FIRE PROTECTION *pocket*

SUMMARY OF FIRE PROTECTION COATINGS

FeuerTrutz

HENSEL

FIRE PROTECTION SYSTEMS

Special production for
Rudolf Hensel GmbH | Lack- und Farbenfabrik, 5th edition

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1 Passive structural fire protection

One key constituent of modern, passive structural fire protection are fire protection coatings. Whether steel, wood, or concrete components, special coating systems always come into play when fire protection requirements must be fulfilled without detriment to visual appeal.

Fire protection coatings are materials whose surfaces are barely distinguishable from paints. This holds true whether they are applied with brushes, rollers, or airless sprayers. In the event of fire, fire protection coatings protect not only steel, but also wood constructions and concrete components from structural failure. Also cables and cable trays are protected against combustion and malfunction. In combination with a joint sealing compound, they also serve as seals in walls and floors.

The fire protection effect is provided by a robust, heat-resistant carbon foam layer that forms at temperatures over 200 °C, protecting the coated components against overheating, combustion, and loss of their structural properties for a period defined in the product approvals. This period of time can be used to rescue persons and retrieve material assets from the structures treated with fire protection coatings.

Owing to their relevance to safety, fire protection coatings must comply with stringent market approval criteria. Training courses held on the manufacturer's premises familiarise customers with the products and their use, and certificates are issued.

Inadequately treated and incorrectly designed components can cause considerable damage in the event of a fire, hinder the rescue of persons and animals, and prevent effective firefighting. Every year, around 80,000 residential buildings burn down in Germany, killing around 340 people a year and seriously injuring several thousand. The corresponding fire protection requirements have been set down with legal force in § 4 of the MBO (Model Building Regulations) and in other ordinances, directives, and official decisions.

2 Fire protection coatings on steel

Steel and glass are the building materials of spectacular architectural achievements and so enjoy high demand for major building projects. In fulfilling the safety requirements for structural fire prevention, building projects must also preserve the aesthetic points of the design plans, so fire protection coating systems for steel are the first choice.

Although it does not burn, steel does lose its structural integrity at temperatures over 500 °C. Fire protection coatings applied to the profiles of sectional steel safeguard heat resistance for a defined period and hence the structural integrity of both open and hollow steel components.

Fire protection systems for steel are available as water- and solvent-based products for indoor and outdoor applications on open and hollow, corrosion proofed, and/or galvanised sections. They cover the DIN 4102 fire resistance classes F30 to F90 and the classes R15 to R180 under DIN EN 13501.

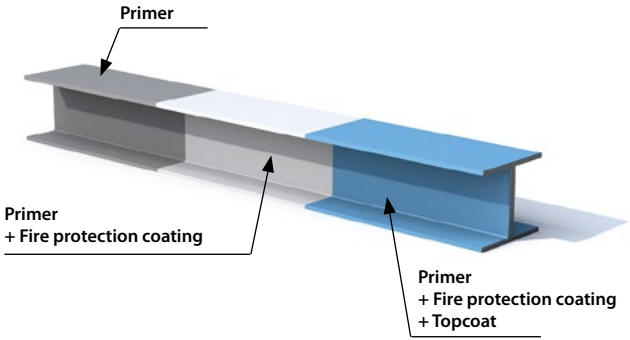
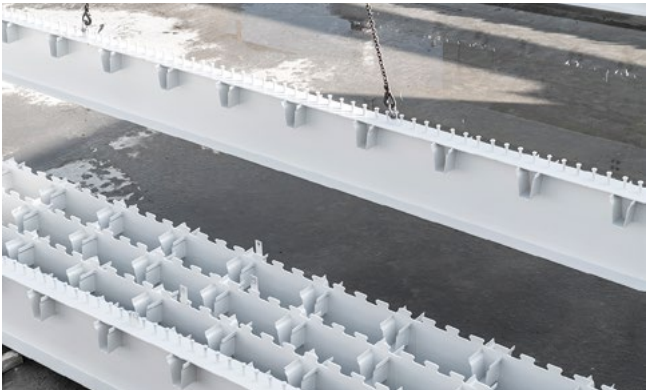


Figure depicts: Coating structure on steel blasted according to Sa 2.5

The required fire resistance class F/R for the steel component is achieved by the correspondingly applied dry film thickness (DFT) of the fire protection coating / intumescent, which foams up (intumesces) in case of fire. The thickness of the carbon foam delays the heat transfer to the steel component in the required time.

The application of 1C steel fire protection systems is usually carried out directly on the construction site. Water- or solvent-based intumescent coatings are used in particular for conversion and/or renovation measures in existing buildings.

