documented cases of actual fires. **KBS® Coating** is produced only by BASF in Illertissen where a quality system fulfilling the requirements of DIN EN ISO 9001 and DIN EN ISO 14001 has been in place for more than a decade.

KBS® Coating is also an integral part of the cable penetration seal **KBS® Panel Seal ABL**. Here it is used as a coating for the mineral wool panels, the sealing of the penetrating cables and other utilities. For use of **KBS® Coating** in the installation of **KBS® Panel Seal ABL** please refer to our separate brochure.

How does an ablative coating work?

KBS® Coating protects electrical cables through ablation as opposed to intumescence. Energy is consumed or generated to change any material from one condition or state to another.

Processes consuming energy are called “endothermic”. Some materials need large amounts of energy to decompose or “break down”. A good ablative composition requires a maximum of energy to decompose. **KBS® Coating** when exposed to fire starts to ablate by chemical and physical reactions, for instance evaporation, chemical cracking, melting - all this is consuming energy (heat) while keeping the cable relatively cool (for a certain space of time, as the process is self-sacrificial).

The gases and vapours generated during the ablative process push oxygen away from the surface, dilute flammable gases preventing them from burning and interrupt the “chain reaction” of fire chemically. After decomposition of all organic components, a solid structure of inorganic components remains offering further protection by insulation.

KBS® Coating...

- ... lasts for the lifetime of cables
- ... does not derate electrical cables
- ... is totally weather and water resistant



Special Features

Fire protection

KBS® Coating prevents flame propagation on cables, thus keeping a cable fire localized to its source, where, however, some minor damage to the most exposed cables must be accepted.

According to bibliographical references, a fire on vertical cable ways can spread 20 m per minute. Flame spread on **KBS®**-coated vertical cables in the 40-minute IEC 60332-3 test has been restricted to less than 10 cm (see list of international test results).

KBS® Coating has an LOI (Limiting Oxygen Index) value of 100.

What is an LOI value of 100 ?

The Limiting Oxygen Index value test, in accordance with ASTM D 2863, determines the percentage of oxygen in a nitrogen/oxygen mixture at which a material sustains burning on its own. In this test, which determines the burning characteristics of all plastic materials, the sample is secured in a glass cylinder – containing a definite gas flow of O₂/N₂ mixture – and ignited with a gas flame. Then the gas flame is removed and the sample is observed for continued burning. Soft PVC, as used for cable jackets, continues to burn at a low 25 – 30% oxygen content. Teflon, however, sustains burning only at a high 90 - 95% oxygen content.

KBS® Coating has an LOI of 100, which means, it does not even burn in a 100% oxygen environment.

Ampacity

KBS® Coating does not affect the current carrying capacity of electrical cables. The FM test states “no derating required” (see list on page 5).

Why no derating when cables are coated with **KBS® Coating**?

KBS® Coating protects electrical cables through ablation and not through insulation. It is dense and thermally conductive during normal cable operating temperatures. Its thermal conductivity is better than that of PVC. The coating increases the circumference (= surface) of the cable or cable bundle. The surficial area is further enlarged by the roughness of the coat (radiator effect). This extended surface allows more heat to dissipate. The cable temperature, therefore, does not increase.

Prevention of poisonous and corrosive gases and smoke

By preventing the fire from spreading and eventually involving all cables, **KBS® Coating** also prevents the development of the dreaded HCl (hydrochloric acid) from PVC cables as well as the dense black smoke and poisonous gases developing from all types of cables.

Mechanical resistance

KBS® Coating is tough enough to sustain physical abuse such as walking on coated cable trays.

Human health compatibility

KBS® Coating is in no way affecting the human health system, it is non-toxic, solvent-free, phosphate-free and does not contain asbestos or any other substance identified as being cancerogenic. **KBS® Coating** is practically odourless and does not affect the human skin.

Weather and water resistance

KBS® Coating is permanent protection under all weather and climatic conditions. A 30 years outdoor test, documented by the Institute for Fire Protection of TU Brunswick/Germany, found **KBS® Coating** still performing the same as freshly produced material. Here cables had been exposed from highest summer heat to snow and ice in winter, part of their length being constantly immersed in water.

Chemical compatibility

KBS® Coating has been tested for compatibility with close to 90 chemicals and has been found to be unaffected by those most frequently found in industrial installations such as Diesel fuel, ethylene glycol, fuel oil, lubricating oil, turbine oil and many others.

Flexibility

KBS® Coating is highly flexible (see technical data).

Endurance / lifetime

KBS® Coating lasts for the lifetime of cables.



KBS® Coating
lasts for the
lifetime of
cables

Application on cables

Surface preparation

Extensive cleaning of cables is not required. However, oil or grease should be taken up with dry rags (no solvent). Using a broom or vacuum cleaner to remove heavy layers of dust is sufficient.

Spray Application

This is performed in the conventional way by spraying crosswise. On all exposed surfaces the wet thickness of the coating must be at least 2.5 mm. The use of an extension nozzle is recommended when full coating is required in areas with limited accessibility. If cables are situated close to a wall, the cavity between cables and wall is stuffed with mineral wool and then coated over. Usually the required thickness may be applied in one coat. However, if new vertically mounted cables are to be coated, it is recommended that a thin "fog-coat" should be applied first, let dry and the final coat be applied thereafter.

Application by Hand

Single large diameter cables or bundles may be coated by hand. Again, a thin coat should be allowed to dry before the rest is applied, using both hands (wear rubber gloves) like an extruder. To achieve a smooth, even finish, use a wet brush.

Recommended coating thickness on cables:

Wet approx. 2.5 mm – resulting in approx. 1.6 mm dry coating

Coverage at recommended thickness:

Approx. 3.0 kg/m² for level surface. For grouped cables or cables in trays allow 30% more material considering the curved surfaces.

Application on mineral wool panels

This substrate can be coated either by spraying or by hand, using a trowel. When preferring the latter application technique, use a large steel trowel, such as employed for leveling out concrete surfaces. For the **KBS® Panel Seal ABL** an application rate of approximately 3.0 kg/m² will result in the required dry thickness of approx. 1.6 mm.

KBS® Coating is available in two kinds of make-up. **KBS® Coating** sprayable and **KBS® Coating Brushable**.

Thinning

KBS® Coating is water-based. However, both types mentioned before, usually do not require thinning.

Spray equipment

KBS® Coating may be applied with a large variety of spray equipment designed for application of high viscosity materials. Good results have been obtained with the following:

Airless spray equipment

Graco Smart Mark V
Pressure at gun: 0 – 200 bar
Spray gun orifice: 0.9 – 1.0 mm
(preferably reversible tip)

Please note

Air supply, air pressure, diameter of material hose as well as minimum orifice opening must be adhered to as recommended. All filters with the equipment must be removed prior to operating with **KBS® Coating**.

Technical Data

Composition:

KBS® Coating consists of water-based thermoplastic resins, inorganic incombustible fibres, fillers, pigments and various flame retardant chemicals. **KBS® Coating** is free of asbestos and solvents.

Colour: Off-white

Viscosity:

Approx. 40,000 mPas

Density: Approx. 1.43 g/cm³

pH-value: Approx. 8.0

Solids: Approx. 70%

Limiting Oxygen Index (LOI): ≥ 95

(minimum requirement acc. to German approval)

Toxicity: Non-toxic

Storage temperature:

5 – 30°C, Must be protected from frost !

Shelf-life:

In closed original containers at room temperature at least 18 months

Packaging:

Plastic drums of 35, pails of 25 and 7 kg

Thinning i.e. cleaning of equipment:

Water

Drying time:

Depending on temperature and humidity
To the touch:
within 24 hours
(20°C/65% RH)
Cured:
approx. 3 days
(20°C/65% RH)

Flexibility:

PVC cables of 12 mm diameter coated with **KBS® Coating** may be bent to a 3 cm radius without cracking.

Thermal conductivity:

$\lambda = 0.69 \text{ W m}^{-1} \cdot \text{K}^{-1}$ at 25°C

Specific resistance:

$\rho_p = 1.06 \cdot 10^9 \text{ (Ohm} \cdot \text{cm)}$
at 23°C / 50% RH
 $\rho_p = 4.10 \cdot 10^5 \text{ (Ohm} \cdot \text{cm)}$
at 23°C / 83% RH