In public buildings, schools or hospitals, this can easily be done on site with the water-based steel fire protection system HENSOTHERM® 421 KS from the Green Product line. The product system with the associated components primer, intumescent and topcoat fulfils the requirements of LEED v4, is AgBB tested (Committee for the Health Evaluation of Building Products), registered in the DGNB (German Sustainable Building Council) Navigator, has an Environmental Product Declaration (EPD) and is listed in the Cologne List.



2C steel fire protection systems are mainly applied in the workshop. After a drying time of 24 hours, the coated steel components are optimally protected against mechanical loads and weathering. They can therefore already be stored outdoors and/or transported directly to the site of use and assembled in a time-saving manner.

HENSOTHERM® 2C steel fire protection systems are solvent-free and cover fire resistance times of 30 / 60 / 90 / 120 minutes for interior and weathered exterior use. This means that there is no need to change systems if the fire resistance times of the components to be coated vary. This eliminates the need for set-up times. Optimised pot life and drying times ensure effortless application even when using suitable 1C airless equipment.

NOTE: Products with a test certificate according to DIN are rated at 500 °C. Products according to EN can be verified for temperatures from 350 °C to 750 °C. The critical **steel temperature** depends on the static load in case of fire and the steel and can be confirmed by the structural engineer. Basically, no critical steel temperature has been defined in Germany so far; it is always a case-by-case consideration.

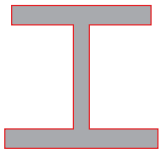
Formula for calculating the Hp/A ratio (section factor)

The Hp/A value is an indicator of a component's massiveness. Calculated from the heated perimeter (Hp) and its cross section (A), this is specified in the unit (m^{-1}). Accordingly, filigree components exhibit a high, and massive components a low Hp/A value. The section type and its cross sectional geometry are therefore decisive factors in the calculation of the applied quantities needed for each and every case.

Example: Open steel profile; HE-A 200 (4-sided + 3-sided exposure)

Hp = 1.14 m
A = 53.8 cm²

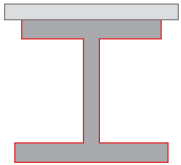
4-sided



$$\frac{Hp = 1.14\ m}{A = 0.00538\ m^2} = 212\ m^{-1}$$

Hp = 0.94 m
A = 53.8 cm²

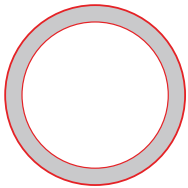
3-sided



$$\frac{Hp = 0.94\ m}{A = 0.00538\ m^2} = 175\ m^{-1}$$

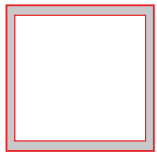
Example: Hollow profile; CHS profile 244.5x11 mm
(4-sided) SHS profile 100x100x3.6 mm

Hp = 0.768 m
A = 80.7 cm²



$$\frac{Hp = 0.768\ m}{A = 0.00807\ m^2} = 95\ m^{-1}$$

Hp = 0.394 m
A = 13.8 cm²



$$\frac{Hp = 0.394\ m}{A = 0.00138\ m^2} = 286\ m^{-1}$$

Hp/A / example calculations of section coefficients

Hollow sections, circular

Closed steel section RR 244.5 x **3.6** (heated on four sides)
Parameters: Hp = 0.768 m, A = 0.00272 m^2
Calculation: $\frac{Hp = 0.768\ m}{A = 0.00272\ m^2}$ = **282** $\mathbf{m^{-1}}$

Closed steel section RR 244.5 x **11** (heated on four sides)
Parameters: Hp = 0.768 m, A = 0.00807 m^2
Calculation: $\frac{Hp = 0.768\ m}{A = 0.00807\ m^2}$ = **95** $\mathbf{m^{-1}}$

Hollow sections, square

Hollow steel section QR 100 x 100 x **3.6** (heated on four sides)
Parameters: Hp = 0.394 m, A = 0.00138 m^2
Calculation: $\frac{Hp = 0.394\ m}{A = 0.00138\ m^2}$ = **286** $\mathbf{m^{-1}}$

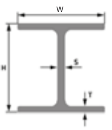
Hollow steel section QR 100 x 100 x **11** (heated on four sides)
Parameters: Hp = 0.394 m, A = 0.003916 m^2
Calculation: $\frac{Hp = 0.394\ m}{A = 0.003916\ m^2}$ = **101** $\mathbf{m^{-1}}$

The thinner the section walls, the higher the calculated Hp/A value and the faster the critical failure temperature (Tcrit) is reached in the event of a fire! In other words, the fire protection coating must be applied in a higher dry film thickness (DFT).
On the other hand, the thicker the section walls, the lower the calculated Hp/A value, and the critical failure temperature (Tcrit) is reached later. The required DFT of the fire protection coating can then be reduced accordingly.

Sections – Section measurements

IPN	Web thickness	T	5,9	6,8	7,7	8,6	9,5	10,4	11,3	12,2	13,1	14,1	15,2	16,2	17,3	18,3	19,5	20,5	21,6	23,0	24,3	25,6	27,0	30,0	32,4		
	Flange width	W	42	50	58	66	74	82	90	98	106	113	119	125	131	137	143	149	155	163	170	178	185	200	215		
	Web height	H	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	425	450	475	500	550	600		
Profile IPN			**80**	**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**	**260**	**280**	**300**	**320**	**340**	**360**	**380**	**400**	**425**	**450**	**475**	**500**	**550**	**600**		
Hp/A (4-sided)			**402**	**349**	**309**	**276**	**252**	**229**	**212**	**196**	**183**	**170**	**158**	**149**	**140**	**133**	**125**	**119**	**113**	**107**	**101**	**95**	**91**	**85**	**76**		

IPE	Web thickness	T	5,2	5,7	6,3	6,9	7,4	8,0	8,5	9,2	9,8	10,2	10,7	11,5	12,7	13,5	14,6	16,0	17,2	19,0
	Flange width	W	46	55	64	73	82	91	100	110	120	135	150	160	170	180	190	200	210	220
	Web height	H	80	100	120	140	160	180	200	220	240	270	300	330	360	400	450	500	550	600
Profile IPE			**80**	**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**	**270**	**300**	**330**	**360**	**400**	**450**	**500**	**550**	**600**
Hp/A (4-sided)			**429**	**388**	**360**	**336**	**310**	**292**	**269**	**254**	**236**	**227**	**215**	**200**	**186**	**174**	**162**	**150**	**140**	**129**



HE-A	Web thickness	T	8,0	8,0	8,5	9,0	9,5	10,0	11,0	12,0	12,5	13,0	14,0	15,5	16,5	17,5	19,0	21,0	23,0	24,0	25,0	26,0	27,0	28,0	30,0	31,0	
	Flange width	W	100	120	140	160	180	200	220	240	260	280	300	300	300	300	300	300	300	300	300	300	300	300	300	300	
	Web height	H	96	114	133	152	171	190	210	230	250	270	290	310	330	350	390	440	490	540	590	640	690	790	890	990	
Profile HE-A (IPBI)			**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**	**260**	**280**	**300**	**320**	**340**	**360**	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**800**	**900**	**1000**	
Hp/A (4-sided)			**265**	**264**	**253**	**234**	**225**	**212**	**196**	**178**	**171**	**164**	**154**	**142**	**135**	**128**	**120**	**113**	**107**	**104**	**102**	**100**	**96**	**94**	**91**	**89**	

HE-B	Web thickness	T	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	17,5	18,0	19,0	20,5	21,5	22,5	24,0	26,0	28,0	29,0	30,0	31,0	32,0	33,0	35,0	36,0	
	Flange width	W	100	120	140	160	180	200	220	240	260	280	300	300	300	300	300	300	300	300	300	300	300	300	300	300	
	Web height	H	100	120	140	160	180	200	220	240	260	280	300	320	340	360	400	450	500	550	600	650	700	800	900	1000	
Profile HE-B (IPB)			**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**	**260**	**280**	**300**	**320**	**340**	**360**	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**800**	**900**	**1000**	
Hp/A (4-sided)			**218**	**202**	**187**	**169**	**159**	**147**	**140**	**130**	**127**	**124**	**116**	**110**	**106**	**102**	**97**	**93**	**89**	**87**	**86**	**85**	**82**	**81**	**78**	**78**	

HE-M	Web thickness	T	20,0	21,0	22,0	23,0	24,0	25,0	26,0	32,0	32,5	33,0	39,0	29,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0
	Flange width	W	106	126	146	166	186	206	226	248	268	288	310	305	309	309	308	307	307	306	306	305	305	304	303	302	302
	Web height	H	120	140	160	180	200	220	240	270	290	310	340	320	359	377	395	432	478	524	572	620	668	716	814	910	1008
Profile HE-M (IPBv)			**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**	**260**	**280**	**300**	**320/305**	**320**	**340**	**360**	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**800**	**900**	**1000**
Hp/A (4-sided)			**116**	**111**	**106**	**100**	**96**	**92**	**89**	**73**	**71**	**70**	**60**	**79**	**60**	**60**	**61**	**61**	**63**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**

Substrate preparation

The surface of the different metals, e.g. stainless steel, cast iron, aluminium, etc., must be prepared in such a way that the adhesion of the primer is guaranteed and the application can be carried out with the selected HENSOTHERM® fire protection system F/R 30, 60, 90, 120 or 180.