Selection of International Test Results and Approvals

Country	Type of Test	Standard	Result	Ref.No.
Germany	Qualifying test concerning reduction of fire risks	-	ignition prevented	008
	Current carrying capacity	-	no derating	106B
	Dermatology test	-	no effect	110A / 110B
	Flame propagation on coated cables	DIN 4102, p. 1 (B1)	passed	169
	Flame propagation on coated cables	IEC 60332-3	non-propagating	148
	Flame propagation on coated cables	IEC 60332-3-22	passed	053
		category A/F		
	Flame propagation TÜV Nord	IMO FTPC, p. 5	non-propagating	047
	Circuit Integrity	IEC 60331-11	52 minutes	052
	Ship Approval Germanischer Lloyd	IMO Res. MSC. 61 (67)	passed	060
	Ageing and weathering	-	no damage after 30 years	180
LOI-determination	ASTM D2863	100	111 / 180	
Great Britain	Flame spread	BS 476, p. 7	class 1	916 A
Norway	Fire spread	NT Fire 004	Class IN 1	710
USA	Ampacity	FM 3971	-	2001
	Current carrying capacity	FM 3971	no derating	2001
	Salt water exposure	FM 3971	-	2001
	Dielectric strength	FM 3971	-	2001 / 2023
	Flammability test	FM 3971	passed	2001 / 2023
	FM approval	FM 3971	-	2001 / 2023

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KBS[®] Mortar

For sealing cable and utility penetrations

 **BASF**
The Chemical Company



KBS® Mortar

For sealing cable and utility penetrations

General Information

KBS® Mortar is a dry mortar mix with controlled swelling effect to provide a non-shrinking, homogeneous and smoke gas-tight fire seal for cable penetrations. Most mortars shrink during drying and curing.

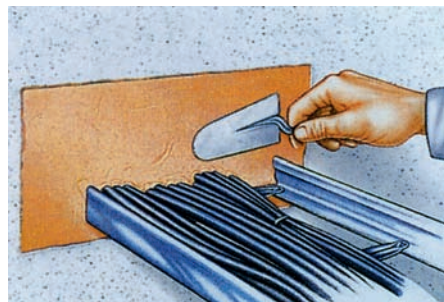
KBS® Mortar expands while it sets (up to 3%), ensuring a tight and crack-free seal. When mixed to pumping consistency, **KBS® Mortar** will not run or sag, allowing easy build-up of material inside a wall opening, whereby for smaller openings, shuttering is only necessary on one side.

KBS® Mortar has been rated up to 240 minutes fire resistance at various thicknesses as per all important standards. (See list of international test results and approvals on back page.)

KBS® Mortar is a blend of inorganic binders, fillers and lightweight aggregates, interlaced with special additives and agents.

KBS® Mortar may be used wherever a fire resistance up to 240 minutes for cable penetrations is specified.

KBS® Mortar is preferably used for floor penetrations but, because of its non-sagging properties, is also easily installed in wall penetrations.



Installation wall penetrations

Pump application

Shutter one side of the opening and start applying **KBS® Mortar** from the open side using a pump type mortar mixer/applicator (such as Putzmeister „Spray-boy“). This equipment must have a shut-off valve for intermittent application. Using **KBS® Mortar** at the correct consistency (see box), will prevent it from running or sagging and allow for an easy build-up of the mortar seal. When sealing large penetrations (more than 30 cm in height) it is advisable to support the applied material on the front side with panels as filling progresses. Where no front-shuttering was used (smaller openings) the mortar may be levelled out with a trowel after 1 hour of setting. Removal of shuttering, depending on temperature and opening size, after at least 24 hours.

Manual application

For small installations or repairs (retrofitting), **KBS® Mortar** may be mixed manually. Please follow the same preparation procedures as mentioned before. For wall installations use heavier consistency to achieve a stiff non-sagging material which can be applied by trowel. For floors use more water.

Retrofitting

New cables or other utilities may be installed in a **KBS® Mortar** seal with ease. The material is of low compressive strength and allows easy drilling (by hand or motor drill) for an adequate opening. After cables have been passed through, some hand-mixed **KBS® Mortar** is used for resealing. A bulk loading caulking gun can be used for this.

Installation Floor penetrations

Shuttering

The underside of the floor opening is to be shuttered with suitable materials (such as hard-foam panels, held in place by a wooden lath). Please note, exact cutting around penetrating utilities is not necessary.