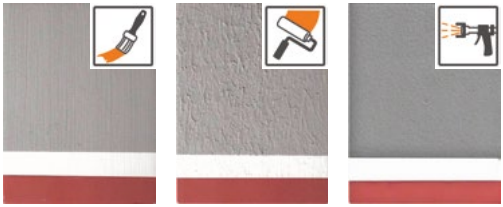
The objective of the substrate preparation	The surface of the different metals must be prepared so that adhesion of the primer is ensured and application with the selected **HENSOTHERM®** fire protection system R 30, R 60, R 90 or R 120 can take place.		
Metal types	**Preparation measures**	**Primers**	
Steel surface, blasted	• Blasting in accordance with degree of preparation Sa 2.5 • Clean: dust, oil and grease-free	HENSOGRUND 1966 E HENSOGRUND 2K EP HENSOGRUND WB Green	The application quantities given in the technical data sheets for the primers do not take into account the correction factors for rough surfaces in accordance with ISO 19840.
Corroded steel parts Sand blasting not possible (PSt 2 / St 2)	• Hand de-rusting of the corroded surfaces, e.g. using a wire brush or mechanical prepared • Minimum requirement PSt 2 / St 2 • Clean: dust, oil and grease-free	HENSOGRUND 1K AK	
Corroded steel parts Sand blasting not possible (St 3)	• Mechanical preparation, metallically bright • Minimum requirement St 3 • Clean: dust, oil and grease-free	HENSOGRUND 1K AK HENSOGRUND 2K EP HENSOGRUND WB Green	
Cast steel	• Remove old layers of paint and all contamination up to the bare metal through blasting • Clean: dust, oil and grease-free	HENSOGRUND 1K AK HENSOGRUND 2K EP	
Stainless steel	• Blasting with abrasive non-metallic blasting material • Roughening with abrasive fleece (grain 200 – 300) • Alternative glass blasting • Clean: dust, oil and grease-free	HENSOGRUND 2K EP HENSOGRUND WB Green	
Transport damage to primed steel surfaces or R 30 coatings e.g. defects	• Hand de-rusting of the corroded surfaces, e.g. using a wire brush • Minimum requirement PSt 2 • Clean: dust, oil and grease-free	HENSOGRUND 1K AK	
Zinc corrosion (white rust), galvanised surfaces	Alternative in accordance with the degree of the contamination: • Sweep blasting (Must be used after storage outside!) • Sanding, e.g. with a sanding pad • Clean with solvent • Clean with high-pressure cleaner	HENSOGRUND WB Green HENSOGRUND 2K	
Pre-coated surfaces	• Suitability and compatibility test, see sheet on „Testing pre-coatings on steel constructions“ • Protocolling, see template „Protocol on the testing of pre-coatings“ • If suitable, further process as for transport damage		

Details on the properties and how to process the primers for HENSOTHERM® fire protection coating systems can be taken from their technical data sheets. These can be downloaded as PDFs from www.rudolf-hensel.de

Application method

Fire protection coatings are technical systems that first develop their safety properties in the event of a fire and protect steel constructions from loss of structural integrity. Their protective function has been proven in fire tests at a materials testing office and confirmed by a European Technical Assessment (ETA) or, for use in Germany, with a general construction type approval (aBG) from the DIBt (German Institute for Civil Engineering).

In contrast to conventional coatings, there is no standardised specification for the applied film thickness. Instead, this is based on the required fire protection class and on the section type and section factor (Hp/A m^{-1}) of the coated steel structure. In other words, the finer the steel component geometries and the longer the required fire resistance duration, the greater the quantity of fire protection coating that must be applied. The minimum dry film thicknesses (DFT) specified in the national technical approvals are therefore 150–7000 µm. As a comparison, automotive lacquer finishes have only the one thickness of about 80 µm. The fire protection coating is applied following the profile. It can be applied with a brush, roller, or airless sprayer.



Painting Rolling Airless spraying

The texture of the final coating is influenced to no little degree by the selected or prescribed application method. A manual application with **brush or roller** gives rise to a heavily textured surface.

The **airless spraying method**, on the other hand, generates under high pressure a fine atomisation or a fine, airless atomisation of the fire protection coating that is applied as a high speed jet to the workpiece for the optimal surface look. The fire protection coating should first be applied after all steel components have been assembled and the roof rendered tight, but before building facilities obstruct access.

One alternative is to apply the intumescent coating to the steel structure before it leaves the workshop. This, however, requires greater care during transport and assembly. Defects caused by transport and assembly must be repaired by qualified personnel. The coating must be protected from the effects of the weather until the full application has been completed.

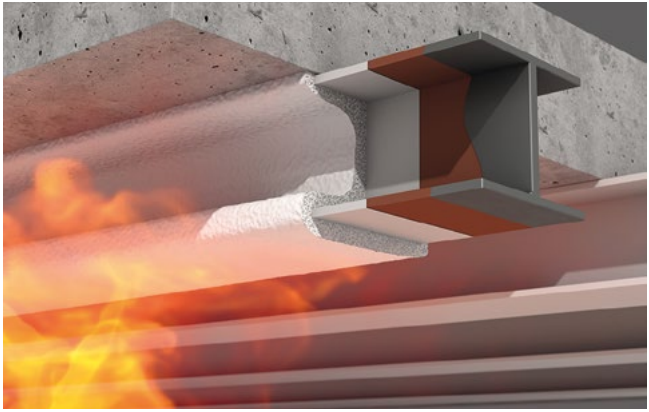
The one component or two component topcoat is first applied on the fully dried fire protection coating. It protects the intumescent coating and is available in all RAL, and custom colours.

The processing specifications listed in the approval and the manufacturer's data sheets, the prescribed DFT, and specifically the drying times must be observed without fail if the application of the fire protection coating is to be assessed as conforming to the approval.

Service life and inspection

Coating systems for fire protection of steel structures in fire resistance classes R 30 / 60 / 90 / 120 are basically maintenance-free coatings. Their fire-protective effect is guaranteed if they are processed professionally and in accordance with the approval and if the topcoat is intact. However, according to the general building type approvals (aBG) and the former general building inspectorate approvals (abZ), the building owner is obliged to keep the coatings in proper condition at all times. For this purpose, a visual inspection must be carried out every 2 years in dry interior areas and every year in exterior areas to determine whether moisture damage, mechanical damage (flaking) or changes to the fire protection system have occurred due to other circumstances.

HENSOTHERM® 421 KS is currently the only steel fire protection system on the German market to have a **service life of at least 25 years** officially confirmed in the ETA and in the aBG (general design approval).



Steel fire protection systems protect human lives and preserve values.

3 Fire protection coatings on wood

How HENSOTHERM® fire protection systems work

The fire protection effect is based on a foam layer (stable carbon foam) insulating against heat, as in steel fire protection systems, which develops at temperatures from approx. 200 °C, due to a fire, and protects the coated components from overheating, ignition and finally loss of their structural load-bearing capacity for a period defined in the product approvals and the fire resistance class. The term "fire resistance class" refers to the fire behaviour of standardised components and cannot be applied to wood materials. The immense number of wood component geometries make standardisations and standardised fire tests simply impossible. Wood components are therefore not classified with respect to their fire behaviour, and so cannot be assigned to fire resistance classes.
Most of the untreated wood and wood-based materials used in timber construction comply with building material class B2 according to DIN 4102-1 or the European classification D-s2,d0 according to DIN EN 13501-1 (SBI test) and are thus classified as "normally flammable" building materials.
By applying a fire protection coating, there is the possibility of upgrading to a higher building material class up to B1 flame-retardant according to DIN 4102-1 or up to B-s1,d0 according to DIN EN 13501-1 (SBI test) depending on the fire protection system used, so that wood can also be used where flame-retardant building materials are prescribed, such as in buildings open to the public, without restricting the advantages of wood as an architectural design element.

NOTE: A fire protection coating for wood therefore has no effect on the fire resistance duration of the component, but on its building material class. An upgrading of timber components to a fire resistance class is only possible via the dimensioning or the burn rate.

Substrate preparation

We recommend that you always check the substrate for suitability and adhesion, especially before starting work! The surfaces to be coated must be free of dust, dirt, grease, wax, parting layers, glues, lime, and oil. Old coats of paint must be completely removed! If necessary, sand the substrate and pretreat with HOLZGRUND AQ or HOLZGRUND SB [requirement approx. 100 g/m²] to avoid highly absorbent substrates and too deep penetration of the intumescent into the wooden components.

1. Solid wood, flat pressed wood chipboard, construction veneer plywood in a thickness of > 12 mm; observe substrate preparation.
2. Fire protection coating **HENSOTHERM® 1 KS INNEN**
3. Topcoat **HENSOTOP 84 AF** (absolutely necessary!)

Coating structure **HENSOTHERM® 1 KS INNEN** | transparent

Application

There are various methods for applying fire protection coatings to wood components too, with a brush, roller, or airless sprayer.