Preparing

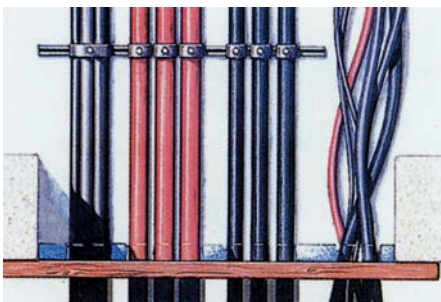
For closing gaps of the shutter, mix **KBS® Mortar** to heavy consistency, using less water (see box). Apply this heavy mix by trowel over all remaining openings and allow to set for at least 1 hour. All masonry surfaces coming in touch with the mortar must be free of loose dust, dirt or oil and should be wetted prior to application of mortar.

This also applies to wall penetrations.

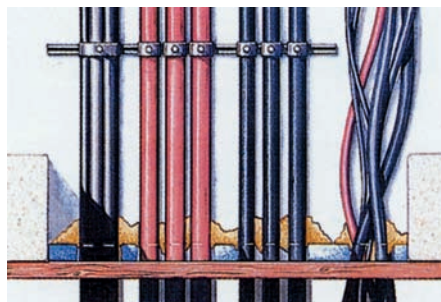
Pouring

Mix **KBS® Mortar** to pouring consistency (see box), using conventional mortar mixing equipment (cement mixer). Pour **KBS® Mortar** into the opening up to the level of the floor. It will flow between all utilities and level out to a perfect finish. Allow to dry and cure at least 1 week (longer for very large openings) before removing shuttering. If access to the floor penetration is necessary, use any suitable cover.

Shuttering



Preparing



Pouring



KBS® Mortar: Technical Data

Colour: Red

Bulk density: Approx. 600 g/l

pH-value at working consistency: 12.3

Toxicity: Non-toxic

Shelf life:

In original, unopened bags at least two years

Storage temperature: -20°C / +40°C

Combustibility: Non-combustible

Packaging:

25 kg multi-layer bags with polyethylene lining

Density of cured material: Approx. 0.6 g/cm³

Compressive strength:

Approx. 0.6 – 0.7 N/mm²

Expansion: Approx. 3 Vol.% (20°C / 24 h)

Workability: Max. 60 minutes

Complete hardening: Approx. 30 days

Minimum temperature for application of

KBS® Mortar: + 5°C

Cleaning of equipment:

Water immediately after use

Mixing dry KBS® Mortar

Water/mortar ratio for various types of application

Pour about half of the indicated amount of water into mixing container and start mixing.
Add rest of water slowly.

	Manual application (small openings)	Pump application (walls and floors)	Pouring application (floors)
25 kg dry mortar	16 l water	17 l water	18 l water
Approx. yield	35 – 36 l	36 l	36 l
1 kg dry mortar	0.65 l water	0.70 l water	0.72 l water
Approx. yield	1.4 – 1.5 l	1.5 l	1.5 l

List of International Test Results and Approvals of KBS® Mortar

Country	Testing Institute/ Approval Body	Ceiling or wall test	Mortar seal thickness (mm)	Official fire resistance rating F/T** (minutes)	Standard	Ref. No.
Australia	Nat. Building Techn. Center	floor	120	30 – 120 T 120 F	AS 1530 p.4	3101
Belgium	Université de Liège	wall	190	120 F/T	NBN 713.020	315
France	C.S.T.B.	wall	200	120 F/T	Arrêté Ministériel	624
Germany	DIBt, Berlin	wall	200	90 F/T*	DIN 4102	125
		floor	200	90 F/T*		
Italy	CSI	wall	250	180 F/T	Circulare n. 91	1011
	Instituto Giordano	flor	250	180 F/T	Circulare n. 91	1012
South Africa	South African Bureau of Standards	wall	225	120 F/T	SABS 017 p. II	4005
Switzerland	VKF	wall	200	90 F/T*	VKF, AEA1	506
		floor	200	90 F/T*		
UK	LPC/BRE	wall	100	240 F/T	BS 476, p. 20	941
	BRE	floor	100	240 F/T	BS 476, p. 20	946
USA	UL	floor	200	180 F 0 – 120 T	UL 1479	2016
	UL	wall	80	180 F	UL 1479	2030
		floor	80			
UL	wall	120	120 F	UL 1479	2031	
	floor	120				

* in Germany and Switzwerland only 90 minutes are required

** F = fire rating / T = temperature rating on cables

All test reports on request.

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