HENSOTHERM® Wood fire prevention systems acc. to DIN / DIN EN
- **HENSOTHERM® 1 KS INNEN** | transparent (indoor)
- **HENSOTHERM® 2 KS INNEN weiss** | covering (indoor)
- **HENSOTHERM® 2 KS INNEN schwarz-anthrazit** | covering (indoor)
- **HENSOTHERM® 2 KS AUSSEN** | transparent (outdoor)

4 Fire protection coatings on concrete

When renovating buildings, it can happen that due to a **missing concrete cover**, the existing reinforced concrete parts have to be strengthened in order to achieve the required fire resistance class. This is because concrete and the internal steel reinforcement expand to different degrees at temperatures as low as 330 °C, which can lead to flaking and loss of load-bearing capacity.

HENSOTHERM® 820 KS is a water-based, one component fire protection coating for retrofitting concrete components in interior areas. In the event of a fire, HENSOTHERM® 820 KS forms a layer of carbon foam that insulates against heat, in accordance with the required fire resistance class, and thus prevents the concrete components from heating up and the concrete from spalling off the steel reinforcement. The system is statically non-loading, space-saving, and ideally suited for changes of use and renovations of structures where retrofitting of fire protection is required due to missing concrete covers.

- Very well suited for building in accordance with DGNB (German Sustainable Building Council) or Minergie-ECO
- Free of APEO (alkylphenol ethoxylate), free of halogen and borate
- VOC emission class A+, LEED confirmation, AgBB-tested

Area of use

- Indoor use without environmental influences
- Concrete flat slabs / concrete walls:
  Fire resistance duration up to 240 minutes
- Concrete beams / concrete columns:
  Fire resistance duration up to 150 minutes
- Prestressed concrete hollow ceilings:
  Fire resistance duration up to 120 minutes
- Ribbed ceilings: On request, retrofitting of ribbed ceilings is possible with a project-specific expertise.

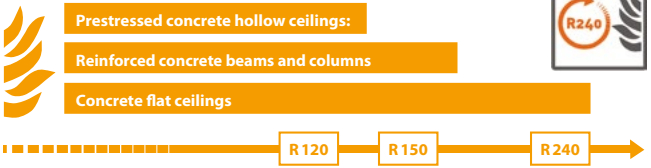
For renovation in areas with a fire protection requirement and high humidity, such as in swimming pools, or with high emission levels, such as in underground car parks / multi-storey car parks, the water pressure and weather resistant concrete fire protection coating **HENSOMASTIK® B 3000** is used. It improves the fire resistance duration of concrete and reinforced concrete components up to 120 minutes.

The **BETON-CARBONSPERRE** primer prevents the penetration of pollutants and water and has a CO_2 and SO_2 retarding effect. Alternatively, concrete substrates indoors without environmental impact can also be primed with **Betongrund AQ**.

Coating structure **HENSOTHERM® 820 KS**

1. Repair mortar
2. BETON-CARBONSPERRE / Betongrund AQ
3. HENSOTHERM® 820 KS
4. HENSOTOP WB Green

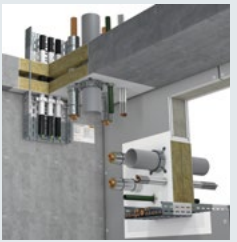
FIRE RESISTANCE UP TO 240 MINUTES



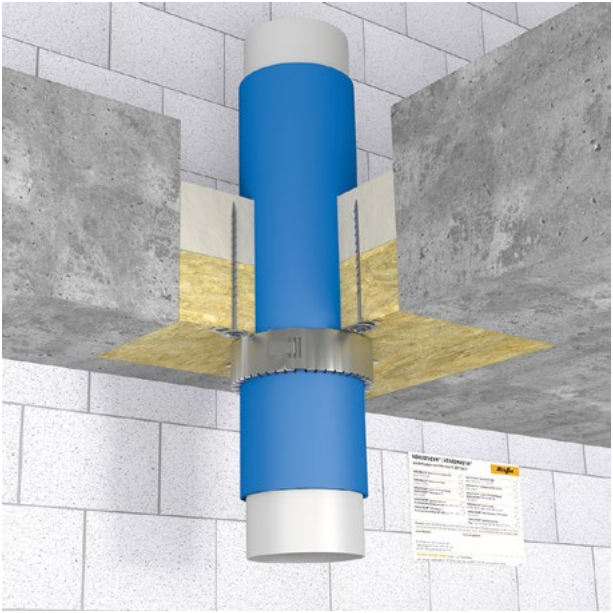
5 Fire protection for penetration seals

In the event of fire, penetration seals installed in the walls and floors of public and commercial buildings prevent the spread of flames and particularly toxic fumes from room to room and between the storeys.
A penetration seal can either be build as a hard seal (mortar based) or as a soft seal (mineral fibre board based), the latter with the advantage of greater flexibility in subsequent rerouting. **A soft seal consists of the components:** Mineral fibre boards (construction material class A1, EN 135011, non-combustible), fire protection coating, and fire protection compound. A soft seal is also suitable for larger cable seals. The cables treated with the fire protection coating are routed through these on cable trays. The gussets between the cables are sealed with a filler, as well as the areas between the trays and the seal edges.

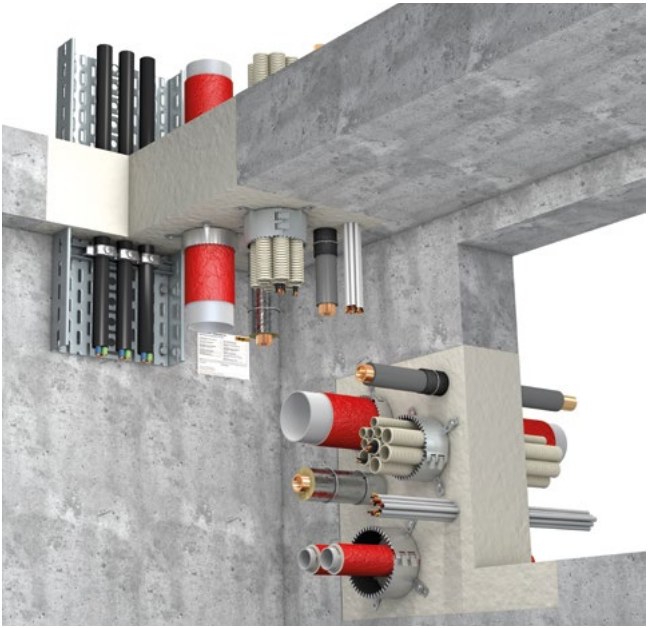
The **HENSOMASTIK® Mixed Penetration Seal systems** have been approved under DIN 4102-9 (S90) and the European standard EN 1366-3 (EI60–EI120) for both indoor and outdoor seals. This mixed penetration seal is effective not only on all kinds of cables, but also on combustible and non-combustible pipes as well as refrigerant conduits. The DIN 4102-9 approval also extends to the use of HENSOMASTIK® 5 KS products as ready-to-install seals. Mixed penetration seal systems can be installed in both flexible partitions and in solid walls and floors. HENSOMASTIK® Mixed Penetration Seal systems retain their sealing functions even at temperatures in excess of 1000 °C. These seals may be installed by trained and qualified personnel only! Training courses for the professional buildup of seals are provided by the manufacturers, who also issue a "certificate".



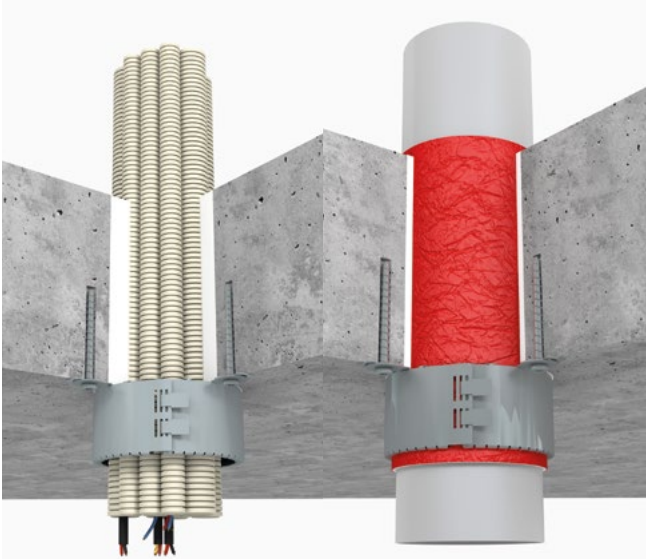
Further fire protection solutions for seals



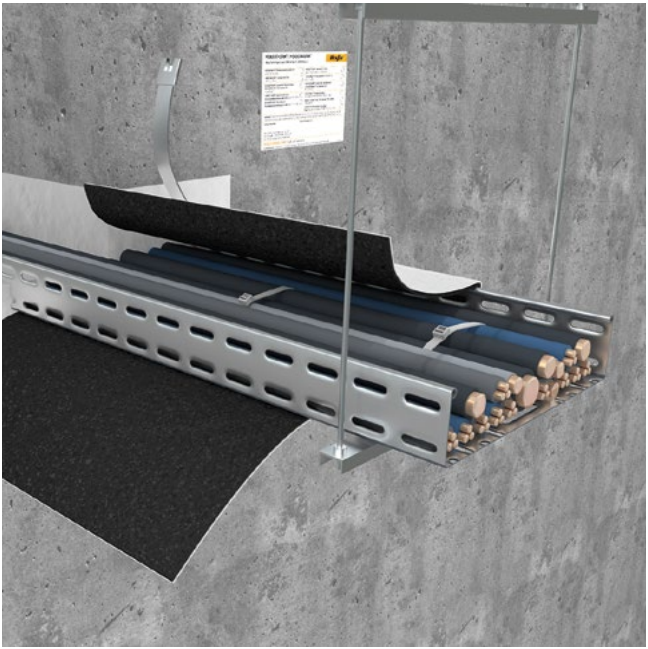
The **HENSOTHERM® GM 2000** is a fire-resistant mineral gypsum mortar used to form a fire penetration seal for single, multiple and mixed services to reinstate the fire resistance performance of rigid floor constructions, temporarily or permanently, where they have been provided with medium or large apertures penetrated by various supply lines and all kinds of insulation materials. It is used in combination with min. 50 mm thick mineral fibre boards serving as lost formwork, HENSOTHERM® RM 50 pipe collars, HENSOTHERM® 7 KS Gewebe 50 pipe wraps and HENSOTHERM® ST Service Transit to form a fire penetration seal.



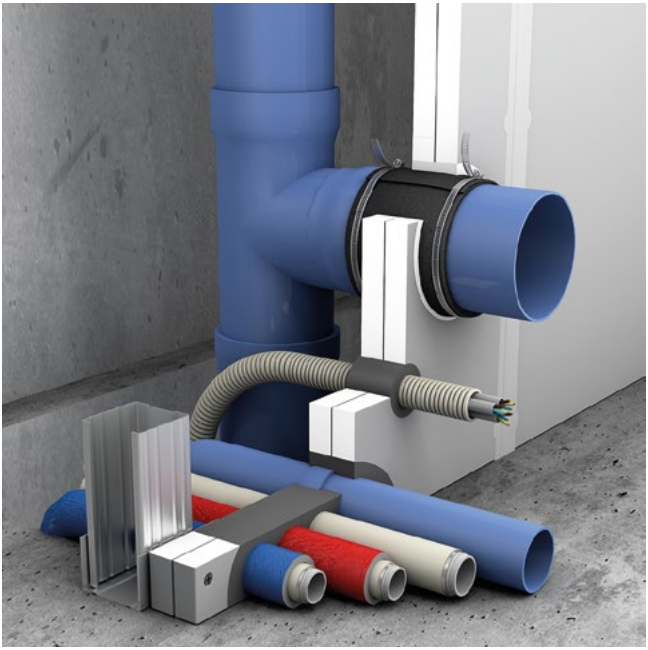
The **HENSOTHERM® M 2000** mortar barrier is a combination hard seal system made of HENSOTHERM® M 2000 fire protection mortar for cable and pipe seals in walls and ceilings. HENSOTHERM® M 2000 is used as a seal to restore fire safety in solid wall and ceiling constructions with openings for combustible and non-combustible pipes, cables and ceilings. HENSOTHERM® M 2000 is used as a bulkhead to restore the fire safety of solid wall and ceiling constructions provided with openings for combustible and non-combustible pipes, cables and cable bundles in EIR / flex pipes. Component sealing is carried out with the combination mortar HENSOTHERM® M 2000. The component is sealed with the combination mortar HENSOTHERM® M 2000.



The **HENSOTHERM® RM 30 / RM 50** for single pipe lead-throughs is used as a sealing of pipes with and without sound insulation as well as EIR / Flex pipes (with and without cables) to restore the fire safety of wall and ceiling constructions that are provided with openings for supply lines. Various common aluminium composite pipes can be laid and sealed as a double feed-through with zero spacing - ideal, for example, for the flow and return of heating installations.



The **HENSOTHERM® 7 KS Gewebe 1000 E** is an A2 glass filament fabric coated on one side with intumescent HENSOTHERM® 7 KS fire protection coating. HENSOTHERM® 7 KS Gewebe 1000 E is classified according to EN 1366-3 as a temporary and permanent fire penetration seal for electrical conduits, electrical installation pipes and cable support structures for a fire resistance duration of up to 120 minutes (ETA 22/0125) to restore the fire safety of massive wall structures provided with openings for electrical supply lines.



Fire protection solutions for single-sided drywalls ≥ 90 mm. The **HENSOTHERM® System für Schachtwand** for the closure of individual penetrations in single-sided planked drywall (shaft) walls ≥ 90 mm offers as a complete system a simple and economical solution for fire sealing of standard pipes for heating, air conditioning, sanitary and electrical systems in modern residential construction. Combustible pipes, aluminium composite pipes with PE insulation as well as EIR/Flex pipes with and without cables can be sealed with the continuous sleeve HENSOTHERM® 7 KS Gewebe 100 or with HENSOTHERM® 7 KS viskos (viscous).

HENSEL

FIRE PROTECTION SYSTEMS

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